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Leveraging TOGAF for Effective Enterprise Architecture Planning in Human Resource Management: A Case Study of A Financial Holding Company

Devita Sertivia Suprapto, Wella

Faculty of Engineering and Informatics, Universitas Multimedia Nusantara, Indonesia

wella@umn.ac.id

Abstract. In the digital era, information technology plays a crucial role in assisting businesses across various industries, including holding companies. This study focuses on PT XYZ, a financial holding company with a complex organizational structure and functions. However, PT XYZ needs help aligning its human resource (HR) business processes with effective information technology implementation. Specifically, the problems include suboptimal technology utilization and the absence of features to measure employee performance. To address these issues, this research proposes designing an enterprise architecture for PT XYZ's HR management. The enterprise architecture design adopts The Open Group Architecture Framework (TOGAF) as it provides comprehensive documentation and well-defined steps. The design process encompasses various phases, from the preliminary phase to the opportunity and solution phase. Each phase of the TOGAF framework yields specific outputs. The preliminary phase involves conducting a 5W+1H analysis—the vision architecture phase results in developing a value chain diagram and a solution concept diagram. The business architecture phase generates business flow diagrams, while the information system architecture phase produces entity relationship diagrams, data, and application designs using use case diagrams, activity diagrams, and interfaces. The technology architecture phase involves the creation of network and communication diagrams, as well as hardware specifications. Finally, the opportunities and solutions phase generate a benefit diagram and system implementation prioritization. Throughout the process, feedback from PT XYZ is sought to ensure alignment with their requirements and preferences. By leveraging the TOGAF framework, this research aims to provide PT XYZ with a comprehensive enterprise architecture design for effective HR management. The results of the enterprise architecture design will be validated through feedback from PT XYZ, ensuring its applicability and relevance to their specific needs.

Keywords: Enterprise Architecture, Holding Company, Human Resource Management, Information Technology Blueprint, TOGAF.

1. Introduction

In this digital era, technology has become essential for running an effective and efficient business (Wibawa et al., 2019). This condition also applies to a holding company, which maintains control through ownership of its subsidiaries, aiming to generate value, efficiency and increase its capacity. In this study, the shaded subsidiary is engaged in the financial sector, while the holding company supports them through application development, insights, recommendations, and decision-making. To carry out these roles and activities, the holding company has its organizational structure.

The organizational structure of a holding company has a vital role in defining the functions and roles of personnel (Aliefiani et al., 2022). Personnel consists of individuals trained to work under strategic leadership and control activities to achieve company goals (Saputra & Syazili, 2022). To manage personnel properly, the company has a human resources division responsible for recruitment, training, performance, and other aspects. Applying right-on-target information technology can support HR management.

Information technology helps process, manage, and distribute data in the form of information within a specific time and space (Huda, 2020). Before implementing information technology, companies must design a mature enterprise architecture to avoid losses and ensure targeted implementation. Enterprise Architecture (EA) involves designing integrated business processes and balancing them with information technology (Pangestu, 2021). Enterprise architecture generally consists of four main parts: business architecture, data architecture, application architecture, and technology architecture (Sasue & Wijaya, 2020). These four sections form the basis for the development of various frameworks.

The design of enterprise architecture began in 1987 by John Zachman through the publication of "A Framework for Information Systems Architecture" in the IBM Systems Journal. This framework emerged as a response to business technology developments in the 1980s when companies realized the need for long-term plans and strategies to support rapid technological developments. The Zachman Framework influences the Technical Framework for Information Management (TAFIM) project developed by the United States Department of Defense (Budi, 2021; Halawi et al., 2019). Enterprise architecture extends across the business to support digital transformation and technology growth (McDowall, 2019). The development of the TAFIM framework then shifted to The Open Group, now known as The Open Group Architecture Framework (TOGAF) (Majstorović & Terzić, 2018). TOGAF is a framework that can be used to develop architectures that meet business needs, providing methods and tools to build, manage, implement, and maintain enterprise architectures and information systems. Integrating technology, data management, and analytics into business models can assist company decision-making (Altarawneh & Tarawneh, 2023). In human resource management, TOGAF brings benefits to reduce operational costs and improve congruence between human resource business processes and information technology (Sidiq & Sumitra, 2019).

This study applies the TOGAF framework to design enterprise business, data, application, and technology architectures. TOGAF provides guidelines to map the HRM baseline and target architecture, complete with appropriate artifacts produced in each phase. PT XYZ is a financial holding company with banking, securities, and insurance subsidiaries. PT XYZ focuses on developing technology-based products to support its subsidiary's operations. PT XYZ was chosen to be the subject of study because its case study aligns with the research topic. Several problems are faced in PT XYZ's human resource management. The first problem is the suboptimal use of information technology, including an online recruitment system that needs to be fully integrated.

The second problem concerns inventory recording, which is still manually done and causing financial losses. In addition, PT XYZ wants to measure employee performance through a Key Performance Indicator (KPI) management system integrated with the human resource system. Therefore, this study aims to design an appropriate enterprise architecture to meet business needs and support PT XYZ's human resource management. These are the research questions to be solved:

RQ1: What is the gap analysis results between the use of information system technology and the

financial holding company's human resource management business process?

RQ2: What is the result of an appropriate enterprise architecture design to digitize the human resource management performance of the financial holding company?

RQ3: What are the responses of PT XYZ regarding the enterprise architecture designs produced?

2. Literature Review

Following are literature reviews regarding enterprise architecture design and TOGAF ADM framework:

Table 1. Literature Review

Title	Researcher	Method	Problems	Results
Enterprise Architecture Framework Design in IT Management	(Dumitriu & Popescu, 2020)	Case study and literature review	Organizations find difficulties in selecting the best IT architectural framework for managing increasingly large and complex information systems.	TOGAF got the highest score (96) in comparison with RM-ODP (80), ZEF (75), and FEAF (73). TOGAF has advantages in application, data, environment, performance, compatibility, flexibility, portability, and software configuration.
Perancangan Enterprise Architecture Menggunakan Framework TOGAF: Studi Kasus PT. Ikido Jorr Sepatu Indo	(Anderson & Andry, 2021)	TOGAF ADM (preliminary phase to migration planning)	The use of IT in PT. Ikido Jorr Sepatu Indo is not optimal, which results in inaccurate data entry and slowing down business processes. Companies are becoming less competitive in the modern era.	The research produced architecture blueprint to synergize business and IS/IT strategies to facilitate sending and processing company data. The preliminary stage is carried out with 5W + 1H analysis. Value chain analysis is done to find out the ongoing business processes. Gap analysis is carried out to determine opportunities for systems.
SOA Based Integrated System for Small and Medium Enterprises Using Service Oriented Architecture	(Fajar, 2023)	Service-based system development	Small and medium enterprise (SME) with tourism sector needs integrated systems to accommodate SME businesspeople and their customers in requesting and providing business processes.	The results of this study are user and system requirements for systems, business model, list of back-end services, strategic integration landscape, SOA architecture, and evaluation of the system. Evaluation is done for the old and new systems by analyzing the differences before and after the construction of the new systems.
Enterprise Architecture Planning for Enterprise University Information System Using the TOGAF Architecture Development Method	(Ulmi et al., 2020)	TOGAF ADM (preliminary phase to technology architecture)	The Center for Computer Science, University of Indonesia (Pusilkom UI) wants to develop Software as a Service (SaaS) on its academic information system with a microservice concept to improve data access performance.	Research conducts two levels: defining factors influenced and technical details for architectural design. The business architecture phase uses flowcharts and case diagrams. The data architecture uses Entity Relationship Diagram (ERD) with the concept of microservices. The technology architecture phase recommends implementation roadmap.
Designing Effective EA for E-Learning System in Kanisius School using TOGAF Framework	(Setyawan et al., 2020)	TOGAF ADM (preliminary phase to implementation governance)	Kanisius Jakarta School realizes the importance of digital transformation using e-learning for the teaching and learning, but school has difficulty implementing enterprise architecture in current business processes.	Preliminary phase prepares scope and framework. Vision architecture phase explains goals and organizational structure. Business architecture covers current and targeted e-learning. IS architecture uses use cases and activity diagrams. Technology architecture involves software used. The opportunity and

