

An Approach to Utilize Open Source ERP Framework: The Case of Ethiopian Governmental Financial Organizations

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Abstract

This paper first attempts to find out and identify matters affecting Enterprise Resource Planning (ERP) adaptation in the Ethiopian context. Secondly, there are lots of Open Source ERP framework vendors, but which one to select is a difficult task. This paper tries to explore and provide ERP evaluation criterion, which will help in choosing an appropriate open source ERP framework. Accordingly, iDempiere ERP is selected as a best fit framework. Thirdly, the main contribution of this paper is high-level and low-level customization approaches or models which will have a significant impact to customize open source ERP framework in a simple way. Finally, one additional new component is added into the ERP framework which allows effortless system development and customization especially for organizations that have complex business logic.

Keywords: ERP Framework; Open Source; Customization Approach; Application Dictionary

1. Introduction

The power of ERP software is now universally seen as a necessity for any organization or business. The features and benefits of these programs can lead directly to increased efficiency and profit. However, organizations in different industries have different requirements for ERP software, which can be difficult to manage with traditional models [1]. To overcome this, in Ethiopia and most developing countries, governmental and non-governmental organizations are trying to develop an ERP framework and system from scratch. But still it is difficult to have a stable ERP system and it is challenging to make it fit with different organizational requirements with minimum customization cost. Some organizations are also trying to use proprietary ERP systems. However, this approach will also have its own drawback to implement in an organization. As a result, implementing ERP framework independently by various organizations and using proprietary ERP systems are not cost effective, ineffective utilization of manpower and make an organization stick to one specific vendor. In addition, local software vendors

do not have the capacity to build it in the scale of the international standard. An ERP with acceptable international standard and reasonably low cost for a poor country like Ethiopia is highly beneficial.

This paper addresses questions such as a) Which Open Source ERP framework is best fit to an organization's business needs? b) What are the most challenging issues to adopt ERP framework for an organization to utilize? and c) What approaches are used to utilize or customize an Open Source ERP framework and system to incorporate an organization's unique requirements?

To answer the identified questions, potential challenges of utilizing Open Source ERP framework are identified and solutions are provided. The evaluation criteria are derived and different Open Source ERP frameworks are compared based on the evaluation criteria and the best fit open source ERP framework is selected, which is iDempiere. Lastly, we provide a customization model and add one component which can simplify customization effort and development time and cost.

The data obtained from the respondents is quantified in the research. Information is gathered from Ethiopian Governmental Financial

Organizations (EGFOs). Two separate questionnaires comprising various questions related to different factors in selecting of Open Source ERP solutions and to identify the challenges to adopt Open Source ERP framework are used. An interview has been conducted with EGFOs to understand the business requirement and the existing system challenges. The results obtained from respondents were analyzed.

2. Related Work

Different related literatures are reviewed in different areas. To identify the existing challenges in adopting Open Source ERP framework several failure reasons have been reported in the literature. In [2], one of the reasons for the failure of ERP is that organizations fail to reconcile between the requirements of their human and business systems and those of the new technological system. ERP failure has been also attributed to a plethora of reasons: the complexity of ERP systems and lack of ERP product knowledge [3]. According to [4] inappropriate project management, lack of executive commitment, unclear business objective, poor communications, resistance to change within the organization, and others are stated as failure factors to adopt open source ERP solution. Different researchers used different evaluation criteria to compare and select best fit ERP framework. The author in [5] used five evaluation criteria and its sub-criteria aid to compare selected open source ERP systems. The author in [6] used two criteria; the dimension and feature as keys to evaluate which one is the best open source ERP. To identify the possible open source ERP framework customization approach the author in [5] described ERP system permits low-level customization through coding and high-level customization through metadata editing. The high-level customization approach is possible through the abstraction of parts of function, structure and behavior from the ERP systems into metadata while the higher level of ERP customization is doing most customization (metadata editing) graphically and supported by tools.

