

A Flexible Enterprise Architecture Management Method (FEAM)

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Abstract: Enterprise Architecture (EA) is employed by enterprises in order to align their business and Information Technology (IT). Most EA projects deal with complexity of business and IT architecture especially in implementation phase. In order to cope with the implementation complexity, this paper presents a flexible management method for EA project. The Proposed method is inspired by agile architecture in order to be flexible, iterative, and faster. The proposed method reduce complexity of EA project by providing appropriate support in EA implementation, filling the gap between strategic planning and implementation, and providing continuous improvement method in order to support future changes. The results of this research are useful for both academic and practical purposes.

Keywords: Enterprise Architecture; Enterprise Architecture Management Method; Enterprise Architecture Implementation Methodology; Management Method.

1. Introduction

Today's enterprises realized that appropriate utilization of Information Systems (IS) through Information Technology (IT) is a critical factor to their business success [1], and it is an essential means to achieve

competitive advantage [2, 3]. Enterprise Architecture (EA) is developed for alignment IT and business[4, 5]. EA causes enterprise has an integrated environment in their business and IT [6]. To achieve mentioned purposes EA represents three distinctive

stages, As-Is architecture, To-Be architecture, and migration plan [7]. In As-Is architecture, EA will be defined current situation of business and IT of enterprise by means of set of definitions which illustrate the current state of the enterprise's mission, business processes and technology's infrastructure. The key role of this stage is vision of enterprise. In To-Be architecture EA will be represented the desired architecture including future of business and IT based on vision of enterprise. This type of architecture is the result of enterprise's long-term strategies and plans. The key role of this stage is to identify appropriate ISs. In EA, migration plan is the essential strategy that will be employed for Transition from the As-Is (current or baseline) to the To-Be (desired) one [8, 9]. The key role of this stage is using the proper implementation method. Well implemented EA helps a company innovate and change by providing both stability and flexibility [10, 11].

EA management is a continuous and self-maintaining management function seeking to improve the alignment of business and IT in an enterprise [12]. Based on a holistic perspective on the enterprise furnished with information from other enterprise level management functions it provides input to, exerts control over, and defines guidelines for these enterprise-level management functions. The EA management function consists of the activities envision EA, document EA, analyze EA, plan EA, and implement EA [13]. EA management plays the role of bridging to cover the gap between EA strategy that comes from organisational level and EA implementation that comes from operational level. The aims of this paper is to complement the implementation of EA by controlling and conducting EA project in appropriate manner and right direction [14]. For achieving this purpose, a management method is introduced which has comprehensive perspective for EA project lifecycle. Management method

according to the functionality permits verification of the formal EA models used to state a methodology [15]. It also supplies a means to manage the changes that will occur to the methodology over time. The functionality required for effective methodology management that allows traceability of deliverables from inception to usage [16].

EA project team comprises of specialists in different fields [17, 18], for instance business, IT, top management, and others. In other word, EA team is multi-disciplinary [6]. Although, There are several methods and frameworks which are developed and designed for EA and each with particular plan in order to represent As-Is (current architecture), To-Be (desired architecture), and migration plan (from As-Is to To-Be), most of EA projects face to complexities of business and IT architecture especially in implementation phase [19]. Those complexities come from complex processes of current EA implementation methods.

The remainder of this paper is organized into two sections as the following; proposed method is presented in section2, and finally conclusion of this research is expressed in section3.

2. Related Works

Zackman's Framework (ZF) (as first EA framework) is limited to architecture and does not include a strategic planning methodology. In 1992 Steve Spewak introduced the first methodology for implementing EA. Spewak presented the EA planning to complete EA lifecycle. In other words, EA management complement EA framework.

Several EA implementation methodologies (e.g. TOGAF, DoDAF, TEAF, FEAF) have been proposed by academics and practitioners in literature. Although they are different in implementation practices and development phases, they are common in the concepts, principles of transition from current architecture (As-Is) to desire architecture (To-Be). This transition is known as "Migration Plan".

