

## Effective Requirement Elicitation Process using Developed Open Source Software Systems



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### ABSTRACT

Requirement gathering is an important and most critical phase of software engineering. Collecting requirements requires concerted efforts as well as time consuming. Therefore, this process requires domain knowledge specially when handling big project such as the Enterprise Resource Planning (ERP) systems. Collecting requirements from developed open source software is beneficial and takes place by understanding the business process of whole software. In this study, collaborative way of elicitation is discussed with the help of open source ODOO ERP system. The results showed that collecting requirements from an already existing software consume less effort with greater accuracy as compared to elicitation process performed based on traditional techniques. This research is hope to assist the requirement analyst and researchers for making data sets more efficiently with less amount of time for all those systems where requirement gathering is much difficult.

**Key words :** Functional requirements, requirements, requirement engineering, requirements prioritization, user requirements.

### 1. INTRODUCTION

Requirement Engineering (RE) deals with how requirements are collected for a software system [1]. RE is not an easy task and requires much efforts. RE is the most critical phase of Software development life cycle and any mistake during this phase can lead the software to failure. The importance of RE can be seen from the fact that if during the testing phase, the reason of failure of system or any functionality is traced back to RE phase, then it is very much difficult and costly to fix it so much attention will be required for gathering requirements. There are four phases of RE and elicitation is the first phase where requirements for software system are collected. In analysis phase, requirements are further examined and purified through models. After analysis all requirements are specified in the document known as software requirements specification document (SRS). In the end, all requirements are validated and tested.

During elicitation, requirements from different sources are collected by applying various elicitation techniques. There

are two broad categories of elicitation techniques i.e. traditional ways and collaborative ways. Further details of techniques are discussed as the following.

**Background Study:** Detail knowledge is required for some systems like business ERP system. In such case background study is conducted for knowing the detail of business. This study requires knowledge of business policies, accounts, inventory etc. The detail can be studied from any business related document or from manual made system like Excel sheets. This technique is quite time consuming and requires much efforts but the advantage is that depth knowledge and understanding of business can be made easy. In one of the paper, authors have discussed the advantage of using background study as elicitation technique by using technical document with natural language processing used for formatting the document in order to fully understand the business process [2].

**Interview:** This technique requires direct communication of clients and vendors where requirement analysts have certain questions and clients have to answer that. This technique is helpful in those cases where both clients and vendors have knowledge about the business. This technique is not useful for collecting hidden knowledge inside software [3]. Only experience person can collect requirements using interview.

**Apprenticing:** In this technique, requirements are collected by observing people on their works. In organization, different people have different roles and responsibilities, asking about their tasks and way of doing that can help in gathering requirements because everyone knows well about their work. Such activity is also helpful in those cases where people behavior is difficult to describe with the help of other available techniques. Exceptions and hidden detail information's can be missed using this techniques and this shows the weakness of the technique [4].

**Requirement Modelling:** Through models requirements can be validated from user. Models like USE CASE, sequence diagrams, context models and state diagrams are few types of models [5][6].

**Brainstorming:** This is innovative way generating lots of ideas and solutions for gathering requirements for a certain software system. But this technique fails on business oriented software's where brainstorming is impossible. This technique works well for projects like games and mobile smart phone applications [3].

**Workshops and Discussion forums:** Arranging workshops and having fruitful discussion is beneficial for getting solution to variety of problems. This technique can be used for gathering requirements, where workshops are arranged and different experts, vendors and clients sit there and start discussion. This technique is fruitful specially when someone is launching his new idea of brand and take feedbacks and suggestions [4].

**Prototyping:** Gathering requirements by making prototypes of some systems can help in understanding the requirements. Prototyping is helpful but quite time consuming [4].

When collecting user requirements through traditional techniques of elicitation, a lot of risks and challenges are associated with that. According to [7] the following challenges and risks are associated when collecting requirements.

