Integrated Information and Communication Media Modeling Based on Organization Goal-Oriented Requirement Engineering (OGORE)

Fransiskus Mario Hartono Tjiptabudi[1*]
Information System Department, STIKOM Uyelindo
Kupang, 85111, Indonesia
tjiptabudifrans@gmail.com

Abstract

The BPD NTT pension fund is a company incorporated as a legal entity that manages and runs a pension benefit program for BPD NTT employees. In its current business process, BPD NTT does not yet have a capable media to accommodate the information and communication needs of participants and interested parties, as a business branding and service facility for the participants. The problem that occurs is in the requirements elicitation stage when developing the information and communication media. For example, if the development is carried out by applying the Global eXtreme Programming (GXP) model, in the exploration phase the Organizational Goal-Oriented Requirement Engineering (OGORE) method will be applied to elicit requirements that base each activity on organizational goals. The results of the research are in the form of web-based information and communication media modeling based on IT goals which are described in various tasks equipped with actors and resources used as well as KPIs that are integrated into each goal.

Keywords*: GXP, information and communication media, IT goals, KPI, OGORE*

Introduction

Currently, there has been a disruption in technology and information which has resulted in the encouragement of every sector to adapt and adjust the facilities used according to specific needs and the business processes being carried out. One of the tools that are qualified to be applied in this era is online-based information and communication media. This media not only have an important role to play in improving effective decision-making processes in a company (Tjiptabudi et al. 2019), but can also provide other benefits in the form of an increasing business competitive advantage which is a significant added value.

To accommodate the important role and benefits required for a high level of information accessibility, the right information media to apply is a website. Why should a website, because the website is a medium for communication and delivering complete information to the general public online (Hadi and Rokhman 2020). Apart from being a medium of information, the website can also function to build business branding, as a promotional medium, as a consumer service medium, and as a means of delivering criticism and suggestions (Huda 2020).

Despite its various advantages, the application of a website as a medium of information cannot always fully meet the needs of a company. The cause is a problem that quite often occurs at the stage of a need

[1*] Corresponding Author

elicitation when developing the website. As the results of research conducted by Kartiko et al. (2021) and Shofi et al. (2020) which show that the risk of failure in system development can increase when user needs do not match the generally accepted standards because user needs are only based on personal desires. Another example, if the development is carried out by applying the Global eXtreme Programming (GXP) model; then there is a stage known as the Exploration Phase, wherein this stage is focused on aligning the vision between the system developer and the client, identifying the actors involved and analyzing system requirements, user needs, and company business processes (Tavares and Tjiptabudi 2020). Errors that occur in this stage certainly can increase the risk of failure in website development as a medium of information and communication for a company (Adikara et al. 2016).

Various techniques or methods were developed to minimize or even eliminate problems that often occur in the process of requirements elicitation. For example, Agile Techniques for Agent Based Goal Elicitation (STAGE) who adopted minimum possible documentation for state the requirements natural language (Iswari 2012), User Persona techniques that focus on the analysis and design of software based on user characteristics (Kusuma et al. 2020), and Goal-Oriented Requirement Engineering (GORE) which focuses on rationalizing needs based on the goals to be achieved. Why use GORE for needs elicitation in this study? Because, based on organizational goals can provide traceability from strategic issues to technical details so as to generate rationale for system requirements and models systematically. Other than that, formalization of organizational goals can prove if the improvement is correct and complete so that it can show a structure that can be understood in the requirements document (Aljahdali et al. 2011) (Rehman et al. 2010). In practice, GORE alone does not appear to be sufficient for the requirements engineering process, therefore a more specific method was developed which is a derivative of GORE, namely Organizational Goal-Oriented Requirements Engineering (OGORE). The OGORE method is a needs elicitation method that bases each of its activities on organizational goals, starting from the elicitation process, followed by analysis and refinement, to the validation stage of its needs. The purpose of the OGORE method is to minimize various risks that may arise due to user needs that are only based on personal desires (Adikara et al. 2020).

The BPD NTT pension fund is a legal entity company with the task of organizing and managing a pension benefit program for BPD NTT employees. Based on the results of interviews with the President Director, it is known that in carrying out its current business processes, BPD NTT does not yet have a capable media to accommodate the information and communication needs of participants and interested parties. In addition to the purposes, BPD NTT also needs a media that can be a business branding and service facility for its participants. The general needs that have been conveyed certainly cannot be the basis for the development of the media, this is because a weak definition of requirements can lead to project failure. Therefore, in this study, we will discuss the need elicitation process in more depth by applying the OGORE method so that it emphasizes the company's goals and not the user's personal needs.

Literature Review

Organizational Goal-Oriented Requirements Engineering (OGORE)

OGORE is a new method developed based on the GORE method (Adikara et al. 2020). GORE is a way of engineering requirements by making various system requirements that will be built rationally, based on predetermined goals so that requirements are engineered not only based on data and manual business processes. Then, the method was developed into OGORE which focuses on company goals, with the aim of reducing personal needs with all the risks. The approach used in this method is to extract the company's goals into IT goals and add a Key Performance Index (KPI) to each of these goals (Shofi et al. 2020).

As in Figure 1, the first step in this method is to define a profile, especially the company's vision in order to understand the business objectives of the company. Then, developers and company leaders discuss the IT goals that are expected to be achieved with the system or media that will be developed. Alignment of business **objectives** with IT goals is used by companies to reduce costs, increase efficiency and relationships with consumers and suppliers, as well as create new products and business

solutions. Based on **IT** goals, will be extracted in the form of tasks, actors involved for each task, as well as the required resources. This will be used as the basis for designing the system or media that will be developed.