Title	Researcher	Method	Problems	Results
				solution phase determines implementation with stakeholders.
Enterprise Architecture for Designing Human Resources Application Standard Reference	(Wati et al., 2019)	TOGAF ADM (preliminary phase to migration planning).	Human resources are an important part of the company. PT Sumber Inti Sukses, management wants to develop an enterprise architecture for its human resources division so that every employee is ensured to be reliable, skilled, and experienced.	The preliminary phase uses SWOT analysis. Business architecture using UML (use cases, activity diagrams, sequence diagrams, and class diagrams). Database design is created in the information systems architecture phase. This study recommends modules for HRM. Implementation priority table is produced in the migration planning phase.
Perancangan Enterprise Architecture Menggunakan Framework TOGAF ADM Pada Divisi Human Resource Unit Pengembangan di PT Albasia Nusa Karya.	(Respati et al., 2020)	Conceptual model using TOGAF ADM (preliminary phase to technology architecture) .	PT Albasia Nusa Karya is a wood-cutting manufacturing company founded in 2015 in Garut City, West Java Province. Company needs the presence of HRM information systems to enable redefine HR roles, develop new competencies, and carry out data collection and forecasting in each department.	Principle catalog is produced for preliminary. The vision architecture phase uses a value chain diagram to describe the scope, stakeholders, and requirements to be achieved. A solution concept diagram is created to provide an overview of high-level solutions. The business architecture phase creates a functional decomposition diagram. The information systems architecture focuses on the applications used by corporate units. The technology architecture phase describes the environment and location diagrams.

Based on literature reviews shown in Table 1, TOGAF is the best framework to do enterprise architecture planning (Dumitriu & Popescu, 2020). Researcher adopt the method of 5W+1H in preliminary phase and gap analysis (Anderson & Andry, 2021). Principle catalog is also adopted for preliminary phase (Respati et al., 2020). Gap analysis can support the evaluation between before and after construction of new systems (Fajar, 2023). Business, information systems, and technology architecture is one unit that described with flowchart, activity diagram, ERD, and software needed (Setyawan et al., 2020; Ulmi et al., 2020; Wati et al., 2019). The opportunities solution phase is done with implementation planning by stakeholder (Setyawan et al., 2020).

3. Research Methodology

Figure 1 below is the research methodology used in this research. The research begins with literature studies from books, journals, and previous research. Then, researchers identified problems by conducting interviews with the company as research objects. The problems can be solved by carrying out the phases recommended by the TOGAF ADM framework. Six phases of TOGAF ADM were implemented. Each phase has an input-process-output, with the final results generating blueprints of enterprise architecture that can align the business and technology sides of the company. The preliminary phase begins with interviewing the IT project manager of PT XYZ. The interview results as the input of this phase are business strategy, IT strategy, business goals, architecture framework, and scope of work as the input of this phase. Those inputs are mapped into 5W + 1H and analyzed into the principal catalog. The vision architecture gets inputs from PT XYZ's official website and documents that describe the company vision, mission, organizational structure, and business function. Company issues and impacts are identified through interviews with the human resource division. Outputs of vision architecture are the value chain and solution concept diagram. The high-level solution produced is confirmed to PT XYZ. Business architecture's input is obtained from observing human resource baseline business process. The target is set through gap analysis and described by business process flow

diagram. Information systems architecture is divided into two parts: data and application. Both get input of baseline condition by asking the company for a written document about the current application and database table. The gap analysis also conducted to set targets and produce Entity Relationship Diagram (ERD), activity diagram, user interface, and dashboard recommendation. Similar to the previous phase, technology architecture gets input from written documentation about the current topology used in the company. Researcher then recommends a network and communication diagram to support information systems planning. Hardware specification is also adapted or upgraded from the current condition. After finishing the previous steps, the blueprints produced are used for the input of opportunities and solutions phase. The design results will be presented to get feedback from the company as the object of research. Finally, researcher together with PT XYZ's project manager and human resource personnel define the benefits and priority of implementation. The limitation of the study is that enterprise architectures are designed for human resource management of PT XYZ. Outputs produced are chosen based on company preference and following TOGAF standard. Some biases may exist in the business understanding from users.

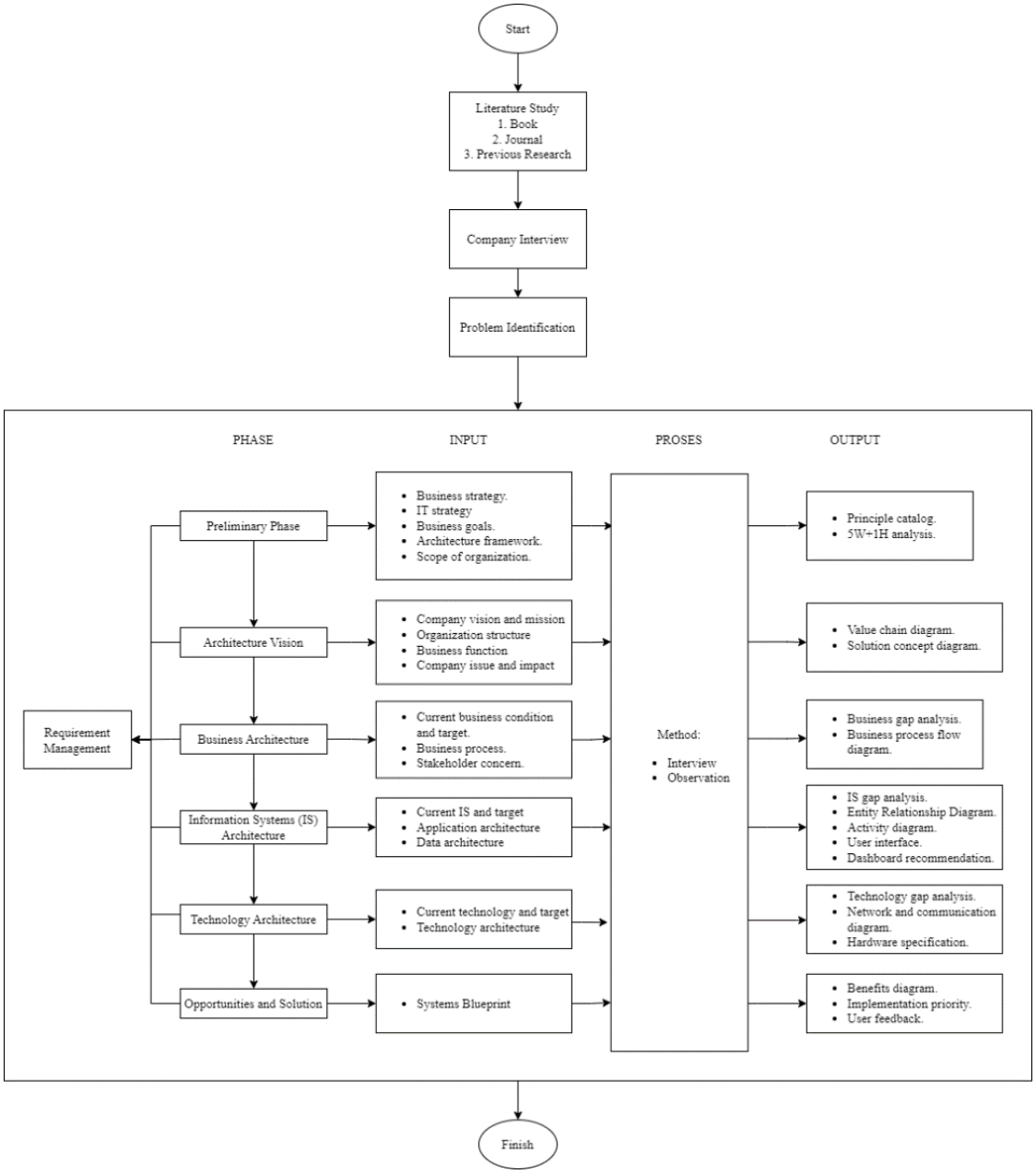

Fig.1: Research Methodology (Kurniawanto & Kusdiantoro, 2019)

4. Result

The research carried out the 6 phases of The Open Group Architecture Framework (TOGAF) Architecture Development Method (ADM) as follows:

4.1. Preliminary Phase

Stakeholder commitment, framework, and enterprise architecture design methodology are confirmed in the preliminary phase. Input includes business and IT strategy, business objectives, and design scope. Based on interviews, business and IT strategies related to PT XYZ's human resource management are recruitment, training, and appropriate IT implementation. The purpose of designing enterprise architecture is to provide appropriate IT support to increase the effectiveness of human resource business. It is known that the company has not used any previous framework, so researcher chose TOGAF ADM as a framework. The scope of research focuses on human resource management in a financial holding company. The results of the preliminary phase are 5W+1H analysis and principal catalog.