- Gathering of unnecessary requirements from users is a big problem. Sometimes along with necessary information's, some unwanted requirements are also gathered due to poor understanding of clients about business process.
- Sometimes the requirements explained by users create ambiguities because they are not aware of what will be the final output of these requirements.
- The clients are not fully aware about the requirements or how system will look, this creates a lot of problems for requirement analyst because sometimes at the end of development, they refuse to accept some requirements and its design criteria and the reason of failure is traced back to poor requirements gathering.
- Clients have just rough data in mind and give incomplete requirements to analyst, this process sometimes miss necessary information's that are latterly difficult to adjust in system.
- As clients are not conscious of the final output design of a system, this create a lot of problems for developers while making design for requirements. So keep in mind the challenge, analysts have to make several design scenarios while discussing requirements with clients.
- Communication gap is a critical challenge between vendors and clients due to lack of knowledge, experience of clients. Sometimes other factors like language barriers, culture differences etc. also exist.
- Sometimes clients are very much busy in their activities and business, this also create a lot of problems.

Our research work highlights the issues of traditional elicitation techniques and suggest the alternative ways of

collecting user requirements with the help of using already develop software's. Already developed open source systems have fully developed modules and requirements that helps in understanding and collecting user requirements. Already exist software's can be used as prototype and can be discussed with clients. This will save a lot of time, clients will discuss about the design changes and can suggest other changes. Using open source software's for understanding the requirements helps in better management of requirements too. As from open source software's, analyst not only just collect the requirements but understand the flow of data among the requirements that will reduces barriers when making groups or design for requirements. The aim is to reduce the efforts during elicitation with greater efficiency and more accurate results. For this purpose, a collaborative process is designed for collecting user requirements for ERP systems. This work will fill research gap and will helps vendor organizations and analyst during elicitation

## 2. LITERATURE REVIEW

In literature, we found a lot of suggested techniques for elicitation of requirements. Software engineers can get advantage of the existing techniques from literature while gathering requirements. According to [8] the selection of a particular technique depends on analyzing the type of system, environment, knowledge and technical abilities of clients, size of requirements etc. So, it is important to identify the attributes that represent these contexts. [9] stated that all the available techniques with advantages for elicitation like open ended interview, structured interview, task observation, questionnaires etc. According to [10] success of any software projects depends on many factors, but one of the key factor is being the efficiency of using elicitation technique.

According to [11], elicitation technique 'interview' is not good approach in developing modern software systems. In some complex situations, more than one technique should be used for efficient elicitation process [10] [12]. According to [12], it is not easy and possible to know about all requirements at initial level in beginning but it evolves over a time after development and implementation. So, it is necessary to collect as many requirements as many possible in start. It has already mentioned by many authors that which technique is suitable for collecting requirements under different situations of developing software. According to [10], selecting a proper technique by requirement analyst is necessary for more efficiency.

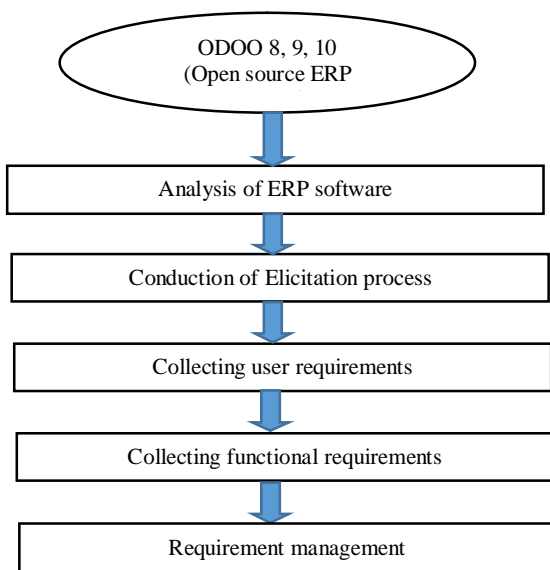
While talking about elicitation process for local clients, it's too difficult process when conducting during global software development (GSD) where clients and vendors are separated by distance. Proper elicitation requires a lot of efforts in GSD due to challenges like culture difference, difference in languages, time difference [13]. In such

situations where clients and vendors are far away from one another, applying traditional techniques like background study, interview, apprenticing etc. are not possible but instead of that some collaborative techniques are required in GSD [14].