Furthermore, developers and company leaders will determine the Key Performance Indicators (KPI) for each goal as targets to be achieved as well as controllers. Developers and company leaders must ensure that the KPIs that have been determined can be achieved if the system or media developed has been implemented and in accordance with the stated objectives (Adikara et al. 2016).

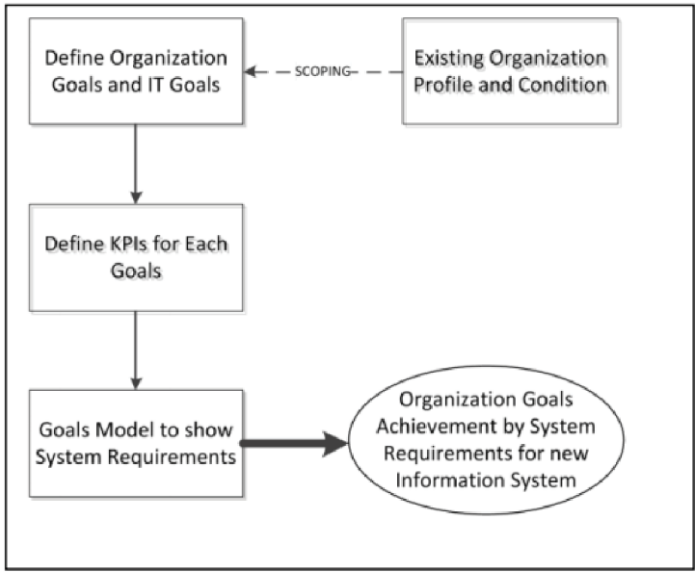

Figure 1. Requirement elicitation concept using organization and IT goals

According to (Adikara et al. 2016), there are three main OGORE processes, namely:

a. Requirements elicitation process.
b. Requirements refinement process.
c. Requirements analysis process.

In this study, it is only limited to the requirements elicitation process based on OGORE, which consists of 3 (three) activities as follows:

1. Determine the target based on the profile of the organization/company.
2. Mapping system goals.
3. Integrating KPIs.

The results of the elicitation of these requirements are then modeled using a diagram called the Goal Tree Model (GTM) which is adapted from the Goal Requirement Language (GRL) modeling method using symbols as shown in Figure 2 (Marosin et al. 2014).

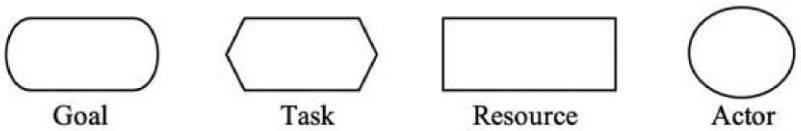

Figure 2. Goal Tree Model (GTM) elements in OGORE (Marosin et al. 2014)

Global eXtreme Programming (GXP)

According to Ferdiana, GXP was first put forward in the journal internationally. GXP defined as a method that emphasizes intense communication between client and team, efficient development through test models intense, to iterative models and incremental. The GXP model has 5 (five) phases, namely Exploration, Planning, Iteration, Production and Maintenance. Each phase will manage input and generate outputs to be managed in next phase (Tavares and Tjiptabudi 2020).

a. Exploration Phase

In this phase, the focus is on equalizing the vision between developer and client, identification of actors and system requirements analysis. At this stage, the business objectives and IT goals are reformulated and reorganized to produce a product vision. Result of this stage is a set of user requirements that aimed at the next stage.

b. Planning Phase

The results of the previous stage in the form of a set of user requirements are used as input at this stage. These inputs will be selected according to the limitations of the client and team. This phase agreement produces a release plan and iteration plans. The release plan is attaching the features that will be developed in the the agreed timeframe and the iteration plan produce a set of steps that will carried out along with the output obtained for each the stages.

c. Iteration Phase (Development phase)

This phase is also known as the development phase solution. The iteration phase executes the iteration plan as a result of the previous stage and customer feedback through a series of technical activities such as generate architecture, code and performing unit tests for each module. The output of each iteration are known as partial releases or small releases.

d. Production Phase

This phase uses the release plan resulting from the planning phase as input and tests any partial or small releases as a result of each iteration of the previous phase. In this phase, testing of each iteration that has been set between the researcher and the client. This test is known as acceptance testing for find out if the system is working properly provisions to address the current problem this. At this stage, verification and integration of existing results and release plans. Results this phase is a solution that is well tested by the team as well as clients and need to be implemented in real conditions.

e. Maintenance Phase

The results of the production phase in the form of solutions that have been well tested by the team and clients and have been implemented in real conditions are used as input in this phase. This phase focuses on support services after the software is developed. This phase makes repairs of errors that found in the solution as well as minor adjustments to solution, in addition, at this phase it is also possible there is an agreement for the development of a system that more detailed and adapted to developments requirements in the next release.

Methodology

This research applies a case study research method, which is a case study conducted on a website-based information and communication media development project for a company, in this case, the BPD NTT Pension Fund which has not owned or applied the information and communication media before. The purpose of applying the case study method is to identify the requirements elicitation process in the company based on the organization's goal-oriented requirements engineering (OGORE) technique by involving various stakeholders from the company side represented by the President Director, Head of

section and staff, pension fund participants, and from the developer side represented by analysts and programmers.

In the process of collecting data, there are several ways, namely through direct observation of the company, conducting interviews with the company and participants, and conducting literature studies on supporting documents. For the information media and communication development process, the Global eXtreme Programming (GXP) model is used. This model is defined as a model that demands the intensity of communication between the client and the development team and the efficiency of the development process through the test model. The GXP model consists of 5 (five) phases, namely exploration, planning, iteration, production, and maintenance as shown in Figure 3.