3. The Proposed Solution

The main reason that Open Source ERP framework is used is because organizations own the system without any cost and its full source content. There is no lock-in or dependency on the vendor and they are free to create new interface shell outside of the core system to meet the business needs and line-up with the organization's goal.

Thus, this paper meets an ultimate goal by providing a customization model and one major component which aids to utilize ERP Framework for various organizations. It addressed the following issues: i) It identified the challenges to adopt or utilize an Open Source ERP framework in the Ethiopian Organizations; ii) Selects best fit Open Source ERP framework (iDempiere) by evaluating existing different Open Source ERP Frameworks; iii) It provided a Low-level approach and High-Level approach model by focusing on iDempiere Framework and accordingly we have added one new core component into the framework in order to simplify and minimize the customization or development process, implementation time and cost.

3.1 Challenges of Adopting Open Source

Most of the organizations believe that possessing and exercising the use of an ERP system has become an essential asset in order to be able to adapt to environmental changes and be competitive in today's market. However, organizations encounter many challenges and issues when adapting or implementing an ERP system.

In order to gather data related to the existing challenges of adopting open source ERP system in the Ethiopian context a questionnaire is designed and data analysis is performed and covers a sample population of four financial organizations. IT departments or developers are chosen in order to determine stakeholders' needs based on their experience and familiarity with the topic. Thus, the major factors or challenges that have hindered an ERP system to be adopted by EGFOs are shown in Table 1.

Table 1: Major Challenges of ERP System Utilization

Priority	Factor	Number of Responses	(%)
1	Lack of executive or top management commitment	75	73.5
2	Unable to get an approach to adopt/implement ERP system	71	69.6
3	Lack of knowledge of ERP product	64	62.7
4	Incompatible business process with ERP products	53	51.9
5	Lack of education about the system's advantages & functionalities	47	46.1
6	Lack of commitment, acceptance and readiness to deploy the system	38	37.3
7	Resistance to change within the organization	27	26.5

3.2 Evaluation and Selection of Open Source ERP Framework

There are many open source ERP software. Out of these, one of them will be identified and selected through different mechanisms. In the first mechanism, the leading Open Source ERP systems are identified by searching the Internet [1, 7].

In the second mechanism, after a preliminary review of different research works on each of the identified open source ERP systems and according to the organization's requirements, it became evident that only some of the ERP frameworks deserve being looked into in more details due to its competitive offering. These two mechanisms resulted in the selection of the three open source ERP systems for

comparison. They are: Apache OFBiz, OpenERP, and iDempiere. In the third mechanism, the pre-selected or the three chosen open source ERP frameworks are evaluated through different criteria.

To evaluate and select one best fit Open Source ERP framework, we adopt six criteria that are documented by different researchers. The criteria are Functional fit, Flexibility, Support Availability, community, Maturity and Organization Size and sub-criteria that serve to compare the selected open source. We also added one basic need to cover the requirements and set point for the objective of the research which is "Plugin custom code/module" as presented in Table 2.

Table 2: Open Source Evaluation Criteria

No.	Main Criterion	Sub-criteria
1.	Functional Fit	Number of tables, Inventory & Warehouse, e-commerce, Accounting MRP & POS.
2.	Flexibility	Customization, Flexible Upgrades, Architecture, Security, Internationalization, User friendliness, Interface, Scalability, OS Independence, DB Independence & Programming Language.
3.	Support	Support Infrastructure, Training & Documentation
4.	Continuity	Project Structure, Community Activity, Transparency, Update Frequency & Other lock-in effect.
5.	Maturity	Development Status & Reference Site

In this paper, weight scoring method is used for evaluation. Thus, string values Yes, No, Above Average, Average and Below Average are used. The result is a single weighted score for each criterion and the evaluation criterion necessarily assigns numeric values to judgments. Accordingly, there is a margin being assigned between 0 and 10. Yes is

assigned to an available feature and for the value of maximum which is 10. No is assigned if that specific feature is not available within the open source ERP and assigned the minimum value which is 0. Above Average is found in between Yes and Average and supports all features with certain limitations and it is closer to the value Yes which is 8. Average -