4.1.1. 5W + 1H Analysis

Table 2. 5W + 1H Analysis

	Questions	Answer
What	What are the results of enterprise architecture planning?	The results of enterprise architecture planning are blueprints that includes business, information system, and technology architecture.
Why	Why is it necessary to plan an enterprise architecture for human resource management?	Enterprise architecture planning for human resource management needs to be done because the use of information technology is not fully maximized yet, which can slow down business processes and bring losses.
Where	Where is the enterprise architecture planning location?	The enterprise architecture will be planned according to the target location, namely PT XYZ office located in Central Jakarta.
When	When is the enterprise architecture planning implemented?	Enterprise architecture planning will be implemented from March 2023 to May 2023 as a stage before application development begins.
Who	Who will be involved in enterprise architecture design?	The enterprise architecture planning will involve the Human Resource and Information Technology divisions through IT project manager informants.
How	How will the implementation of enterprise architecture planning?	The enterprise architecture planning will carry out the sequence phases of the TOGAF ADM framework (preliminary phase, vision architecture, business architecture, information systems architecture, technology architecture, and opportunities and solutions).

4.1.2. Principle Catalog

The principal catalog contains standard principles for a good architectural solution. The principles help evaluate and approve the decision-making of architecture.

Table 3 Principal Catalog

No	Architecture Category	Principles	Description
1.	*Business Architecture*	*Support Effective Process*	Simplify the human resource management of company through technology support.
		Reduce Time/Effort	Reducing human error in business processes.
		Productivity	Adding value to the company's HR services.
2	*Data Architecture*	*Data as Asset*	Data must be managed, stored, and can be utilized properly.
		Data Security	Data must be stored and distributed safely.

No	Architecture Category	Principles	Description
		Data Veracity	All data displayed on the portal must be guaranteed to be correct.
3	*Application Architecture*	*Application Completeness*	The application provides complete features according to business processes.
		User Friendly	Applications can be easily understood and used by users.
		User Authentication	The application is equipped with security features to set user access rights, for example: the account log in page.
4	*Technology Architecture*	*High performance*	Technology supports the speed of information system performance.
		Stability	Server stability and other supporting technologies.
		Technology Security	Security technologies used to protect data and application performance.

There are 3 business principles, 6 information system principles which are divided into data and applications, and 3 technology principles.

4.2. Vision Architecture

Vision architecture helps develop the vision and business value generated through enterprise architecture planning. The input obtained is the company's vision and mission and the output of this phase are value chain diagram and solution concept diagram.

4.2.1. Value Chain Diagram

The value chain diagram maps business functions into main and supporting activities so that the company can produce value according to its missions. The value chain diagram for holding company differs from the value chain diagram for operational company, where it does not only focus on adding profits from manufacturing results.

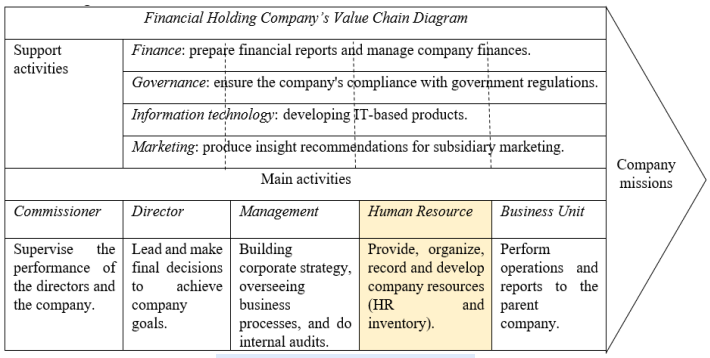

Fig.2: Value Chain Diagram

The value chain diagram above shows that the activities of the human resource are the main activities carried out by the holding company. However, some problems still need to be solved through enterprise architecture planning. Table 4.3 below represents the problems and impacts experienced by the company:

Table 4. HRM Problems and Impact

No	Problem	Impact
1	Incomplete HRM information systems.	Business processes slow down due to unnecessary repetition of activities.
2	Utilization of information technology is not optimal.	Mobile attendance that is not integrated with any system so that technology does not produce any value.
3	Development of a new feature to be integrated with the HRM information system.	The features are not maximized, so it is necessary to redesign the enterprise architecture.

4	Unclear flow of inventory recording which is done manually.	Financial(inventory) loss.

4.2.1. Solution Concept Diagram

The solution offered to those problems is the development of a complete and integrated human resource management website portal system. The solution is divided into 6 layers, namely the job applicant, division head, human resource, employees, IT support, and board of directors. Each layer has its own

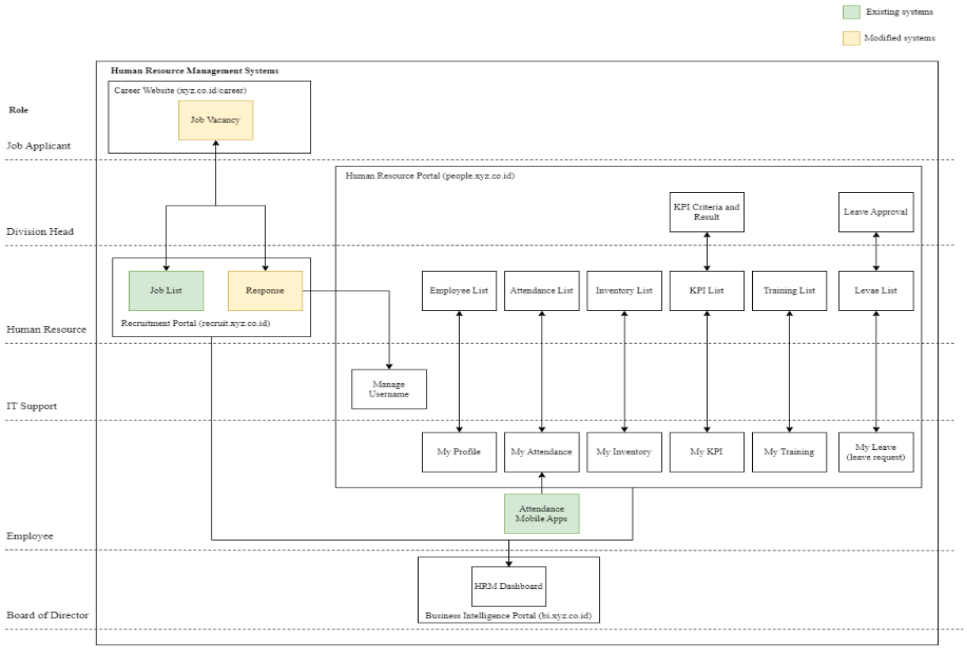

Fig.3: Solution Concept Diagram

access rights to the system.

Based on Figure 3, HRM is divided into 5 main systems, namely: career website (xyz.co.id) for job vacancy opening, recruitment portal (recruit.xyz.co.id) for manage recruitment, human resource portal (people.xyz.co.id) for managing employee administrative needs, and business intelligence portal (bi.xyz.co.id) for dashboard reporting.

4.3. Business Architecture

The business architecture will describe human resource management from the point of view of its business processes. Gap analysis is carried out to determine the current business process to be added or removed.