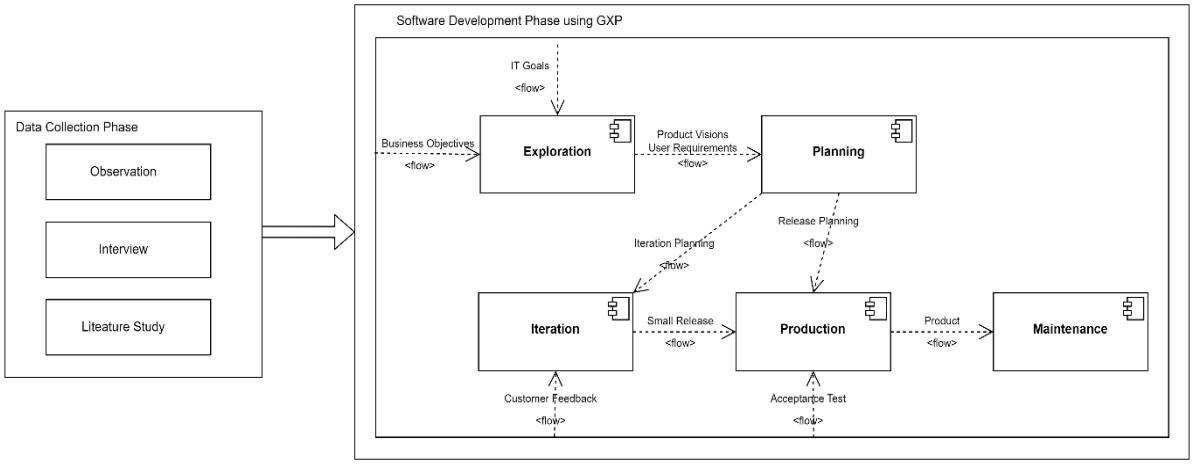

Figure 3. Research design based on GXP (Tavares and Tjiptabudi 2020)

The application of the OGORE to elicit the requirements for website-based information dan communication media development was implemented in the exploration phase of GXP, with stages that can be seen in Figure 4:

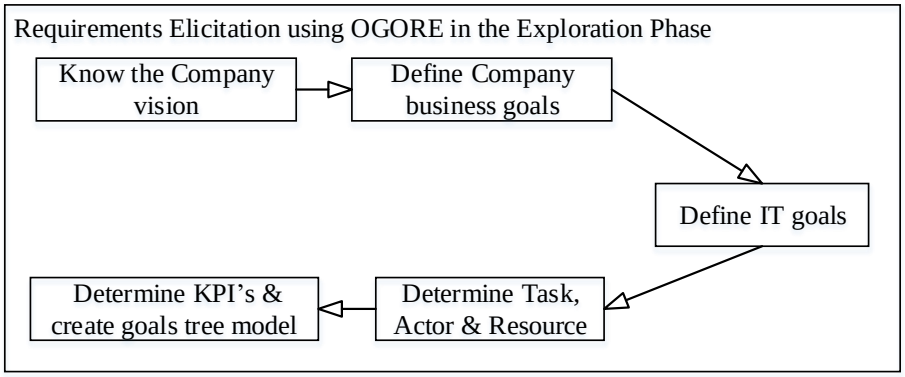

Figure 4. Stages of requirements elicitation using OGORE

In this study, the requirements for the elicitation stages used the OGORE method based on Adikara et al. (2020) which were modified and detailed, so that consisted of several stages. First, understanding the vision of the company can be done by applying the literature study method and interviews with several sources from the company. Furthermore, based on this vision, the company's business goals to be achieved will be formulated. Due to the information, and media to be built based on IT, the company's business goals that have been set are converted into IT goals. Each IT goal consists of a series of tasks performed by actors using certain resources; therefore, the next step is to determine the tasks, actors and also resources involved. The last step is to determine the KPI for each goal that is determined and described in the goal tree model.

Results

This study is focused only by using OGORE to elicit the requirements of website-based information and communication media, so that not all phases of GXP will be carried out and only includes two phases, namely the exploration phase and planning phase.

Exploration Phase

This phase has several main activities such as equalizing perceptions between the system development team and the client, identifying the actors involved, and analyzing system requirements (Tavares and Tjiptabudi 2020). In this case, the development team must understand the vision, mission, and ongoing business processes of the BPD NTT Pension Fund to elicit complete requirements and then be able to determine company business goals, set IT goals based on the company business goals, and determine KPIs for each IT goal. which is then used as the basis for creating a goals tree model. So that in this phase will produce the formulation of the product vision and business goals as well as user requirements which will be used in the next stage.

a. Know the company vision

Through the data collection process carried out by applying the methods of observation, interviews, and also literature studies, it is known that the vision of the BPD NTT Pension Fund is "to become a Pension Fund that is growing stronger to provide services to all interested parties and to guarantee the continuity of income for participants and retirees, in an on-time, in the right number and the right recipient".

b. Define company business goals

Based on the company's vision, the development team saw that two important things that became the focus of the company's vision so that it could be formulated into the company's business objectives, namely:

1. Provide services to all interested parties.
2. Provide a guarantee of continuous income in a timely manner, in the right amount, and to the right recipient.

c. Define IT goals

To provide maximum service to various interested parties, especially the participants, the development team digs deeper into the related requirements. The services that will be provided on the website are focused on pension fund participants while some of the information needed by participants is strictly confidential, therefore it is clear that a complete and well-recorded process of managing participant data is needed. This is also related to granting access rights to participants.