Migration plan includes a set of methods with a clear definition of business objectives. The method is needed for the transitional processes in order to implement new technologies in response to the changing business needs. This means the EA includes also the process to create, update and manage the evolution of the architecture domains in line with business strategy. EA management focuses on migration plan and provides some techniques and tactics to reaching to the TO-Be architecture.

The Enterprise Architecture Methodology supports advanced development techniques and technologies. It covers all aspects of the EA lifecycle- planning for enterprise understanding projects, the analysis of business requirements, the design of systems, the evolution of systems, and the ongoing enhancements of all of the above. The methodology is both complete and concise, serving as a coherent guide for practitioner professionals. It allows paths and pieces of content to be selected and extracted for application on specific projects.

In summary, several studies have been done in area of EA management; however there is lack of consideration on using agile architecture in EA management. Therefore, we consider our work to be an important starting point to identify effective practices and factors of EAIMs.

3. Proposed Method

The Proposed method is inspired by agile architecture in order to be flexible, iterative, and faster. These features support proposed method to manage EA project flexibly [20, 21]. Agile architecture is chosen because it is: easy in the documentation, adaptive to changes, and customer-based [22, 23]. Agility is a systematic and deliberate approach toward software development [24]. High-risk projects with variable demands are fully applicable in agility and it has been successful in projects because it credits importance on customer concerns and promotes team work [25]. The proposed method is based on philosophy either top-down or down-up due to iterative pattern. The concern of this method is to provide a flexible and

comprehensive plan for supporting all identified application during the EA project. Most of Current EA projects are developed based on their architect's experiences that come from previous projects this leads to face with serious challenge due to using inappropriate and inflexible plan for this purpose. Flexible Enterprise Architecture Method (FEAM) gets concepts and principles from agile architecture to create fast development and easy understanding method. FEAM attempts to capture EA artifacts (e.g. models, documents, charts, and the others) and keep them into the repository. The purpose of utilizing a repository is to keeping all developed artifacts for using them in appropriate situation like future changes. The deficiency of EA artifacts also will be solved due to iterative development. In order to cope with the complexities of EA implementation this method use the following phase:

- **Preliminary Phase:** The Preliminary phase concerns on setting out the business case for starting an EA initiative

and gaining the required budget and resources.

- **Elaboration Phase:** The Elaboration phase concerns on making the necessary identified changes and adjustments to the enterprise in preparation for it to be able to utilize EA. The work required to be undertaken is totally dependent on each enterprises specific goals and timescales identified in the Preliminary phase.
- **Implementation Phase:** The implementation Phase concerns on the processes of “doing” EA. These processes are largely the same for all enterprises although they may change slightly depending upon the structure of specific enterprises.

3.1. Preliminary Phase

In this phase the activities that typically occur as an organization are evaluating their readiness to leverage an EA, in general.

3.1.1. Proposed EA Management Method Manifest

The following manifests are employed for supporting FEAM in preliminary phase:

- **Investment's Efficiency** would increase by focusing more on processes of permanent value. Conclusively EA project has found a special importance when many enterprises are implemented enterprise architecture in order to use its benefits in their organization. When an enterprise architecture method is applied, it should return values quickly to ensure rest of its activities.

3.1.2. Reliable Results will be presented by customer satisfaction and repetition of interactions. Acceptable results of the project and its business value make the stakeholder more willing to use this plan.

- **Predicted Deficiencies** are resolved through iterations, anticipation and adapting them with the situations. These deficiencies not only capture from weak performance and

inappropriate management plan, but also rapid business changes play significant role too.

Proposed method tries to manage EA implementation by considering the following items as EA management foundation:

- ✓ Environment (put the project outputs into information systems)
- ✓ Management (resource management, planning, monitoring, quality, reporting, visual possibilities)
- ✓ Application engineering (requirements management, development and evaluation)
- ✓ Change management (organizational effects and preparation)

3.2. Elaboration Phase

Elaboration phase of proposed method is divided into two groups, function and operation as shown in Figure2. Function group represents baseline architecture (As-Is) of enterprise and operation group represents desired architecture (To-Be) of

enterprise. Within functional group there are four activities which they need to consider:

- **Planning for definition of vision of enterprise:** To define the accurate and holistic vision of enterprise based on its capability and competitive business.
- **Planning for designing business architecture:** To designing enterprise business architecture based on its businesses and activities
- **Planning for providing current application environments:** To provide status of current applications in enterprise
- **Planning for providing current infrastructure environments:** To provide status of current technologies which they use in enterprise

On the other side, in operational group there are five activities which they need to consider:

- **Planning for developing software:** To develop required software for enterprise, based on To-Be architecture

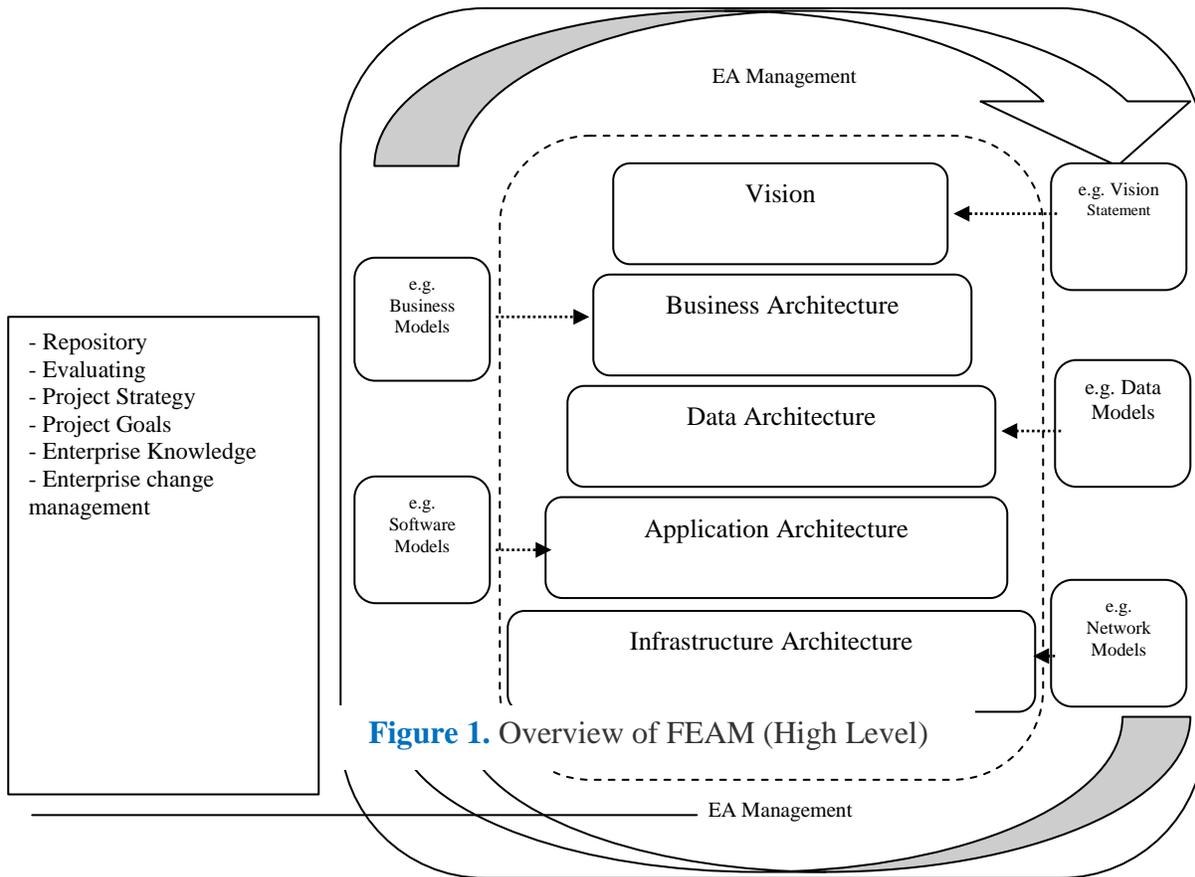
- **Planning for utilizing infrastructure architecture:** To utilize appropriate infrastructure for enterprise, based on To-Be architecture
- **Planning for maintaining enterprise business models, software models, and EA processes:** To maintain all developed models and processes in To-Be architecture in order to employ them in the future changes
- **Planning for extending knowledge within enterprise:** To extend and share required knowledge of using new approach of enterprise based on To-Be architecture within enterprise employees
- **Planning for continual and iterative improvement:** To improve enterprise capability against future changes