Baseline / Target	*Recruitment*	*Conduct training*	*Record employee data*	*Record attendance*	*KPI management*	*Record inventory*	*Manage termination*	*New*
Recruitment	*Gap: need complete systems*							
Conduct training		*Gap: need systems to support training flow*						
Record employee data			*Gap: need flexibility on editing data*					
Record Attendance				*Gap: need integrated systems*				
KPI Management					*Gap: need systems to do frequent evaluation*			
Record inventory						*Gap: need complete record*		
Manage termination							*Gap: need disable access on HRM systems*	
Leave Management								*Gap: in design*
Monitor overall HRM								*Gap: in design*
Eliminated	-	-	-	-	-	-	-	-

Fig.4: Gap Analysis Business Architecture

Figure 4 is the result of a gap analysis from a business perspective. There are gaps in business processes due to a lack of technology support. The recruitment process requires a complete information system. The training process requires a transparent support system. Recording employee data requires flexibility in changing profiles and data. Recording attendance requires integration with other human resource systems. KPI evaluation requires a continuous system. Inventory recording requires structured record keeping. Management of layoffs requires closing access to the HRM portal. In addition, there will be 2 new business processes, namely overall HRM monitoring and leave arrangements.

4.3.1. Business Process Flow Diagram

Following is the baseline of business process. Baseline means human resource management supported by current technology.

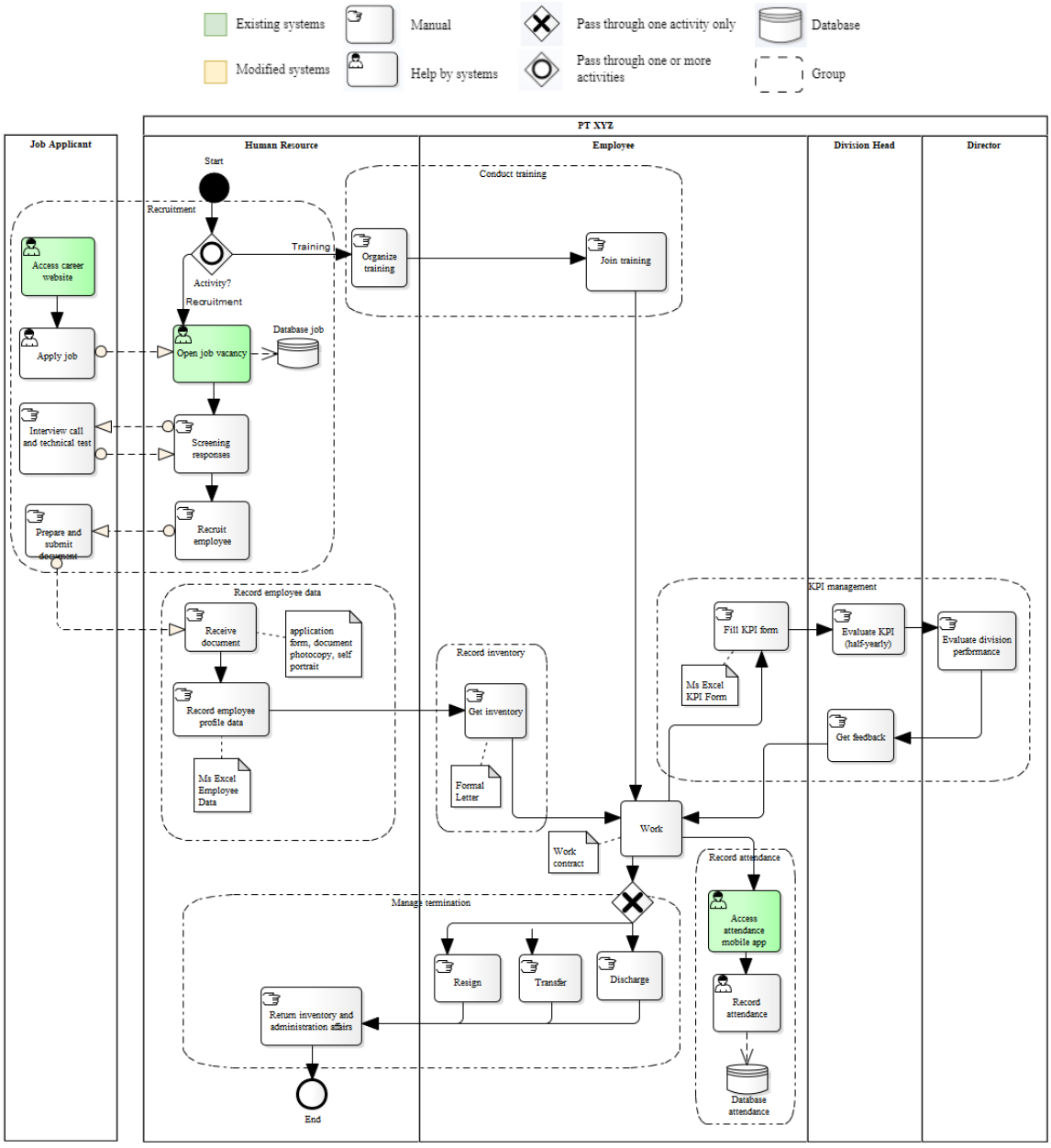

Fig.5: Baseline Business Process Flow Diagram

In Figure 5, PT XYZ's HRM business processes start from the human resources division. The first process is recruitment, which includes the opening of job vacancy, selection and recruitment. After that, the employee's data and inventory are recorded manually. Attendance recording is not connected to the system, and KPI management is carried out with an evaluation every 6 months manually. There is also a process for procuring training and terminating employees. Then we need to make the target architecture.