Moreover, the information services are provided not only to participants but also to various interested parties including the general public, so it is important to ensure that the information presented must be complete and meet the needs of all parties. However, there is information that is confidential and may only be known by participants, so a facility for direct communication is needed, between participants and administrators, for example through chat-box services or so on. Of course, this service can only be accessed by participants who have access rights, as evidenced by the existence of participant accounts with usernames and passwords. This is certainly related to the first point that has been described, namely the existence of features for managing participant data.

In addition, to ensure continuity of income promptly, with the right number of recipients following the second company business goal, the website must be able to provide real proof of transaction service regarding the process of disbursing funds so that it can include some important information such as how much was disbursed when it was disbursed and in accordance with the rights of each participant. Based

on these requirements, IT goals are defined that can be set to answer the company's business goals, including:

1. Membership data is well managed.
2. All information is well managed and presented.
3. User inquiries are well managed and responded to.
4. Access to MP (*Manfaat Pensiun*) receipts online is served properly.

The IT goals that have been set and their relationship to the various business goals of the company to be fulfilled can be seen in Table 1 below:

Table 1. Relationship between IT Goals and Company Business Goals

No	IT Goals	Company Business Goals	
		Provide services to all interested parties.	Provide a guarantee of continuity of income in a timely manner, in the right amount and in the right recipient.
1	Membership data is well managed.	√	
2	All information is well managed and presented.	√	
3	User inquiries are well managed and responded to.	√	√
4	Access to MP receipts online is served properly.	√	√

Based on Table 1, it can be seen that all designed activities can meet the organization's business objectives. So based on this, it can be described in a goal tree model as follows:

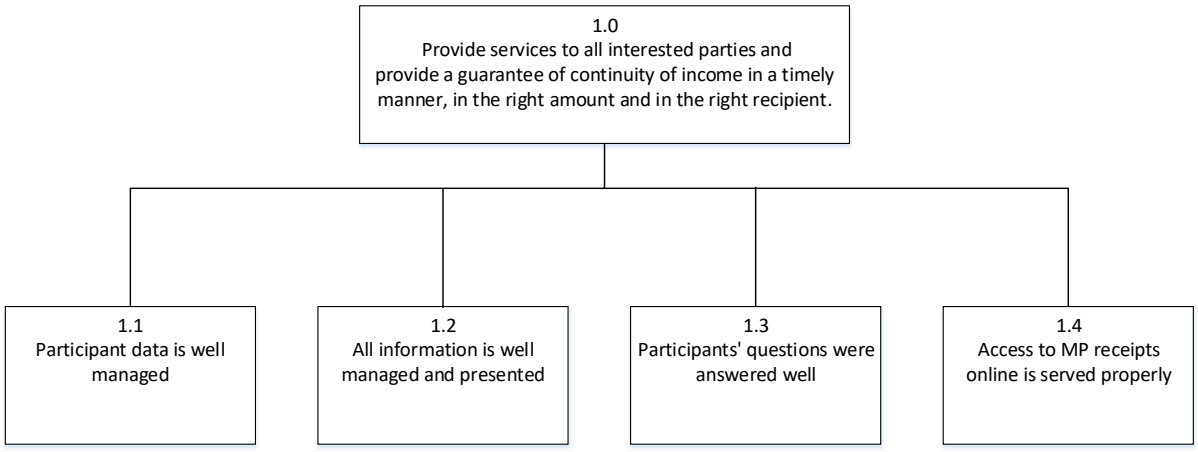

Figure 5. IT goals as a derivative of company business goals

d. Determine task, actor, and resource

Before determining Key Performance Indicators (KPIs) and integrating them into each goal, it is necessary to determine the tasks, actors, and resources needed for each goal first. Furthermore, the integration of KPIs into each goal is made in a goals tree model (see Figure 5). Figure 6 shows some of the tasks that will be carried out by an administrator or officer from the company including the resources used. These tasks are processes that must be carried out to meet the IT goals that have been set. Figure 7 also shows a series of tasks that will be carried out by pension fund participants.

In Figure 6, tasks performed by the administrators include adding data, updating data, creating participant accounts, answering participant questions, and also making MP receipts. Each of these tasks requires database resources, especially the task of answering participant questions requires an engine to connect the website with the WhatsApp or email application. All tasks performed by this administrator are related to the four IT goals that have been set previously.

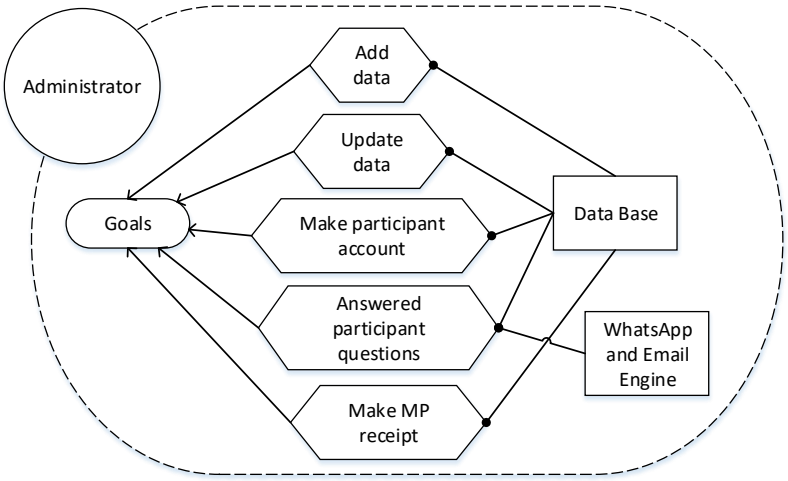

Figure 6. Tasks performed by the administrator

In Figure 7, the participating actors can perform two tasks, namely asking the administrator and also asking for MP receipts. Each of these tasks requires database resources. The task leader is related to the 3rd IT goal, namely "user requests are managed and responded to properly" and the 4th IT goal, namely "Access online MP receipts served properly".