3.2.1. Reducing the Risk

The proposed method is an adaptive method because it is inspired from agile approach [25]. It also reduces EA's project risk by means of agile

management to adapt itself by the text development. Assessment plays a key role as a basis for decision making "go" or "not to go" in any major changes applied to the original project (as shown in Figure 3), whereas other method

have no appropriate plan. Elimination the risks, indicates that the application requirements are stable.



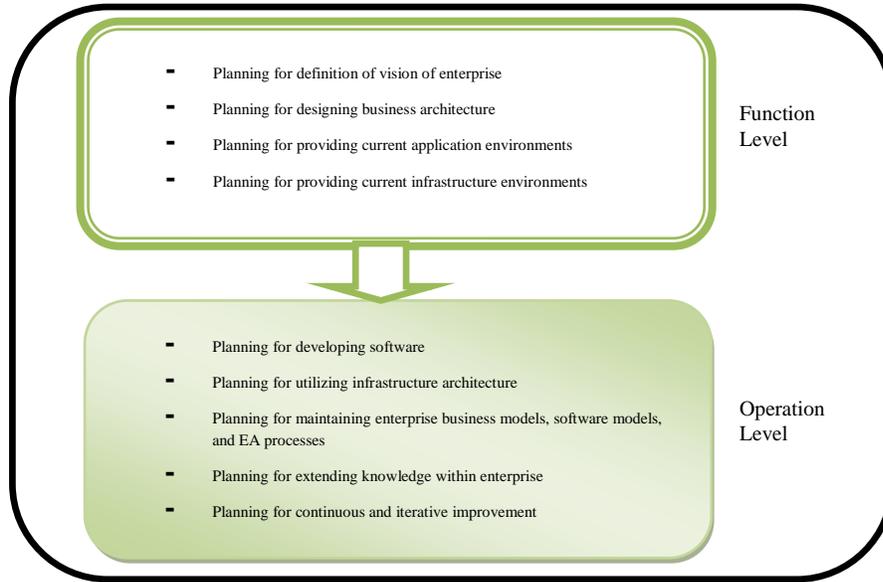


Figure 2- Function and Operation levels (Elaboration Phase)

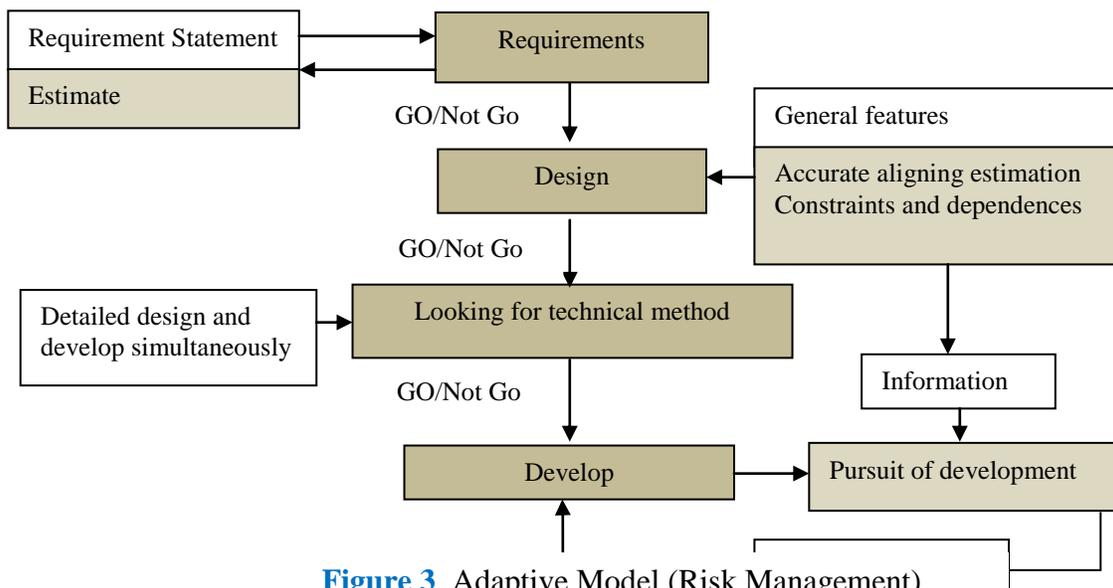


Figure 3. Adaptive Model (Risk Management)

