REQUIREMENT ANALYSIS USING EXTENDED VORD METHOD

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ABSTRACT

Requirement identification has a significant role in information system development. Failure in requirement identification can lead the system fail to fulfill user expectation. VORD (Viewpoint Oriented Requirement Definition) is a method and approach to identify user requirement based one view points from different stakeholders. The stakeholders include they are impacted directly or indirectly by the system. Proposed of extended VORD method adds interaction analysis to build interaction matrix which provide better analysis in requirement elicitation.

This paper describe about VORD method and extended version which include analysis of viewpoint interaction. The method is implemented to analyze the requirement of Course and Training Information System to support the Training Center Unit in an organization. The result show that the method can help us identify the requirement more comprehensive and also provide us the tools to identify the potential of system automated based on viewpoint interaction matrix analysis. By automating the direct interaction, it is expected can reduce the direct interaction and streamline the business process.

KEYWORDS

VORD, requirements, viewpoints, interaction.

1 INTRODUCTION

Requirement elicitation plays an important role in system development life cycle. At this stage, we analyze the existing problems, user expectations, and proposed solution which includes the specification of information system to be developed. Specifications include functions and services should be provided by the system, hardware and software performance requirements, and many more.

Requirement elicitation process involves many stakeholders which have direct or indirect interest on the system to be developed. Indirect stakeholders may not interact directly with the system but how they work will be affected by the system. The requirement identification process is usually not an easy task due to various causes, such as[3] :

- The stakeholders often do not know exactly their expectation, difficult to express the requirement in clear, easy to understand and unambiguous statements.

- The requirements sometimes sounds unrealistic, and do not consider the organization capabilities to realize the request.

- Stakeholders often express their requirements in their own terminologies and assumed that the others also understand the content and context as well as their knowledge, so they feel that they do not need give us the details.

- The developer team sometimes does not have sufficient experience and knowledge about user domain, but they are required to understand the work and request.

- Different opinion between stakeholders about identification of system specification, or the same requirement is expressed with different languages so that the system developer need to be able uncover the requirements and find the similar pattern or resolution for each conflict in requirements.

- User environment is typically dynamic politically or economically that can changes rapidly during analysis process. It could causes highly variant of requirements, and sometimes, new requirements can rises from the

stakeholders that are not involved at initial stage.

There are many methods and techniques have been developed to analyze and identify the system requirement. One of them is VORD method (Viewpoint Oriented Requirements Definition) which emphasizes the importance of determining the viewpoint and identifies the requirement based on multi-dimensional viewpoint so the developer can obtain better system overview and would be able to meet the requirements from many stakeholders.

This paper describes how to implement the VORD method to identify the requirements of an information system namely Course and Training Information System (CTIS). By implement this method, the developers expect that they can define the optimum specification so it can be implemented to build the system that meet the requirements.

2 VORD METHOD

VORD is a model of processes designed to reveal, analyze and record the needs of the service-based system or service-oriented systems (SOS). This model uses a variety of viewpoints entities that interact with the system, and functionalities are needed by the system. Sources of information may come from stakeholders, other systems that interact with the system to be built, or other entities in the environment where the system will operate, which may be affected operationally. Each resource needs are considered as a view point or a point of view.

The method consists of 4 steps[3]:

1. Viewpoint identification, determines any stakeholders (viewpoints) that will receive system services and identify what kind of services are provided by the system for each stakeholders.

2. Viewpoint structuring, grouping viewpoint in a hierarchy. The services are generally placed at a higher hierarchical level.

3. Viewpoint documentation, refine descriptions for each viewpoint and services identified in the previous stages.

4. Viewpoint-system mapping, map the results of the analysis to the design of object-based form.

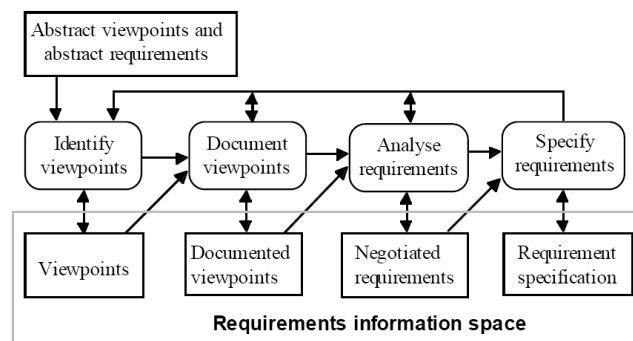Figure 1 show the stage of VORD method schematically.

Figure 1. Stages of VORD Method

Viewpoints can divide into two groups, that is [1]:

- Direct viewpoint, refers to the clients who receive services directly from the system and transmit data and information to the control system. Direct viewpoint can be either user or operator of the system or sub-systems, which deal directly with the system to be built.