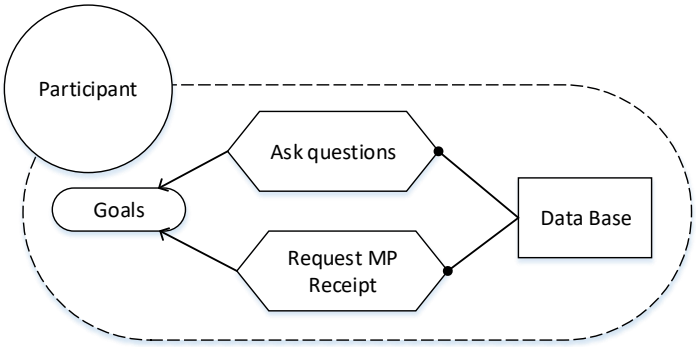

Figure 7. Tasks performed by participants

e. Determine KPIs and create a goals tree model

Implementing KPIs is an important way to ensure that everything that is done can support the company's overall goals. The determination of each good performance indicator must be in line with the objectives to be achieved (Mourtzis et al. 2017; Nozari et al. 2019). Each indicator determined as a KPI is not intended to make the process of assessing something more difficult, but rather to become a tracking and measuring tool that is easy to use. Thus, the most important thing about KPI is that it is simple and easy to use but measurable (Pîrlog and Balint 2016; Stricker et al. 2017). Therefore, in this study, KPI is used to become a standard in measuring how well the company's requirements that have been elicited are met in website-based information media that will later be implemented.

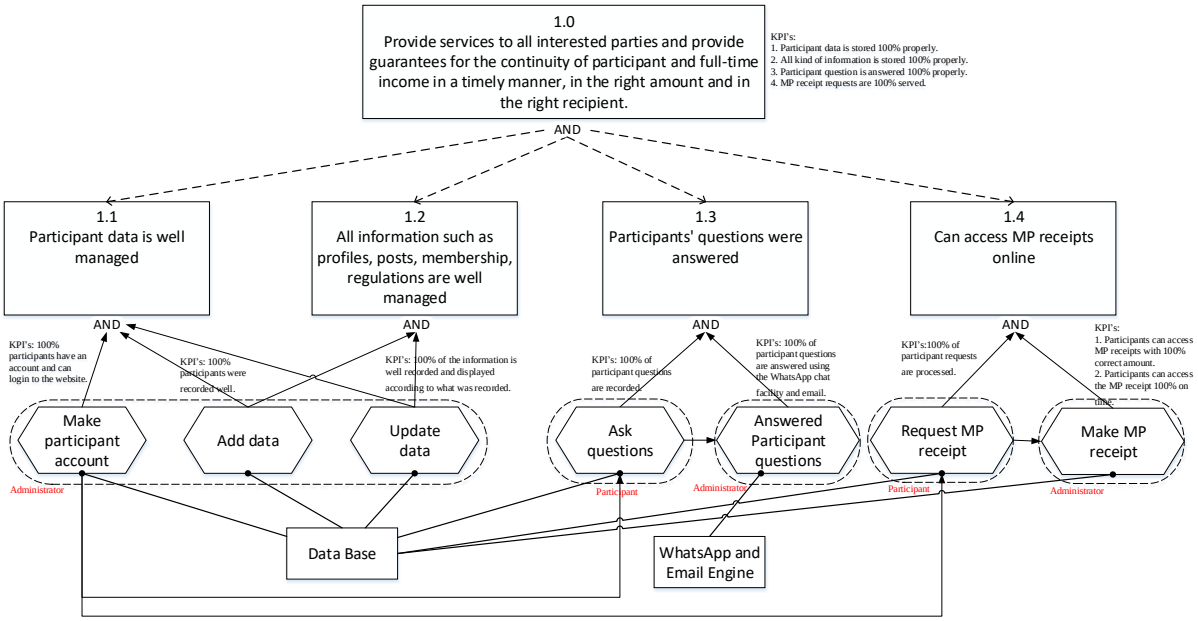

Figure 8. Goal's tree model with KPI

Figure 8 shows a series of goals that have been set and depicted in a tree model equipped with the tasks performed by each actor, the required resources, and also the KPIs for each of these goals. The KPIs that have been set will be assessed when the communication media website is completed and implemented. The point is that every task that will be carried out has been adjusted to the IT goals that were previously set based on the company's business goals and company vision. These tasks will later be implemented in various features provided on the website as a result of the planning phase which will then be carried out in the GXP development model.

Planning Phase

The planning phase is carried out after the exploration phase is complete and will produce various release plans consisting of the product functions of the website to be built and an iteration plan in the form of details of the next stages accompanied by various outputs obtained (Bratakusuma et al. 2018). In this phase, the Unified Modeling Language (UML) will be used to create a model of the website-based information media.

a. Technology Architecture

Information and communication media to be built based on the website. This is to support the rapid dissemination of information so that every interested party can access information from anywhere, anywhere, and anytime. The general website architecture can be seen in the Figure 9.

Figure 9 shows that every actor, both administrator and participant, can access the website via the internet. Every data inputted and managed by the administrator will be stored on the web server, which will then be presented to participants according to the request given. To further improve the accessibility of information, this information media is made multiplatform, which means that every user can access the information media using various devices ranging from personal computers, and laptops to smartphones.