So either in absence of clients or in GSD, analyzing open source developed software systems is good approach for elicitation. Although it still requires efforts to study that but results will be more accurate and satisfactory and can be easily validated.

### 3. RESEARCH DESIGN

The design of our research consist of the following steps as shown in Fig. 1. We have considered ODOO 10 ERP system for gathering requirements.



**Figure 1:** Step-by-step research design framework

#### 3.1 Analysis of open source ERP systems

Analysis of ERP system is must in order to fully understand the processes and requirements. Understanding the business logic and all work flow which takes place in every enterprise in must in order to understand ERP system functionalities. Several authors have conducted their studies on how to deal business process efficiently through information technology. In fact, Re-Engineering is the process we can conduct. It is the process of studying the existing software’s and derive the requirements and a kind of reverse action. In this study we used three versions of ODOO 8, 9 and 10. Several authors have referred to different versions of ODOO in their studies. In their studies, authors have worked on different modules. The following modules of ODOO are studied and being identified from open source ODOO 8, 9 and 10.

1. CRM and SALE module
2. SCM and PURCHASE module

3. HR management system
4. PAYROLL management
5. BANK and ACCOUNTS module
6. DATAWAREHOUSE
7. COMMUNICATION System
8. FLEET and VECHICLE management system
9. PROJECT management module
10. DOCUMENT management module

#### CRM (Customer Relationship Management):

Customer relationship management (CRM) is a term that discusses the practices, policies and machineries that businesses use to accomplish and examine customer communications and data throughout the customer lifecycle, with the aim of improving customer service relations and supporting in customer holding and driving sales growing [15][16].

#### SCM (Supply Chain Management):

In business, supply chain management (SCM), the managing of the stream of goods and services, include the movement and storing of raw resources, of work-in-process inventory, and of completed goods from point of source to point of consumption [17].

#### HRM (Human Resource management):

Human resource management (HRM or HR) is the management of human resources. Normally stated as the HR Department, it is intended to exploit employee performance in service of an employer's planned purposes. HR is mainly concerned with the management of people inside organizations, concentrating on strategies and on systems. HR sectors are accountable for supervision of employee-benefits strategy, employee recruitment process, training and development, performance evaluation and assessments, and rewarding (e.g., handling pay and benefit systems) [18].

#### HR Payroll:

A payroll system is software implemented to establish all the jobs of employee payment and the filing of employee taxes. These tasks can comprise of maintaining track of hours, calculating salaries, concealment taxes and deductions, printing and carrying checks and giving service taxes to the government. Payroll software often needs very less input from the employer. The employer needs to input employee salary information and hours—then the software computes the information and does withholdings automatically. Most payroll software’s are automatically updated when a tax law variations occur and will remind employers when to file several tax procedures [19] [20] [21].

#### Data warehouse management:

It involves product information along with storing information where its location and quantity is fixed. Data warehouse and

product information's are central part of any ERP system because purchase and sale totally depend on products detail[22] [23].

**Accounts:** Accounts management is core module of ERP system. Accounts include invoices, billing for selling, purchasing and employee expenses and payroll management system[19].

**Communication system:** Communication include message system inside organization which communicate all employees together. Latest versions of ODOO include this facility.

**Fleet management system:** vehicle are used by every organization for transportation purpose. Managing information's about vehicle, drivers, routes, fuel consumption, parts repairing, maintenance is necessary for every organization. ODOO include fleet management system for managing vehicle system[24].

**Project management system:** Managing tasks or projects inside organization needs proper module. ODOO include project management module[25].