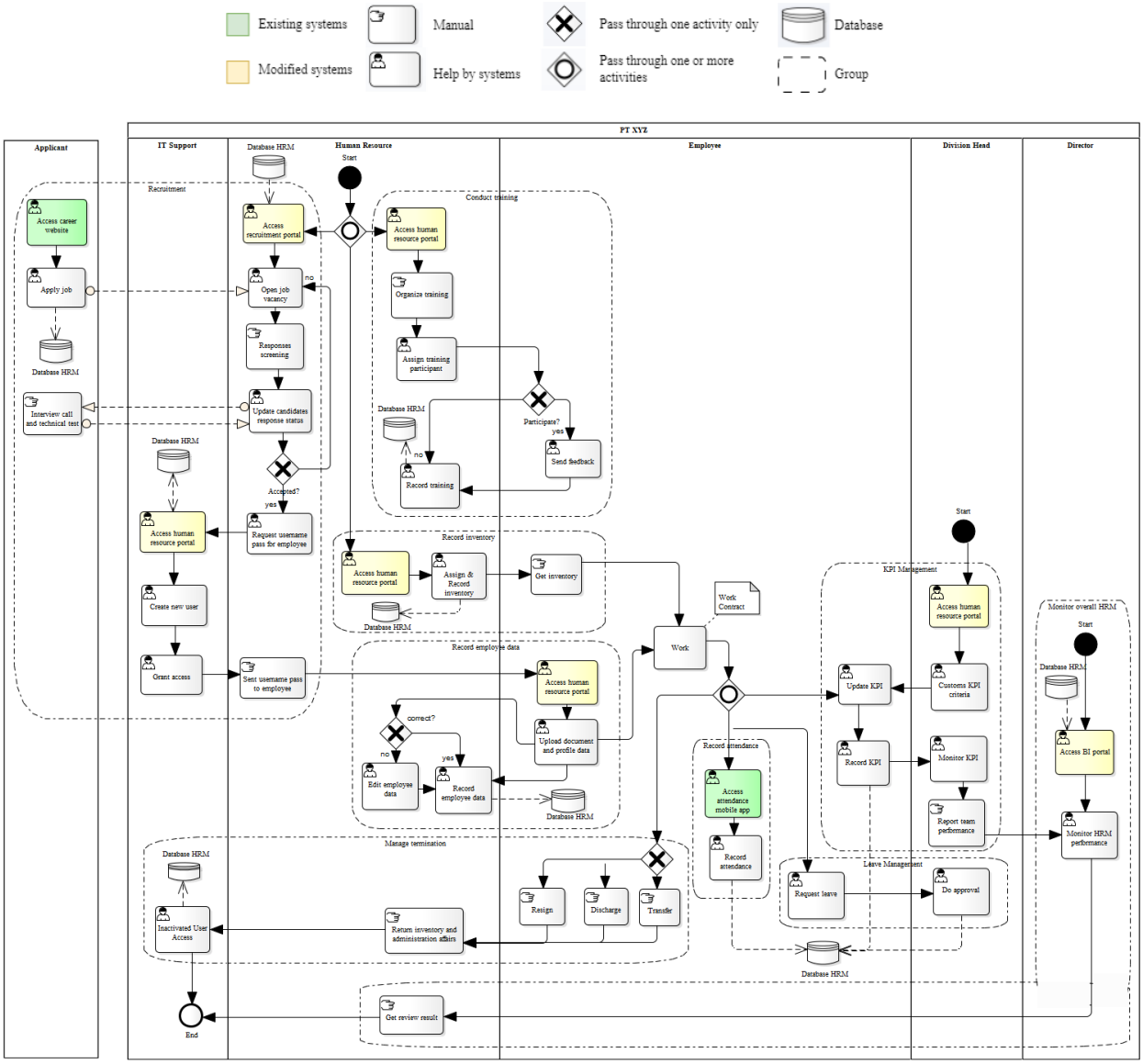

Fig.6: Target Business Process Flow Diagram

In Figure 6, the target business process starts from the HR team that accesses the HRM portal. The HRM portal is connected to the HRM database, which includes data on users, employees, divisions, job vacancies, job applicants, training, inventory, attendance and KPIs. The first process is recruitment, where HR opens job vacancies and manages recruitment status through the portal. New employees can fill in the data, and HR can monitor and change it. Furthermore, HR records the company's inventory and monitors employee attendance through the portal. Training is arranged through the portal, and employees can update KPIs according to their work achievements. Directors can monitor performance through a BI dashboard connected to the HRM database. Finally, work is terminated by returning inventory and disabling employee portal access.

4.4. Information Systems Architecture

After the business architecture phase, the next step is the information system architecture. PT XYZ's business target architecture aims to have a complete and integrated information system to support the human resource management process. There are two main components in information system architecture: data architecture and application architecture. The data architecture determines the type of data required and involved in the information system, while the application architecture includes the technical flow and design of the application interface. Before designing an information system, a gap analysis identifies parts that need to be maintained, eliminated, developed, or updated in the existing information system. The following is the result of the gap analysis.

Target / Baseline			Attendance mobile app	Career website	Recruitment portal		BI portal	
				Job vacancy	Job List	Responses	HRM Dashboard	New
Systems name	User	Menu						
Attendance mobile app	Employee	Attendance record	Included					
Career website (xyz.co.id)	Job applicant	Job vacancy		Gap: modify field				
Recruitment portal (recruit.xyz.co.id)	Human resource	Job List			Included			
		Responses				Gap: modify feature		
Business intelligence portal (bi.xyz.co.id)	Director	HRM Dashboard					Gap: develop new dashboard	
Human resource portal (people.xyz.co.id)	Human resource	Employee management						Gap: to be developed
		Attendance management						
		Inventory management						
		Training management						
		KPI result						
		Leave list						
	Division head	KPI management						
		Leave management						
	Employee	My Profile						
		My Inventory						
		My KPI						
		My Training						
		My Leave						
	IT Support	Manage User						
Eliminated			-	-	-	-	-	-

Fig.7: Gap Analysis Information Systems Architecture

Figure 7 shows there are four information systems that already exist and will continue to operate: a mobile application for recording employee attendance, a career website for collecting job applications, a recruitment portal for listing job vacancies and their responses, and a business intelligence portal for monitoring performance by directors. There are three information systems need to be modified, such as the job vacancy menu, which requires more appropriate field names, and redesign of the registration form. The responses menu needs to add a status feature for the recruitment process and request a username. The HRM dashboard menu requires a new dashboard covering recruitment, employees, training, inventory, and KPIs. In addition, a new information system will be developed, namely a human resource portal that will serve company administration. To build the information system integration, database design is part of the data architecture phase.

4.4.1. Data Architecture

The data architecture is described using the entity relationship diagram crow's foot notation. Entity relationship diagram describes the relationship between tables used in PT XYZ's human resource management system.

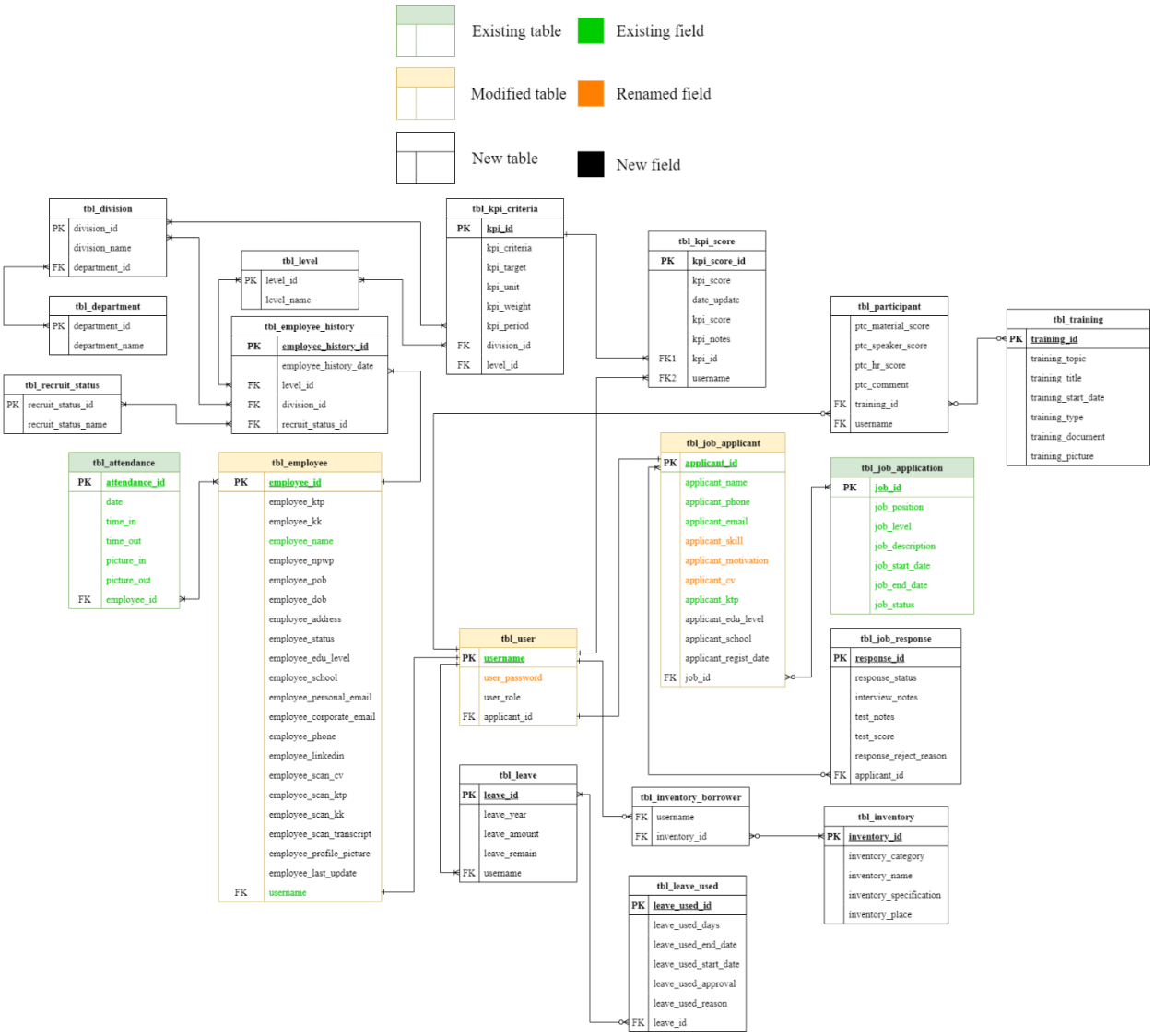

Fig.8: Entity Relationship Diagram (ERD) Database HRM

Based on Figure 8, the HRM database consist of 19 tables with relation one-to-many, one-to-one, and one-to-many. The current PT XYZ database for human resource management represent by green color, while the modified table represent by yellow color, and new table to be created represent by black color.