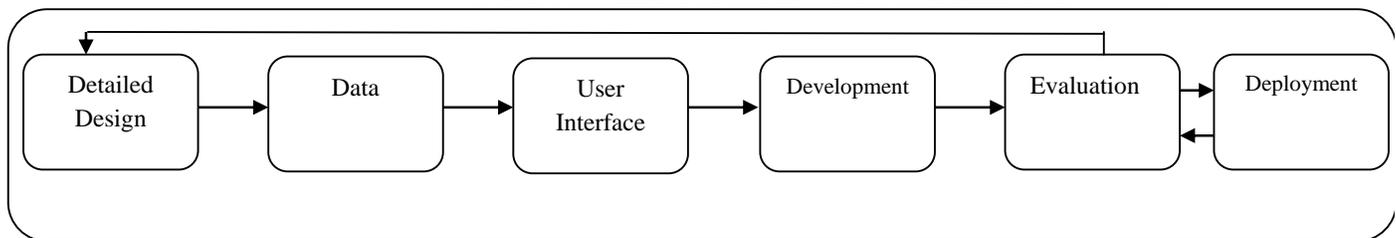


Figure 4. Implementation Phase

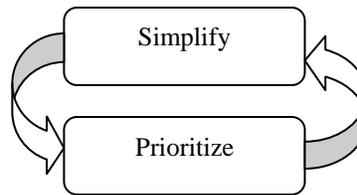


Figure 5. Prerequisites of Implementation Phase

By means of appropriate supplying and extracting, comprehensive information, and also with the ability of reversion and continuing cooperation of the EA up to the end of project, this method can guide EA project and make progress toward success. Recognizing and implementation of activities based on the identified requirements in order to approve transition from one stage to the other cause dynamicity and risk reduction in each stage and in entire of project. Moreover, involving stakeholders in various stages of the project, cause to absorb overall support along with increasing satisfaction received through the approval in each stage. Thus proposed method can support enterprise against future changes.

3.3. Implementation Phase

The proposed EA management method also provides a usable pattern for implementation identified application in EA project which has the following specification:

- **Stable:** It maintain EA artifacts within repository for future usage
- **Flexible:** It can be employed by existing EA framework
- **Sustainable:** It support whole part of EA activities against future changes
- **Verifiable:** It is evaluated by using iterative steps
- **Controllable:** It control EA complexity by using appropriate managing

The Figure 4 shows implementing phase of proposed EA management method which consist of 6 iterative steps.

- **Detailed Design**: Describing activities of system with expressing role of each user
- **Data Design**: Describing format and kind of data which they are used in this system
- **User Interface**: Describing schema of user interface according to user needs
- **Development**: Developing application based on above items
- **Evaluation**: Evaluating application by considering system requirement
- **Deployment**: Deploying enterprise application

Before using this phase, identified Information System (IS) must be prioritized. In order to develop identified ISs based on their importance (for enterprise) in systematically manner against instinct or empirical manner, they must prioritize. So the following activities must be

done before entering implementation phase as prerequisites of this phase:

Each identified IS must breakdown into the sub-system due to simplified development. Meanwhile, they will be developed based on their priority according to the following items:

- Basic Data
- Enterprise System's Integrity (ESI)
- Benefit and Cost (BAC)
- Return of Investment (ROI)
- Time
- Stakeholder viewpoint

In some cases, some applications have same priority, thus it is necessary either simplify them (if possible) and re-prioritize or develop based on Stakeholder viewpoint.