**3.2 Requirement elicitation process**

For elicitation different techniques are presented in Section 1, we have applied the following elicitation techniques while collecting requirements for ERP system.

**3.2.1 Background study**

This technique is used for deep learning the mechanism of anything in detail. Background study about the modules like HR, Sale, and Accounting is necessary before going to understand the whole process. We studied literature where information about every module is given in detail. Knowledge about modules can be better learn when studying the literature in detail.

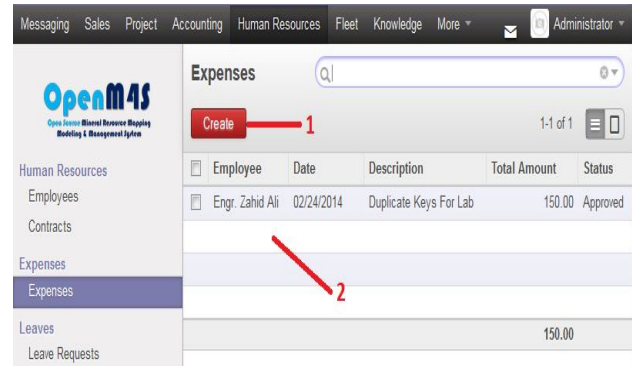
**3.2.2 ODOO as prototype**

ODOO 8,9,10 open source ERP software's were downloaded and installed. All the modules were configured in order to fully implement them for use. Before using software and collect functional requirements, background study or knowledge were must. After background study and going through ODOO and after practices and understanding the whole business process, all the detail user requirements for the above mentioned modules were collected and organized in the form of table 1 as shown below.

**3.3 Analysing every user requirement**

Analysis of every module and understanding the business and work flow process is necessary for knowing in detail

the functional requirements and its internal structure of how one requirement is connected or pre-requisite for other requirement. Understanding the connectivity and integration of different requirements is must for implementing requirements. Fig. 1, Fig. 2, and Fig. 3 show user requirements related to employee expenses, leave management and basis information's.



**Figure 2:** Expenses module for Employee

Fig. 2 is about expenses of employee, but before going to make expenses for particular employee, it is necessary to store employee information's and for that we have to enter employee basic information in module shown in Fig. 4. Similarly, Fig. 3 shows how employee can request for leave, but employee information are must before going to make entry in leave form. So this means module as shown in Fig. 4 is must for both of the above modules. This relation and work flow shows the relationship and dependency of requirements on one another.

Consider an example of the same ODOO EPR, by taking module customer invoice as shown in Fig. 4 and Fig. 5. It is the step done when customer demands for some products and after confirmation of order, invoice is generated. But we can see from these figures that invoice generation needs customer information, sale person information's, and products information's. This means the requirements of this module are integrated or dependent on customer and product module. This indicate that requirements are dependent on other requirements.

In similar fashion as discussed in above section, we analyzed all the modules and its work flow and collected all user and functional requirements along with its relationships in between.

**4. RESULTS**

Table 1 shows the detail set of resulted user requirements which consist of 95 user requirements or sub modules from ODOO.