- Indirect viewpoint, refers to anyone who is interested in the system but do not interact directly with the system. Indirect viewpoint can define the requirements that may inhibit the system services sent to direct viewpoints.

Each viewpoint is connected to the system that will be developed based on the needs and interaction with the system. The model is based on the assumption that if all viewpoints are analyzed and defined, the system also needs to be analyzed and defined.

Viewpoint identification includes some stages, which is [2]:

1. Create abstract viewpoint class hierarchy to eliminate viewpoint that is not relevant to the system.

2. Determine the stakeholders, i.e. people who are affected by system

3. Use models to identify the system architecture viewpoint system.

4. Identification system operator

5. For each class of indirect viewpoint, define the role of every individual that may be associated with the class.

Viewpoint abstraction hierarchy can be created as shown in figure 2. Furthermore, the viewpoint that has been identified, it can be equipped with attributes and with a notation such as the example illustrated in Figure 3.
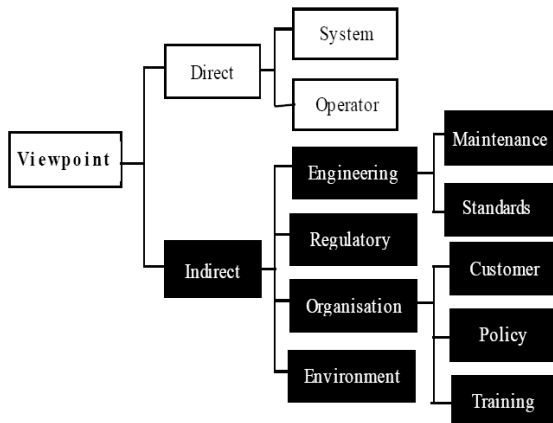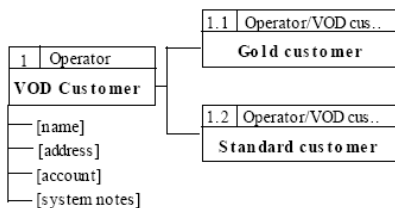

Figure 2. Viewpoint hierarchy

Figure 3. Viewpoints with attributes

Mapping of viewpoint into services can be done using the diagram below [1].
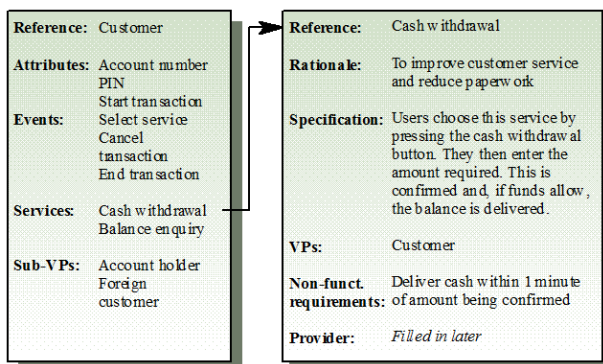

Figure 4. Mapping Viewpoints into services

Ahmad M Salem extends 3 steps into VORD method which is [4]:

1. Mapping the requirement to viewpoint

2. Viewpoint interaction analysis

   Viewpoint interaction documentation (interaction matrix)

The objective of first stage is to map each requirement to its associated viewpoints. This is actually backward from the VORD model listing viewpoints first and requirements second. This is needed since we assume that the most reliable method of identifying interactions is at the level of required services, control requirements, or set of nonfunctional requirements. This step is done by first listing all the labeled requirements, both functional and non-functional.

The second step of extended model is to determine if any viewpoint interaction exists for each requirement. This is done by analyzing the list created in step one, along with the specification for each requirement. If a requirement has only one associated viewpoint, then we can assume that no detail analysis is needed. If there is more than one viewpoint, we need do further analysis on the requirements specification and identify whether the first viewpoint that has been written interacts with the second viewpoint. This process is continued until all viewpoints for requirements have been compared to each other. If we find any interaction between viewpoint, we need to identify the type of interaction which is transitive relation (viewpoint interacts, but only through others viewpoint, so it can be categorized as indirect interaction / indirect). If the interaction is direct then we categorize this interaction as direct interaction. If there is no interaction, then it might be show an indication as compound requirement. In this case, the requirement should be split into two or more sub-requirements.

The third stage is to document the viewpoint interactions that have been found in previous stages. The result is expressed in the form of a matrix.