4.4.2. Application Architecture

Using the data that has been prepared in the data architecture, following is the application design that will be developed. The application design is in the form of Unified Model Language (UML) diagrams and user interfaces. The UML used is use case diagrams and activity diagrams.

4.4.2.1. Career website (xyz.co.id) – minor modification

PT XYZ has an official website that provides information about its main activities, organizational structure, and careers. After analysis, PT XYZ's Career website must be modified on the job registration form. The modification aims to ensure that all fields in the database will be visible to be filled by job applicants. In addition, the color and appearance will be adjusted according to the other pages. Figure

9 below is the original and redesign interface of career website registration form.

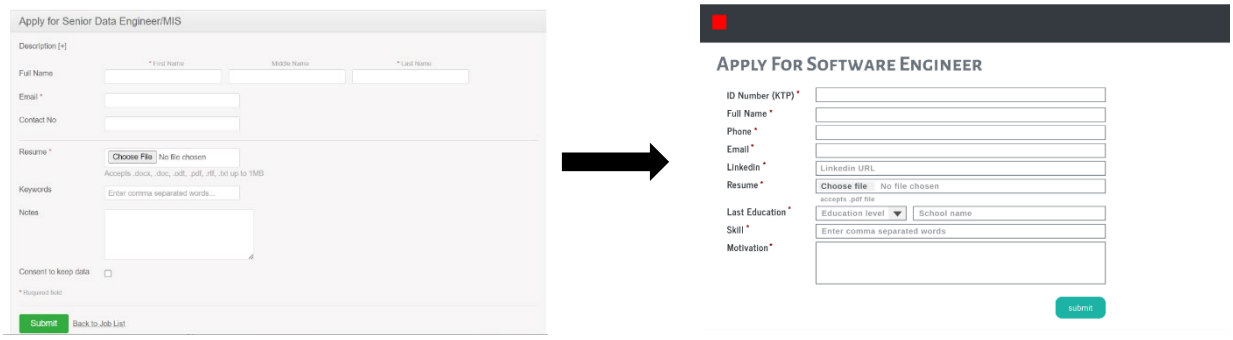

Fig.9: Registration Form Interface (Career Website)

4.4.2.2. Recruitment portal (recruit.xyz.co.id) – major modification

PT XYZ's recruitment portal currently has limitations; it can only view job applications received. To increase efficiency, adding a more comprehensive recruitment process management feature is recommended. The new feature will allow the HRD team to change recruitment status, record the results of interviews and technical exams, and document applications that have been accepted or rejected. This system aims to increase the productivity of the HRD team in processing applicant data and the recruitment stage. In addition, the recruitment portal is also used to request the creation of employee usernames by the IT Support team. Figure 10 below is the use case diagram of PT XYZ recruitment portal.

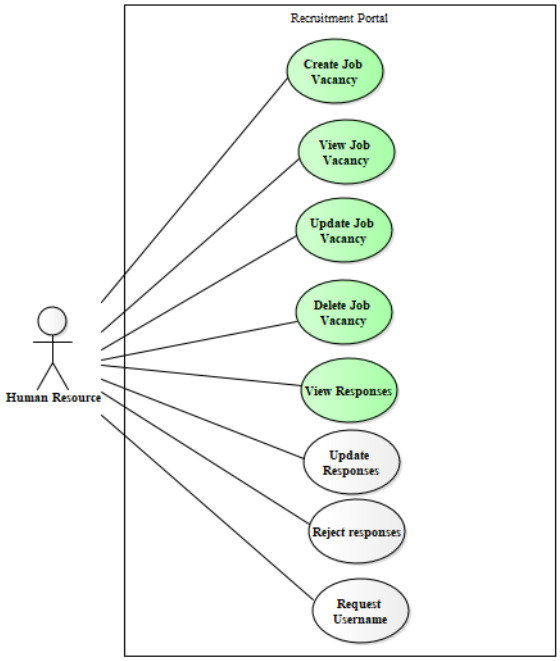

Fig.10: Use Case Diagram (Recruitment Portal)

To support the use case diagram, activity diagrams also be made for each new use case. Application architecture's output also includes interface design. Figure 11 below is the interface of recruitment portal, namely: login page, candidate, accepted response, and rejected response menu. There are 1 sub-menu, namely candidates form for recording recruitment progress and 1 pop-up menu for rejection reason entry.

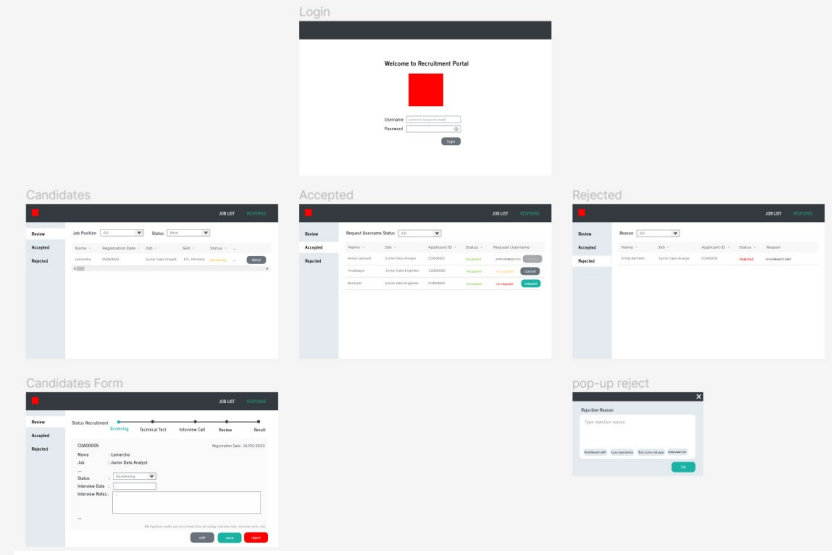

Fig.11: Interface (Recruitment Portal)

4.4.2.3. Human resource portal (people.xyz.co.id) – new portal

The human resource portal is a new portal recommended. The portal fulfils business needs to digitize employee administration and performance management using information technology. The planning results are in the form of use cases, activity diagrams, and user interfaces. Figure 12 below is the use case of human resource portal. There are 4 users involved, namely: employee, human resource, division head, and IT support.

Figure 12 Use Case Diagram (Human Resource Portal)

To support the use case diagram, activity diagrams also be made for each use case. Application architecture's output also includes interface design. The interface design is separated according to user's access capability.

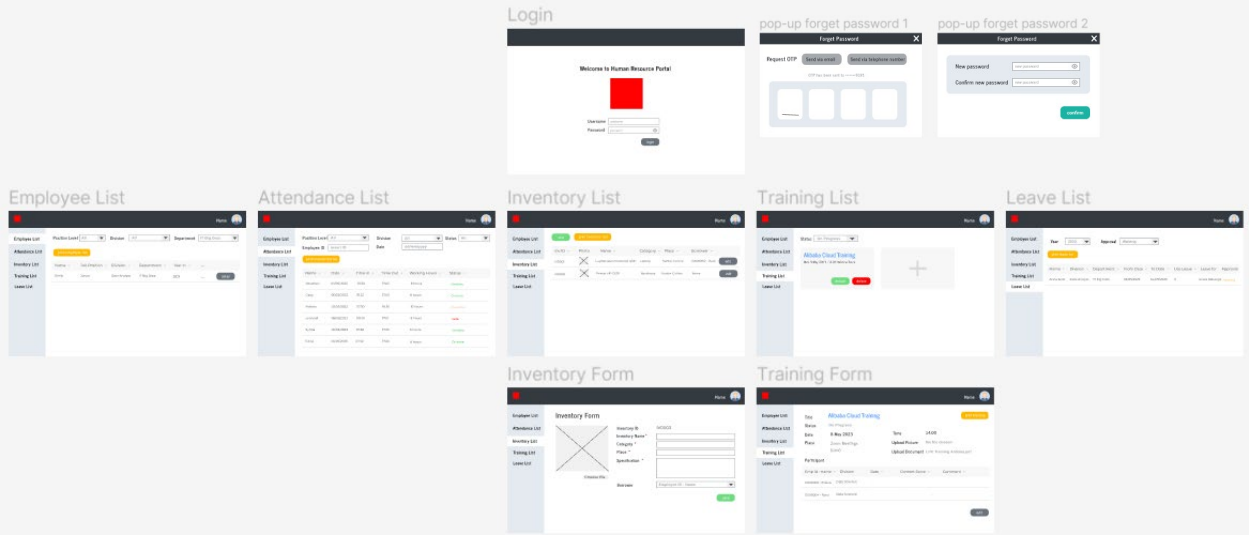

Fig.13: Interface User HR (Human Resource Portal)

Figure 13 is the interface of human resource portal based on user HR. HR is the main admin in this portal. There are 5 menus available, namely: employee list, attendance list, inventory list, training list, and leave list. There are 2 sub menus for inventory and training form.