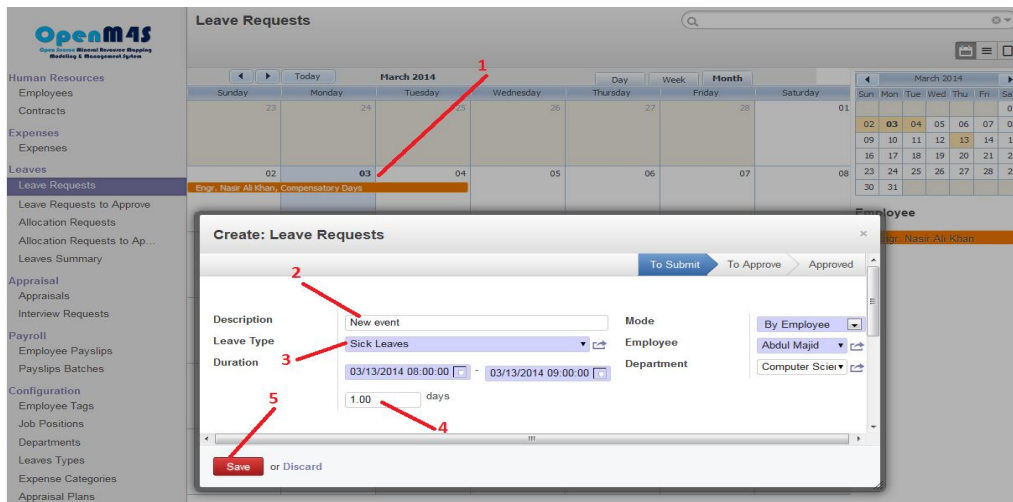


Figure 3: Leave request module for employee

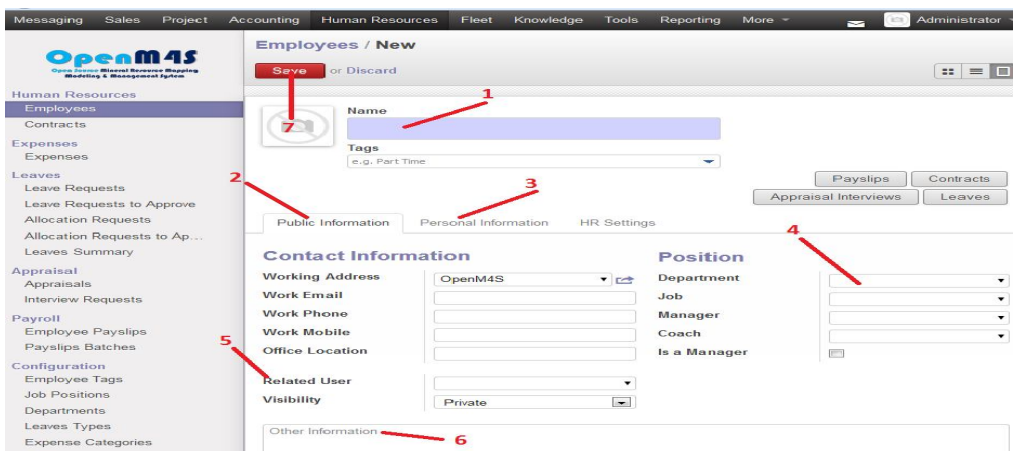


Figure 4: Employee basic information module

1-2 of 2

Customer	Invoice Date	Number	Salesperson	Due Date	Source Document	Balance	Subtotal	Total	Status
test	06/14/2013		Administrator			0.00	18.00	20.70	Draft
ASUSTeK	06/12/2013	SAJ/2013/001	Administrator	06/12/2013		0.00	1850.00	1950.00	Paid

Figure 5: Customer invoice generation

Customer In... / SAJ/2013/001 Test invoice 1

Refund Invoice

### Invoice SAJ/2013/001

<b>Customer</b>	ASUSTeK 31 Hong Kong street Tsepei 106 Taiwan	<b>Invoice Date</b>	06/12/2013
<b>Fiscal Position</b>		<b>Journal</b>	Sales Journal - (test) (EUR)
		<b>Account</b>	X11002 Debtors - (test)

Product	Description	Account	Quantity	Unit Price	Taxes	Amount
	Basic computer with Dvorak keyboard and left-handed	X2001 Product Sales - (test)	1.000	250.00		250.00
	MOUSE					
	Little server with raid 1 and 512FDD ram	X2001 Product Sales - (test)	2.000	800.00		1600.00

<b>Subtotal :</b>	1850.00 €
<b>Tax :</b>	100.00 €
<b>Total :</b>	<b>1950.00 €</b>
<b>Balance :</b>	0.00 €