TABLE I.   VIEWPOINT LIST

ViewPoint No.	Description
V_1	User 1
V_2	Manager

V$_3$	User 2
…..	………….
V$_5$	User N

TABLE II. REQUIREMENT LIST

Req.No.	Description	Viewpoint resource
R1	Member registration	V$_1$
R2	Print order form	V$_2$
R3		
…..		
Rn	Print sales report	V$_n$

TABLE III. MAPPING REQUIREMENT-VIEWPOINT

Req.No.	Viewpoint
R1	V$_1$, V$_2$,V$_3$
R2	V$_2$, V$_3$,V$_5$
R3	V$_4$, V$_5$, V$_6$
…….	……………..
Rn	V$_3$, V$_4$, V$_8$

TABLE IV. INTERACTION MATRIKS VIEWPOINT-REQUIREMENT

	V$_1$		V$_2$		………….	V$_n$	
V$_1$			R1	D		R2	I
			R2	D		R3	D
			R3	I		R4	D
V$_2$	R1	D				R1	D
	R2	D				R3	D
	R3	I				R4	D
	R4	D					
… …							
V$_n$	R1	D	R2	D		R4	I
	R2	D	R4	I		R5	D

3 REQUIREMENT IDENTIFICATION CTIS.

Course and Training Information System, shortened to CTIS, is a system that is built to support the administration process for a training center unit in an organization. The system involves many stakeholders and tries to improve recent business process flow. Recently, Training Center Unit (TCU) using manual process to disseminate training information, recording the participants, and administering the training process.

Some problems have arose from existing system such as how to identify all the training that has assigned to the employees, simplify registration process, allocate the classrooms and confirm the availability of training instructor.

TABLE V. PROBLEM IDENTIFICATION (EXAMPLE)

No	Description
1	Difficulties in identify the data of participants who have completed a previous course type
2	The approval process is done manually and supporting documentation is incomplete
3	There is no transparency in the class quota is met and who qualified participants for each class.
4	No clear eligibility requirements and mechanisms of a course
5	It is difficult to contact participants to ask for confirmation of participation courses
6	Instructors often too late to receive confirmation of the class that has scheduled
…	…….
…	…….

As a solution to these problems, the organization then created an information system to support the training and course administration process which can be accessed by all stakeholders based on their authorization access and information needed. With this system, employees can access information about course to be held, sign up, request approval from their manager, and attend the course.

The managers, in this case is unit or department manager, can use the system to approve the request from their staff and find the information about course that has been followed by each staff, see the results provide written approval.

The system is also expected to be used by the administration to announce the course to be held, the participant registration process, allocate a class, contact the instructor, course report, print the certificate and report the course result into many stakeholders.

The system is also expected to help the instructor to check the schedule availability, confirm, and report the results of the course.

TABLE VI. VIEWPOINT LIST OF CTIS

ViewPoint No.	Description
V$_1$	Employees
V$_2$	Training center administrator
V$_3$	Department Manager
V$_4$	Training center manager

V$_5$	Instructor
V$_6$	HRD Manager
V$_7$	Participant
V$_8$	Employee Information System

Another requirement is the system is expected can provide a recapitulation of employee participation in any course that has organized and use the information to create a plan for development of employee skills and expertise. HRD Manager also expects the integration with existing employee information system. The data must be refers to the Employee Information System all the course report also can synchronized directly to Employee Information System (updating the record track for Employee career and development)

After define the viewpoints, we then categorize the viewpoint into a hierarchy as shown in figure 5 below.
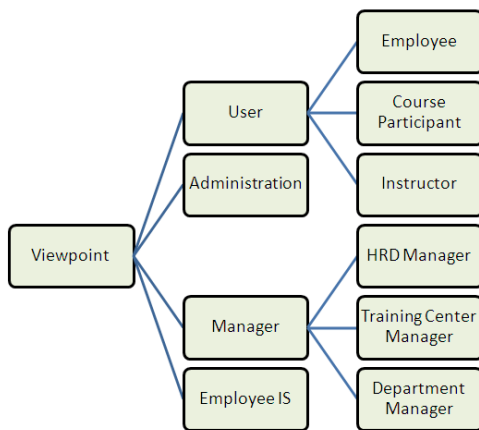

Figure 5. Hierarchy of Viewpoints

During the analysis process, we also determine the constraint for this system which is: Employee Information System uses Oracle database and had developed by different vendor and has been used. Another constraint is the existing system is impossible to modify so the reference data (employee data) must be obtained from and course result must be sent into Employee Information System through CTIS system.

After analyze the problem description, we identify the requirement for each viewpoint as shown in Table VII.