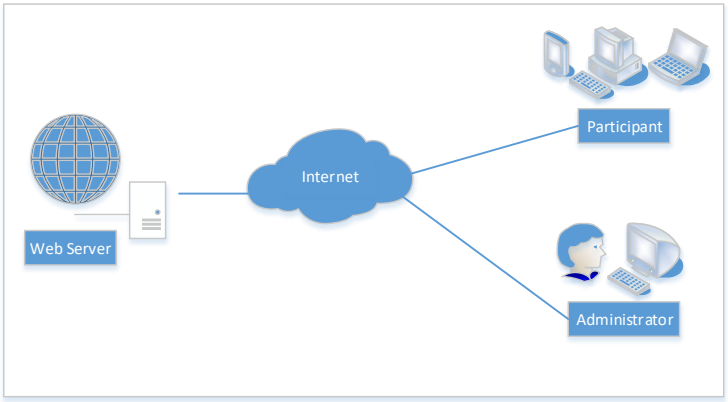

Figure 9. Website architecture

b. Behavior diagrams

The use case diagram is used to visualize which users (actors) are involved and the interactions that occur with the system being built. This diagram is used because it can provide a clear picture of the context of the system to be built to clarify the scope and limits of the system (Kurniawan 2018).

Following its function, the use case diagram in this study is used to model the features provided by the system and its interactions with any actors. In Figure 10, it is clear that the information media that was built has two actors involved, namely administrators and participants. Each actor accesses different features according to the ownership of the access rights determined through the login process. Administrators can access admin dashboard features, manage participant data, profile data, contacts and information postings, process MP receipt requests, answer participant questions, manage FAQs, admin data and web utilities. Meanwhile, participants can access the dashboard, view profiles, contacts and information, request MP receipts and also ask questions. The features provided are the implementation of the tasks that are designed and must be carried out to achieve the goals that have been set as in the previous discussion.

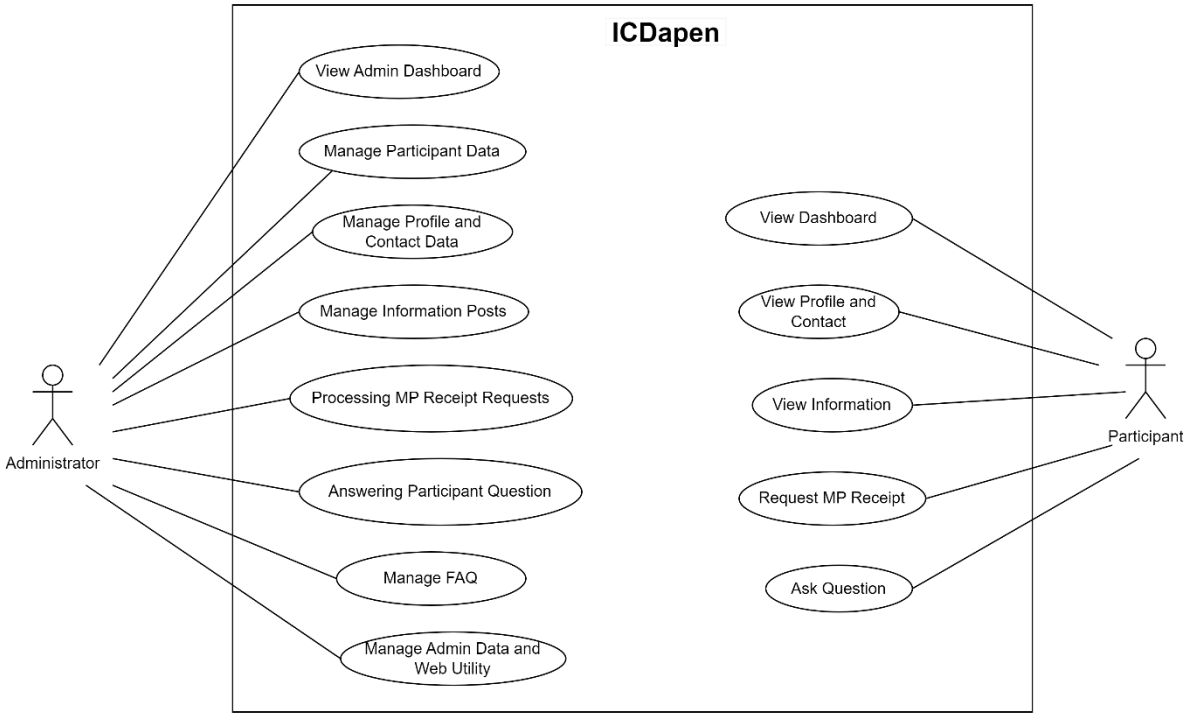

Figure 10. Use case diagram

c. Structured Diagram

The class diagram is a UML diagram with a function to visualize the structure of a system statically (Aprianti and Maliha 2016). The several classes declared in the website-based information media that were built can be seen in Figure 11.