Figure 6: Customer invoice detail

**Table 1:** User requirements collected from ODOO open source ERP system

S_NO	User requirements	Module name	No of functional requirements
1	Employee creation	HR	2
2	Public information's of employee	HR	8
4	Contact info	HR	
5	Job position	HR	4
6	Department	HR	2
7	Job information's	HR	2
8	Manager	HR	5
9	Coach	HR	2
10	Contract information's	HR	5
11	Contract reference information's	HR	6
12	Salary generation	HR	4
13	Salary rules	Payroll	6
14	Salary structure	Payroll	4
15	Salary categories	Payroll	5
16	Registers	Payroll	2
17	Apply for leave	Leave management	6
18	Allocation request	Leave management	9
19	Leave Approval	Leave management	3
20	Leave summary	Leave management	9
21	HR payroll process	Payroll	8
22	HR Expenses	HR	
24	Project management	Project management	6
25	Add team members	Project management	3
26	Extra information's	Project management	4
27	Project stages	Project management	2
28	View current task	Project management	4
29	create a task	Project management	8
30	Extra information's	Project management	3
31	Tasks stages	Project management	2
32	customer invoice	Sale	20
33	customer detail	HR	6
34	product	Warehouse	34
35	sale	Sale	14
36	customer refund	Sale	15
37	Sales persons	HR	6
38	customer receipts	Accounts	15
39	customer payment	Accounts	31
40	supplier receipts	Accounts	15
41	supplier detail	HR	11
42	purchase	Purchase	16
43	Sales man	HR	6
44	supplier refund	Accounts	16
45	supplier payment	Accounts	31
46	bank statement	Bank module	8
47	bank detail	Bank module	6
48	cash registers	Bank module	13
49	put money in	Bank module	3
50	put money out	Bank module	3
51	Profit and lost	Bank module	27
52	supplier payment	Accounts	
53	Journals accounts	Accounts	22



54	Chart of accounts	Accounts	11
55	Analytic accounts	Accounts	13
56	company	Warehouse and product	6
57	region	HR	3
58	area	HR	5
59	purchase view	Purchase	11
60	purchase return	Purchase	15
61	sale return	Sale	14
62	sale view	Sale	14
63	salesman ledgers	Accounts	7
64	customer ledgers	Accounts	7
65	supplier ledgers	Accounts	7
66	stock ledgers	Warehouse and products	13
67	HR expense management	Accounts	22
68	purchase return view	Purchase	10
69	sale return view	Sale	10
70	Product transfer In	Warehouse	8
71	Product transfer out	Warehouse	8
72	order to suppliers	SCM	22
73	order from customer	CRM	26
74	Balance sheet	Accounts	4
75	compose message	Communication system	7
76	message inbox	Communication system	6
77	message Draft	Communication system	10
78	sent messages	Communication system	3
79	message Searching	Communication system	5
80	Job position in recruitment	HR	6
81	Job	HR	12
82	appraisal form	HR	5
83	create a job position	HR	2
84	Recruitment form	HR	12
85	Job selection process	HR	4
86	Link tracker	HR	4
87	Mass mailing	HR	4
88	contact	HR	6
89	business pipeline	HR	13
90	manufacturing orders		8
91	fleet management	Fleet management	45
92	Vehicle repairing	Fleet management	20
93	Directories for documents	Documents management	7
94	Documents history	Documents management	8
95	Documents attachments	Documents management	5

## 5. CONCLUSION

As discussed in literature how important is the selection of appropriate technique during elicitation. The quality of software product is directly proportional to the quality of how well requirements are collected and in this regard, selecting an appropriate elicitation technique bears a lot of significance. Although the existing traditional elicitation techniques work well but they will take a lot of time specially when projects are big like ERP systems with little experience so it is better to adopt collaborative technique as presented in this research work. We have collected functional requirements by studying the open source ODOO ERP system in less amount of time with greater efficiency. The requirements can be discussed with clients, and any changes in list can be welcomed. The presented technique will help the analysts to collect requirements with less efforts in more efficient manner.

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