TABLE VII.   LIST OF SIDIK REQUIREMENT (EXAMPLE)

No. Req	Description	View point
R1	Posting course information	V$_2$
R2	Check the requirement	
R3	Check the approval	
R4	Confirm the participant	
R5	Confirm the instructor	
R6	Print the participant list	
R7	Print the name tag	
R8	Attendance monitoring	
.....	....	
....	....	
R14	browsing course information	V$_1$, V$_7$
R15	Register	
R16	upload/confirm the requirement	
R17	Request approval	
R18	Re-confirm	
R19	Attend the course	
R20	View course report	
....	....	
...	....	
R23	Accept the course request notification	V$_5$
R24	Confirm the request	
R25	Attend the course as instructor	
R26	Create evaluation report	
R27	Accept notification of request approval	V$_3$, V$_6$
R28	Evaluate the request	
R29	Approve the request	
R30	accept the course report	
R31	View course history	
R32	Input the testimony/forum	V$_7$
....	....	
....	....	.....

The next step is mapping the requirements which have successful identified into viewpoints to determine the common requirements (requirements that is needed by more than one viewpoints). Table VIII shown the mapping result.

TABLE VIII.   MAPPING REQUIREMENT INTO VIEWPOINTS (EXAMPLE)

No. Req	Description	Viewpoint
R1	Posting course information	V$_2$
R2	Check requirement	V$_2$, V$_3$
R3	Check approval	V$_2$
R4	Confirm the participant	V$_2$, V$_7$
R5	Confirm the instructor	V$_2$, V$_5$
R19	Attend the course	V$_7$, V$_5$
R20	View course report	V$_7$, V$_5$, V$_2$ V$_4$, V$_3$
....	....	

R22	Upload/download file	V_7 , V_2 , V_1 , V_5
R23	Accept the request of scheduled course	V_5
R24	Confirm the request	V_5
R26	Create course report	V_2 , V_5
R27	Update the employee information system automatically	V_8
R28	Access employee information	V_8

After analyze the mapping result, we can determine some common services such as:

- Upload / download files features is required by employees when they register and supply the required document, required by instructors to post course materials, required by the administration to check the written requirements and others.
- Notification via email is required by all participants who have signed up, as well as the instructor.
- View the course result is required by the instructor, participants, training administration, and department managers.

There is a possibility of common services requirement is not described in detail (granular) so the requirement needs to break down into some sub requirement clearer, or vice versa, some requirements can be combined into a single shared service.

For example, the facility upload / download files (R22) can be break down into some sub-services such as:

- Printing directly, without having to be downloaded:
  - Printing certificates and nametag
  - Printing list of attendees
- Upload file:
  - Submitted by instructor training materials
  - Upload requirement by the applicant / employee
  - Upload brochure by training administrator
- Download the file:
  - Download training material by the instructor and training administrator, and participants
  - Download the course result by department manager

- Download the list of attendees by the training administrator

To identify the better specification, we need to identify the type of viewpoint (direct/indirect) for each requirement which has been identified as the common services above, and the viewpoint was determined will act as direct dominant viewpoint.

The next step is to determine the viewpoint direct/indirect as shown in table IX.

Viewpoint interaction matrix provides us the reference to choose which requirements will be automated by eliminate the direct interaction between viewpoints. The automation of these requirements, in some case, can shorten procedures and streamline business processes. For example, if we can automate the process of approval request which is manually interaction between manager and employee or between training administrator and instructor, we can shorten the procedure and provide the viewpoint quick respond on their request. The proposed system can provide new alternative in direct interaction which is not depend on the same time or space limitation by build the interface which facilitate the viewpoint to interact indirectly.

TABLE IX. VIEWPOINT INTERACTION MATRIX

		V1		V2		V3		V4		V5		V6		V7		V8	
				R1	D	R3	D	R20	I								
				R2	D	R20	I										
V1				R3	D												
	R1	I								R5	D	R30	I	R23	I	R40	I
	R2	D								R23	D	R31	I	R24	D	R41	D
V2	R3	D												R25	D		
V3																	
V4																	
				R25	D									R26	D		
V5																	

4 CONCLUSION

VORD method provides us the approach to identify the requirement by analyzing the stakeholders of information system. This method is suitable for the condition where many stakeholders

is involved and contribute to the system development directly or indirectly, and help us to gain the whole requirement specification of the system.

On this paper, we try to implement the extended VORD method to analyze the requirement for information system which is planned to support the training center in an organization.

The result shows that by using VORD method we can obtain not only basic requirement for each viewpoint, but also shared services which can help us to design the application components.

The extended analysis of VORD method by doing the interaction analysis between viewpoint can help us determine the potential way to reduce the direct interaction which expected to reduce the direct dependency between two viewpoint by automate the interaction process. It will help us streamline the business process.

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