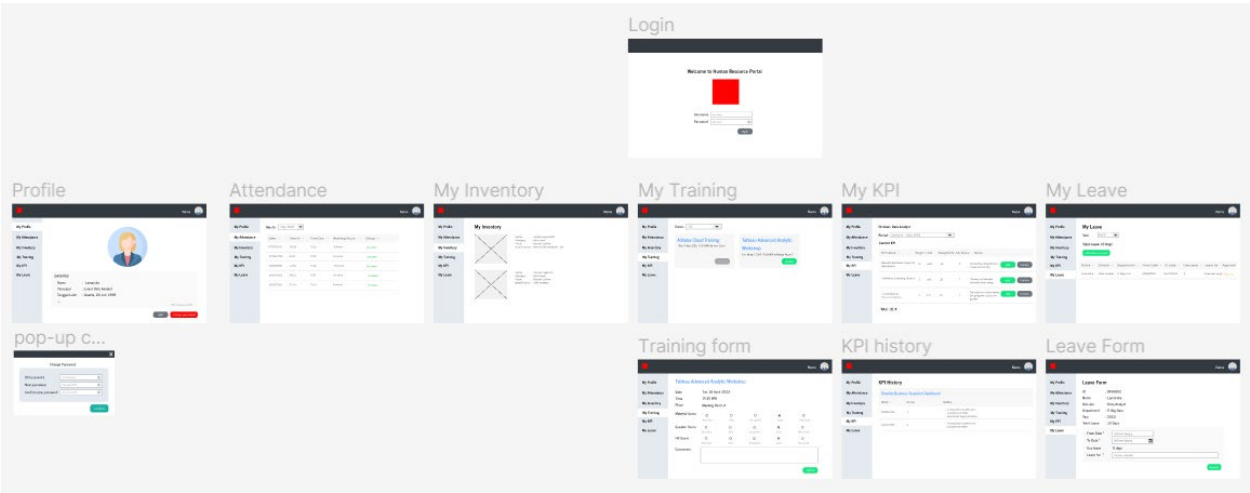

Fig.14: Interface User Employee (Human Resource Portal)

Figure 14 is the interface of human resource portal based on user employee. Employee is the main client in this portal. There are 7 menus available, namely: profile, attendance, my inventory, my training, my KPI, my leave. There are 3 sub menus for training form, leave form, and KPI history.

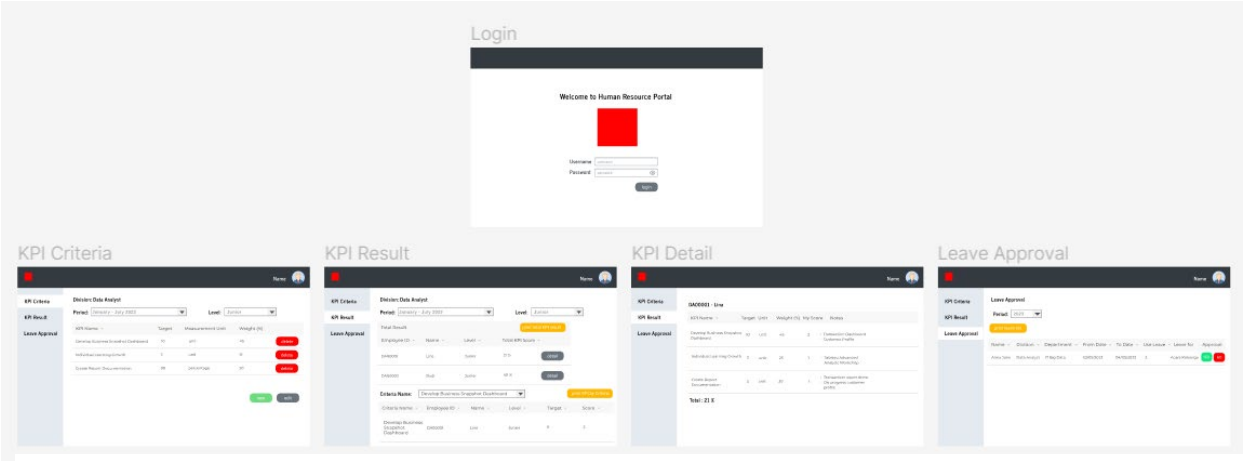

Fig.15: Interface User IT Support (Human Resource Portal)

Figure 15 is the interface of human resource portal based on user division head. Division head is the main admin of KPI criteria and leave approval menu. There are 4 menus available, namely: KPI criteria, KPI result, KPI detail, and leave approval.

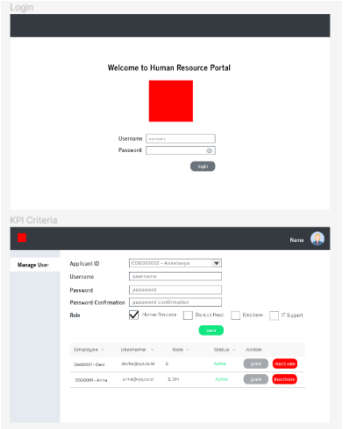

Fig.16: Interface User Division Head (Human Resource Portal)

Figure 16 is the interface of human resource portal based on user IT support. IT support is the user access regulator of human resource portal. There are 1 menu available, namely: manage user.

4.4.2.4. Business intelligence portal (bi.xyz.co.id) – new dashboards

PT XYZ already owns the business intelligence portal with user director, but currently, the portal does not yet have dashboards related to human resource management business processes. Therefore, it is recommended to make new dashboards. PT XYZ's business intelligence portal is a tableau server that can access the HRM database to obtain all HRM data. Table 4 below is the example dashboard list recommendation consisting of purpose, dashboard name, graph, and data field needed.

Table 5. Dashboard Recommendation

No	Purpose	Dashboard Name	Graph	Data
1	Overview recruitment data	Job Vacancy Dashboard	Total job vacancy every month	job_id, job_start_date
			Filter by month year ↓	
			Total job vacancy by status	job_id, job_status
			Total job vacancy by level	job_position, job_level,
			Total job vacancy by division	job_position, job_division

4.5. Technology Architecture

Technology architecture is an advanced part of the information system architecture. It includes hardware and networks used in human resource management systems. First, a gap analysis is carried out between the existing technology (baseline) and the recommended technology to be applied (target). The following is a technology gap analysis table.

Target \ Baseline	Laptop/PC	Printer	Database Server	Application Server	Web Server	Router	Switch	Firewall	New
Laptop/PC	Included								-
Printer		Included							-
Database Server			Gap: additional capacity for new or modified portal						-
Application Server				Gap: additional capacity for new or modified portal					-
Web Server					Gap: additional capacity for new or modified portal				-
Router						Included			-
Switch							Included		-
Firewall								Included	-
Terminated	-	-	-	-	-	-	-	-	-

Fig.17: Gap Analysis Technology Architecture

Figure 17 shows that PT XYZ has all the components needed to implement the enterprise architecture. The gap found in increasing the capacity of databases, applications, and web servers for creating or modifying portals. Based on the technology gap analysis table, the following is the desired technology architecture recommendations.