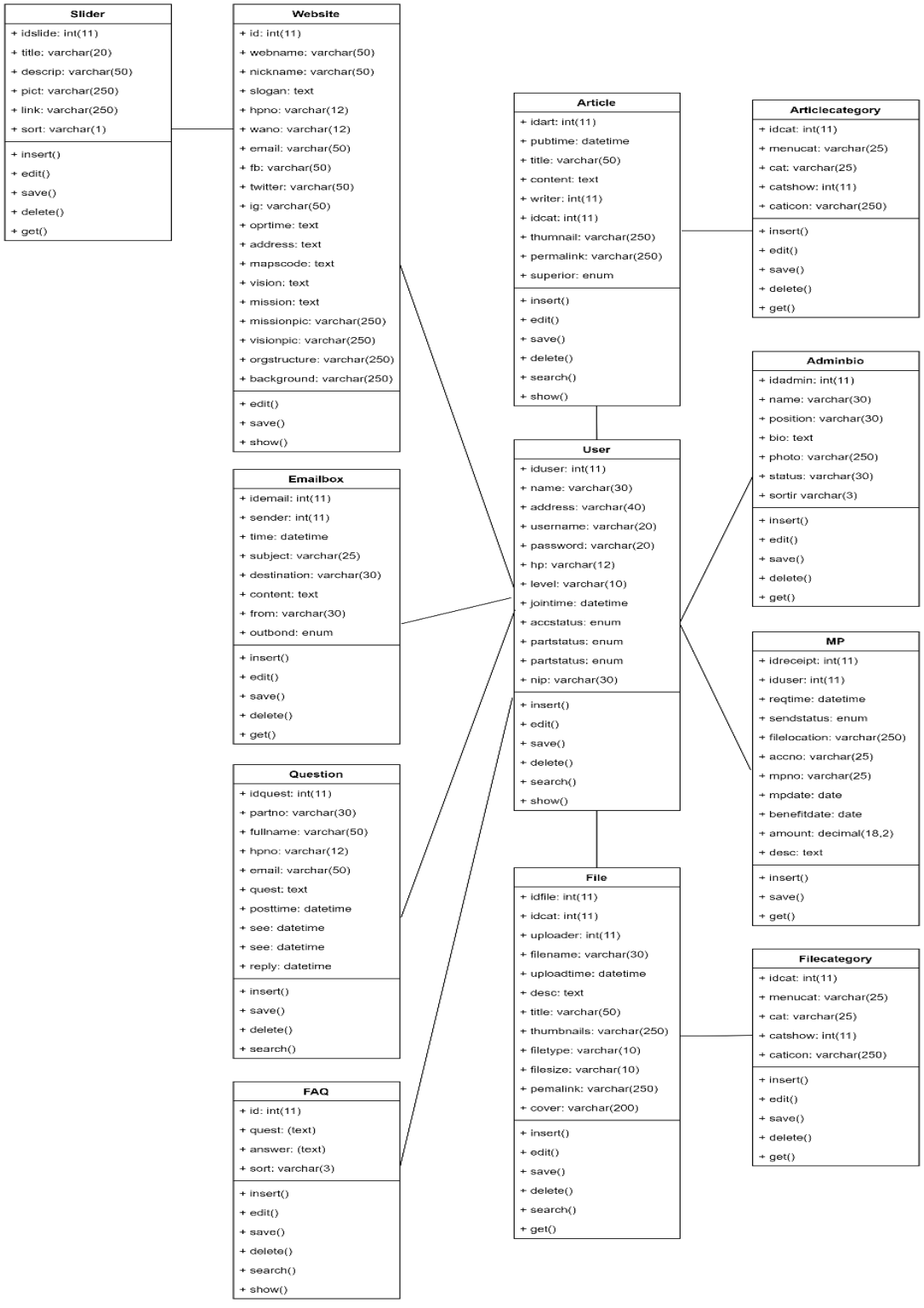

Figure 11. Class diagram

Based on the class diagram that shows the functional and also the structure of the information and communication media will be built, then it will be described in the form of a display design. This view is the interface that will be used by the user to interact with the media in accordance with the access rights that have been determined for each type of user. For example, in Figure 12 which is a display design that can be used by pension fund participants to request and download MP receipts. In addition, Figure 13 shows the administrator interface design to send information to users via Email or WhatsApp services.