Between Above Average and Below Average - is when it supports half of the features and it is assigned a value of 5. Below Average is between the value score of Average and No and has a certain function with limited value and it is assigned a value of 3. A score to specific product per selection criteria is denoted as Score:

$$(Criteria, OSERP) = Count (Yes) \times 10 + Count (Above Average) \times 8 + Count (Average) \times 5 + Count (Below Average) \times 3 + Count (No) \times 0$$

Table 3 shows the summary of evaluating the different open source ERP frameworks. For each product a score value is computed.

Table 3: Open Source ERP Frameworks Comparison Summaries

No.	Evaluation Criteria	Open Source ERP Framework			Max Value	Criteria Weight
		OFBiz	OpenERP	iDempiere		
1.	Functional Fit	160	160	180	180	10
2.	Flexibility	51	36	56	60	25
3.	Support Availability	18	15	16	20	10
4.	Maturity	20	18	15	20	10
5.	Continuity	28	28	28	30	10
6.	Organizational Size	40	40	40	40	5
7.	Plugin Custom Code/Module	26	34	48	50	30
Total Criteria Value Sum (Criteria i X Criteria Weight i)		4,515	4,330	5,430	5,700	100
Percentage (Total Criteria Sum X 100)/Max Value		79.21	75.96	95.26		

In the context of multiple-criteria decision-making, the result of selecting open source ERP systems can depend on the criteria used for the evaluation [8]. According to our criteria used for comparison and organizations requirement, iDempiere is found as a best fit Open Source ERP system than the other two (OpenERP and OFBiz).

3.3 Implementation of New Component and Design of Customization Model

iDempiere is selected with its highly configurable, customizable and extensible platform with high stability. It also has the benefit of being used with no changes and cost. Sometimes iDempiere framework does not perfectly suit organizational needs and may need some changes to parts of the source code. Some customizations are not possible to achieve through iDempiere's core Application Dictionary and we have to modify the source code for that.

The newly added component will minimize customization cost and development time. In addition, by using this component creating any iDempiere is not required (such as User Interface, M

class, I class, X class, Model factory class and Component definition (XML file) class in minimum). Instead the new developed component will automatically generate every necessary menu, class and code from the pre-designed database and based on the information registered on this component. So the developer only considers the unique business logic to be written in the generated class.

Thus, with the new added component and customization model as shown in Figure 1, every necessary model class and code is automatically generated. So, the developer merely focuses on the unique business logic to be coded. Thus, the new developed components and customization model will make easy the customization and used to include any types of organizational business logic.

3.4 Prototype

The prototype development is the basis for EGFOs requirement which need business logic code. It is also developed based on the low-level customization model and the new added component into the iDempiere framework.

The window shown in Figure 2 will help to generate the Menu for the newly added modules. The following windows are generating the class with the required code based on the database tables and our

configuration on the windows. After setting the required information on the specified field, one can generate by selecting the 'Generate CCM' toolbar.