4.5.1. Network and Communication Diagram

Figure 18 is a network and communication diagram for PT XYZ's human resource management systems. The network is connected to the internet through an ISP and is protected by a firewall for data security. Three types of servers are used: database server for data storage, web server for serving web content, and application server for complex data processing. Firewalls are connected to routers and switches that connect directly to human resource laptops and printers via an intranet network. The router functions to transmit data between networks, while the switch connects devices in the local network. In addition, the router is connected to the access point so that the portal can be accessed wirelessly by other devices such as smartphones, laptops, or employee PCs.

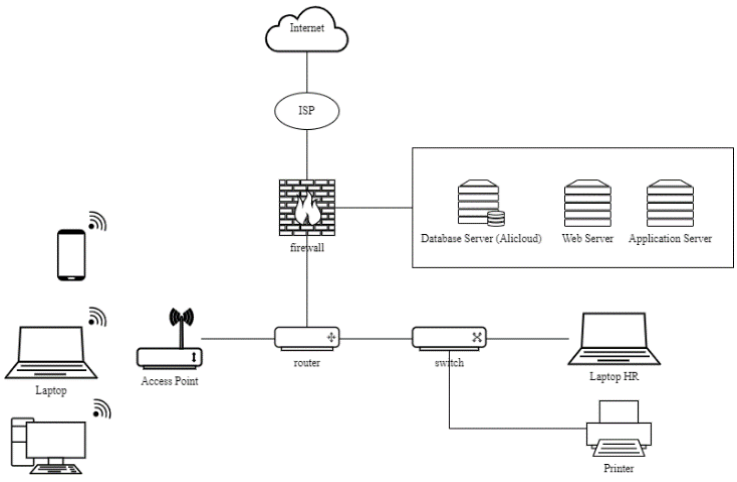

Fig.18: Network and Communication Diagram HRM

After reviewing the network and communication diagrams, here are the recommended hardware specifications recommended for PC and laptop: processor Core i5/AMD Ryzen, RAM 16 GB, internal memory 256 GB SSD or HDD, Windows 10 or MacOS, 11-inch full HD monitor screen, Nvidia GeForce or AMD Radeon graphic card, and support Wi-Fi, Bluetooth, USB 2.0, HDMI connectivity. In addition, to support the report printing feature, PT XYZ can use the existing printer (Printer Epson

L3110). In general, server specifications such as memory and CPU capacity are usually adjusted to needs in line with architectural developments.

4.6. Opportunities and Solution

After the preliminary phase, vision architecture, business architecture, and information systems architecture (data and applications), the next step is the opportunities and solution phase. In this phase, it will be concluded the various benefits that will be obtained if the blueprints are implemented.

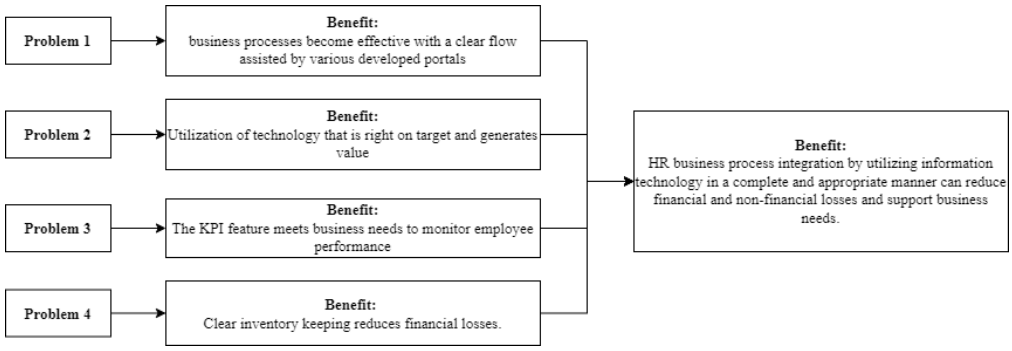

Fig.19: Benefits Diagram

Figure 19 is a diagram of benefits that can be obtained by implementing the result of this enterprise architecture planning. These benefits are derived from the problem and impact table in the vision architecture. Furthermore, this phase produces an implementation and migration strategy based on implementation priorities set by PT XYZ. The following are the results of the strategy.

Table 6. Systems Implementation Priority

Recommendation	Description	Priority	Reason
Career website (xyz.co.id)	Modify the job vacancy form interface.	1	Most simple.
Portal *human resource* (people.xyz.co.id)	Creation of a new portal for employee data and performance needs.	2	Useful for managing employee data.
Portal *recruitment* (recruit.xyz.co.id)	Added response feature.	3	Still can be done manually first.
Portal *business intelligence* (bi.xyz.co.id)	Creation of a new dashboard for director monitoring.	4	Requires complete or executable data according to the priority order of the portal.

In accordance with the priority list, PT XYZ also responds to the results of the overall human resource management enterprise architecture planning, such as: the results are neat, complete, and continually connected between the architectural components, the results can be understood from the business and IT perspective, the results suit company's needs and can be used for the development process.

5. Discussion

In line with previous research (Dumitriu & Popescu, 2020), the TOGAF framework supports companies in achieving goals by successfully involving all enterprise architecture domains (business, applications, technology, and data). Gap analysis assists researcher in mapping current conditions (baseline) with targets to be achieved in business architecture, information systems, and technology (Noranita et al., 2021). The application of TOGAF to plan enterprise architecture creates recommendations in the form of modifications and the creation of new portals in the field of human resource management at PT XYZ, this result is in line with the previous research which also developed several academic portals in (Setyawan et al., 2020). The architectural planning produces outputs in the form of catalogs, diagrams, and tables that are relevant to each phase. Other implication of the research is that the use of standard methods such as the Unified Modeling Language (UML) and Business Process Modeling Notation

(BPMN) is very helpful in designing enterprise architecture. Value chain diagram is proven to help business identify their focus on carrying out their main and supported activities. Solution concept diagrams provide user in understanding what kind of solution that will be presented. Business flow diagrams show the current and target to be achieved by company. Entity relationship diagrams as the logical data model that can be implement for human resource management information systems. Use case diagrams, activity diagrams, and user interfaces describes the portal that need to be modified or built. Network communication diagrams and hardware specifications supports the information systems planning. Those blueprints can be executed for systems development guideline. In line with previous research (Girsang & Abimanyu, 2021), planning enterprise architecture using TOGAF can identify gaps in business processes that require information technology assistance and provide design recommendations that can be implemented so that human resource can run effectively with the help of integrated human resource management systems. Researcher can provide some suggestions for implementing TOGAF in designing HRM enterprise architecture. This research methodology can be applied and tailored according to every organization case study. TOGAF output can be chosen and discussed with organizations, such as: PT XYZ prefer ERD with crow foot's notation rather than chen notation.

6. Conclusions

The research has answered the research questions. The gap analysis shows that HRM business processes require information system technology support to increase effectiveness. Modifications are needed on the career website and recruitment portal, while a new human resource portal needs to be created. In addition, it is necessary to add an HRM dashboard to the business intelligence portal. The technology gap analysis shows that the company already has adequate technology, but adding a web, application, and database server is needed to support procurement and modification portals.

Enterprise architecture planning for human resource management produces various blueprint for each TOGAF phase, such as 5W+1H analysis, value chain diagrams, solution concept diagrams, problem, and impact tables, business flow diagrams, entity relationship diagrams, use case diagrams, activity diagrams, user interfaces, network and communication diagrams, benefits diagrams, and hardware specifications.

Then, researchers also get feedback. The proposed implementation priorities sequentially are: modifying career website interface, creating a human resource portal, adding recruitment portal features, and creating a dashboard for business intelligence portal. PT XYZ has responded positively to the results, considering it neat, connected, suits the company's needs, and understandable from a business and IT perspective.

Based on the results of enterprise architecture planning for human resource management at one of the financial holding company, potential avenue for future research that can be done:

- PT XYZ can implement the recommendations of the HRM enterprise architecture.
- PT XYZ can continue the TOGAF ADM stage to phase H Architecture Change Management to maintain the company's capabilities of information technology and business functions that rapidly growing.

Acknowledgements

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