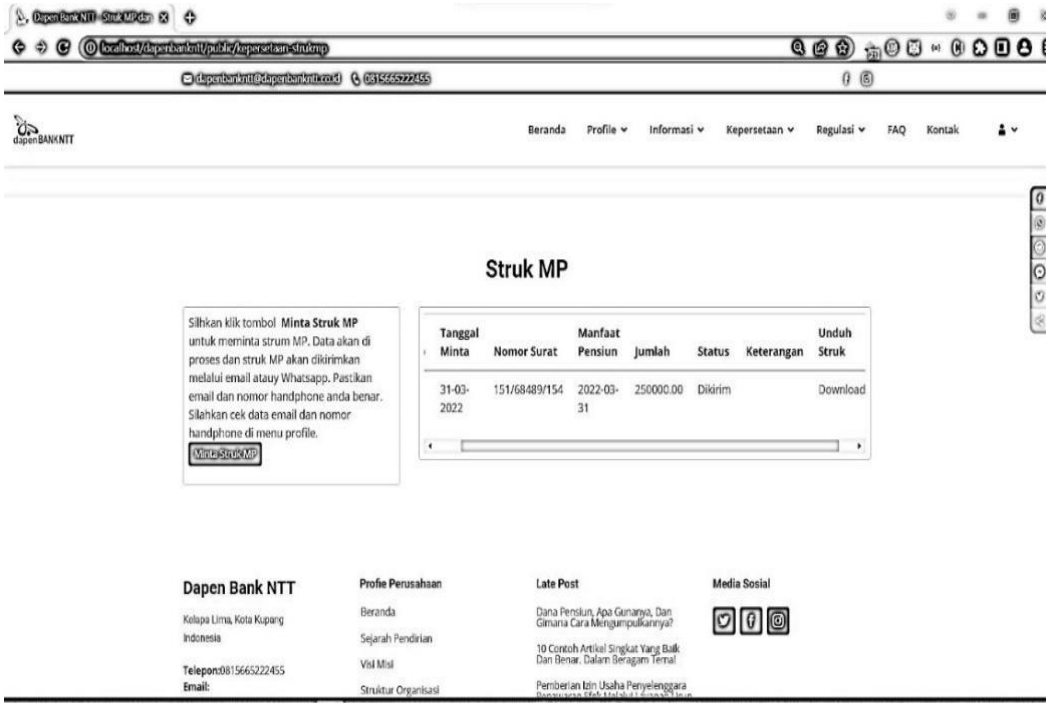

Figure 12. Design form for MP receipt request

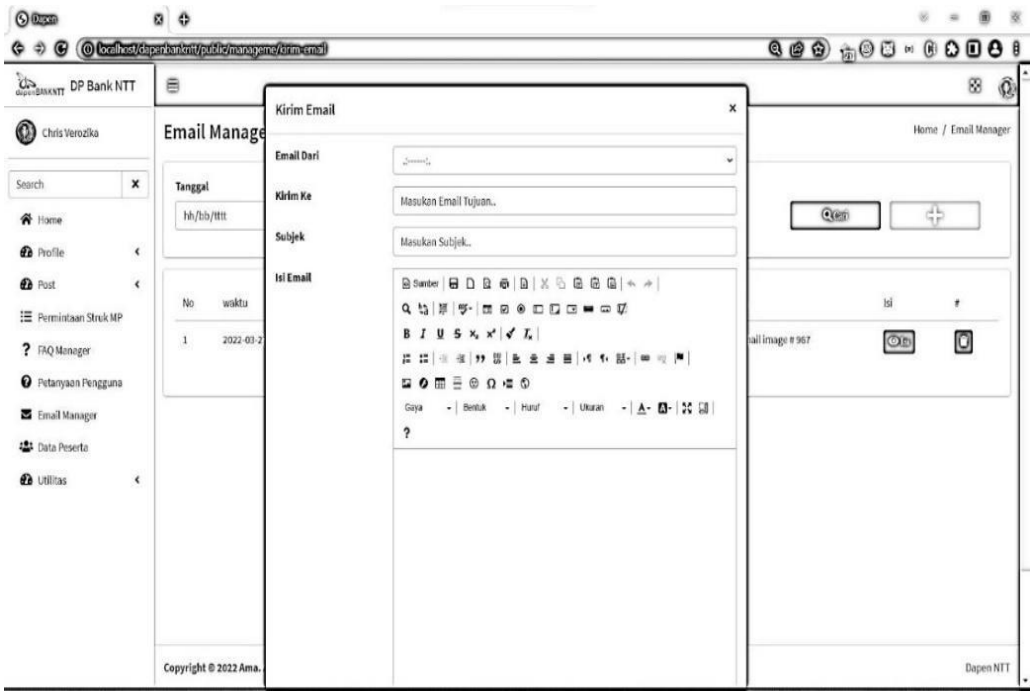

Figure 13. Design form of sending information via email

Discussion

According to Gaol et al. (2019), the OGORE method is a collection of requirements gathered from the interviews and small discussion groups which involve stakeholders in the company such as the President Director, Head of section and staff, pension fund consultants and experts, system analyst, and system developers. The discussion begins with the company's vision, mission, and objectives, including an ongoing operating system, procedure, and expected system implementation results.

The first step is to define the organization vision, mission, and goals of the organization. Where the engineers requirements to identify organizational goals should be achieved by developing this system. The second step is to define a KPI for the setting goals followed by the elicitation processes (Tjiptabudi and Bernardino, 2020), which are steps of understanding the business domain, Goal Tree Model, and the KPI. The third step is to improve the results of the elicitation process with a problem-solving method.

Based on (Adikara et al. 2020), OGORE can be used to determine the initial requirements of an organization or company as a basis for system development. OGORE is very useful for anticipating the emergence of personal requirements that deviate or conflict with company requirements. Likewise in this study, OGORE can make a very large contribution in the requirements elicitation stage, which is a fundamental stage in the process of developing a system. If the requirements obtained are not suitable, it will increase the risk of failure.

Moreover, Requirement Engineering (RE) is one of the first key elements of the system development process (Aljahdali 2011).

The application of OGORE is very appropriate because it has various advantages in the requirements elicitation process. First, OGORE can identify and also determine the general goals of a company, then these goals can be specified into more detailed goals as a complete summary of the requirements of each stakeholder level. Next, based on the requirements obtained, a basic model of system development can be made by determining and compiling a goals tree model element in the system requirements consisting of goals, tasks, resources, actors and KPIs. So, OGORE not only determines requirements, but also determines KPIs so that they can measure each goal quantitatively.

Based on these advantages, the application of OGORE in the need elicitation process makes a lot of sense because every company must have a vision, mission and goals, so that they can be further elaborated into system requirements to be developed and become the basis for designing systems to be developed.

Conclusions

Organization Goal-Oriented Requirement Engineering (OGORE) methods modeling a website as a medium of information and communication of the BPD NTT Pension Fund. It might conclude that the application of OGORE can identify specific company requirements based on the company's vision, mission, objective, and not personal requirements. The requirements of the elicitation process in using the OGORE method deliver in three phases, and they are as follows: The first phase is to define the company's or organization's vision, mission, and goals of the organization. The second phase is to define a KPI. The third phase is to improve the results of the elicitation process with a problem-solving method. OGORE can simplify complex requirements engineering in the systems development stage. OGORE can convert company business goals into IT goals whereas described in various tasks equipped with the use of the actors and resources. Such as the tasks, actors, and resources become the basis for modeling the information and communication media to be built and visualized using the unified modeling language (UML), namely the use of case diagrams and class diagrams. The KPIs integrated into each goal have been defined with clear steps to ensure they can be delivered, evaluated, and achieved. This OGORE modeling can be a basis for developing a system application required by information and communication media. In the future, the researchers may compare this OGORE method with the other like Agile method or User Persona method to test the capability advantage.

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