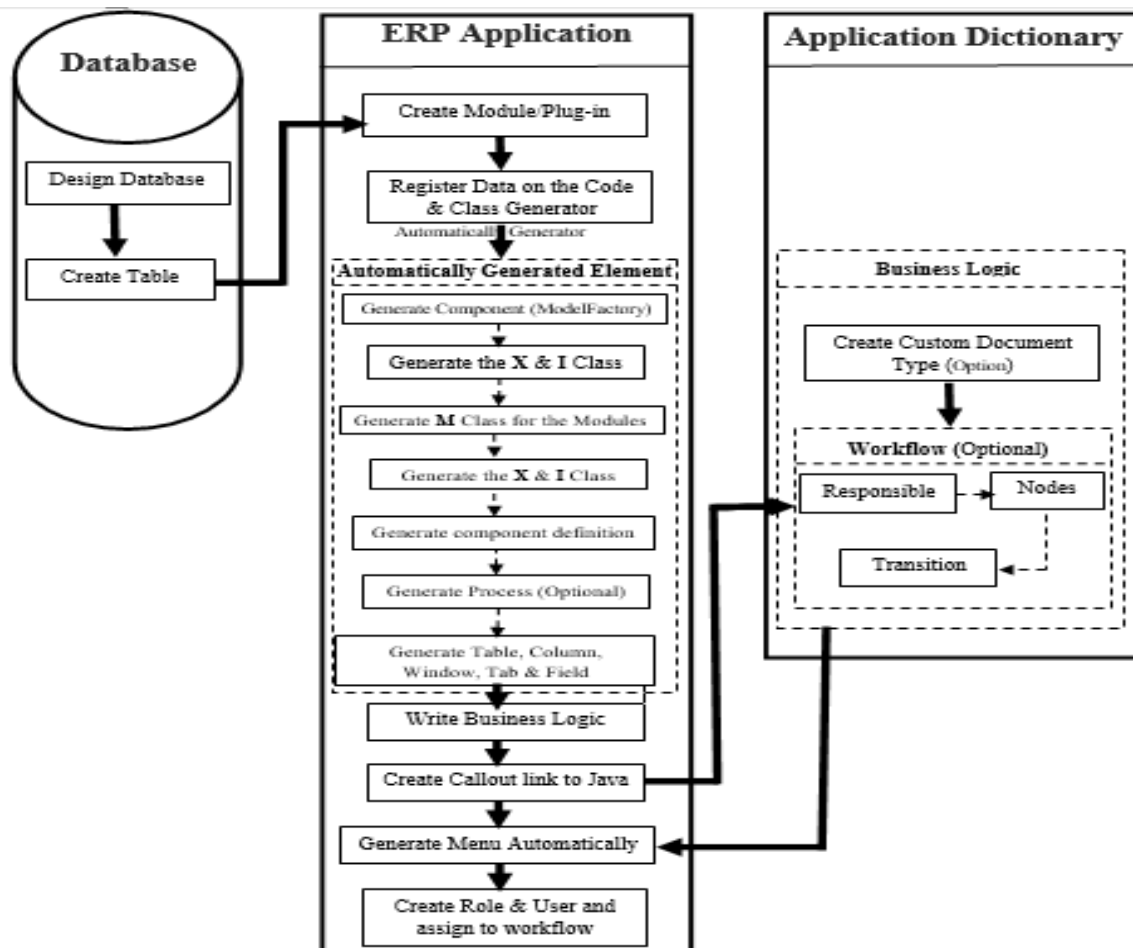


Figure 1: Low-level Customization Model to Add New Business Logic Using the Newly Developed Component

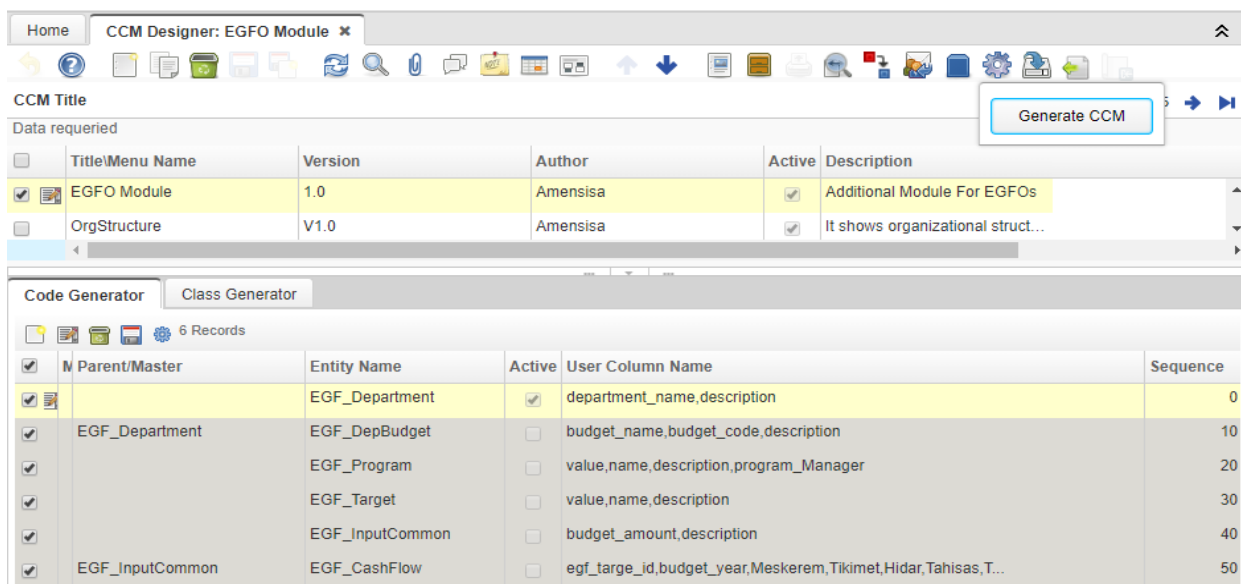


Figure 2: Class, Code and Menu Generator Window

Then the system or component automatically generates the required Tables and Columns, Window Tab and Fields, Classes with their codes and Menu as shown in Figures 3 and 4.

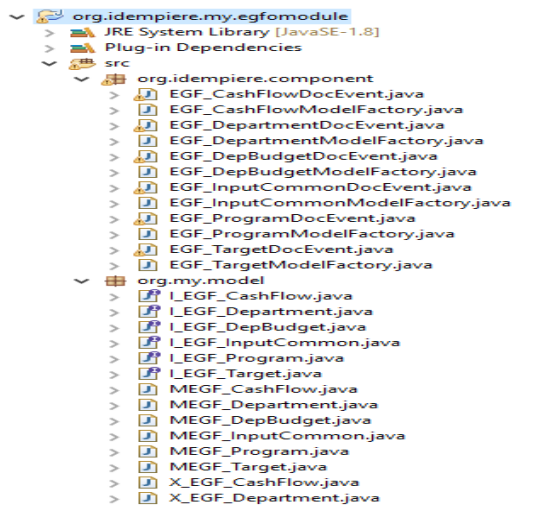


Figure 3: Dynamically Generated Class with its required Source Code

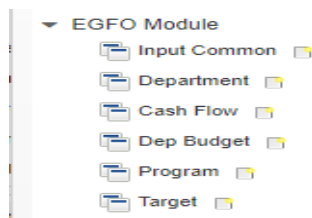


Figure 4: Automatically Generated 'EGFO' Menu

4. Conclusion and Future Work

The purpose of this paper was to provide high-level and low-level customization (utilization) approach or model for Open Source ERP framework and one new component is added into the ERP framework which makes more simplified and minimize the customization or development process and implementation time for developers. The supplementary aim was, since lots of Open Source ERP software vendors exist, selecting Open Source ERP framework is a difficult task. This paper formulated ERP evaluation criteria, which help in choosing the best fit open source ERP framework. In addition, this paper also revealed the challenges to adopt open source ERP framework in the case of EGFOs and provide a solution.

There are several lines of research arising from this work which should be pursued.

- Even though the customization approach or model is provided for most of iDempiere framework components, the customization model and the newly added component need some extension which can fit with customization needs based on the unique requirements of organizations.
- The current iDempiere framework works only for Java based application. By modifying the bottom layer architecture of the framework, it is possible to avail the framework for other programming languages such as .Net.

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