3.3.1. Example of Implementation Phase

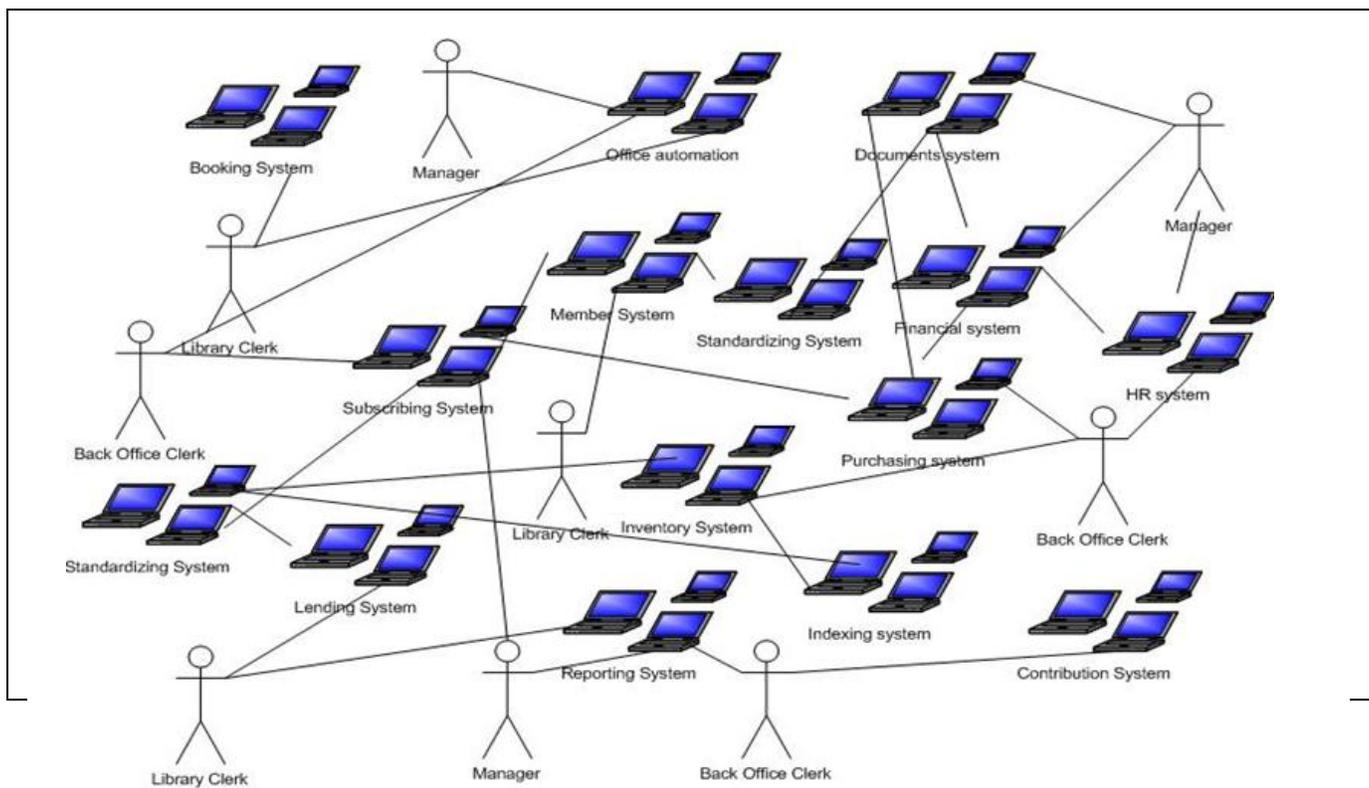
In this section we use FEAM in one real EA project in order to demonstrate the reduction of complexity. Our target EA project is one Public Library which we focus on the implementing phase. Our purpose is not to show in detail how

FEAM works, but rather to give the reader a feel for FEAM's advantages.

Before we utilize our proposed method the EA project team provides a final perspective of applications as shown in Figure 6.

The system shows complexity due to focusing on developing without any considering about

holistic management. On the other hand, by using proposed method that perspective has been changed as shown in Figure 7. The complexity of applications and their relationships are reduced.



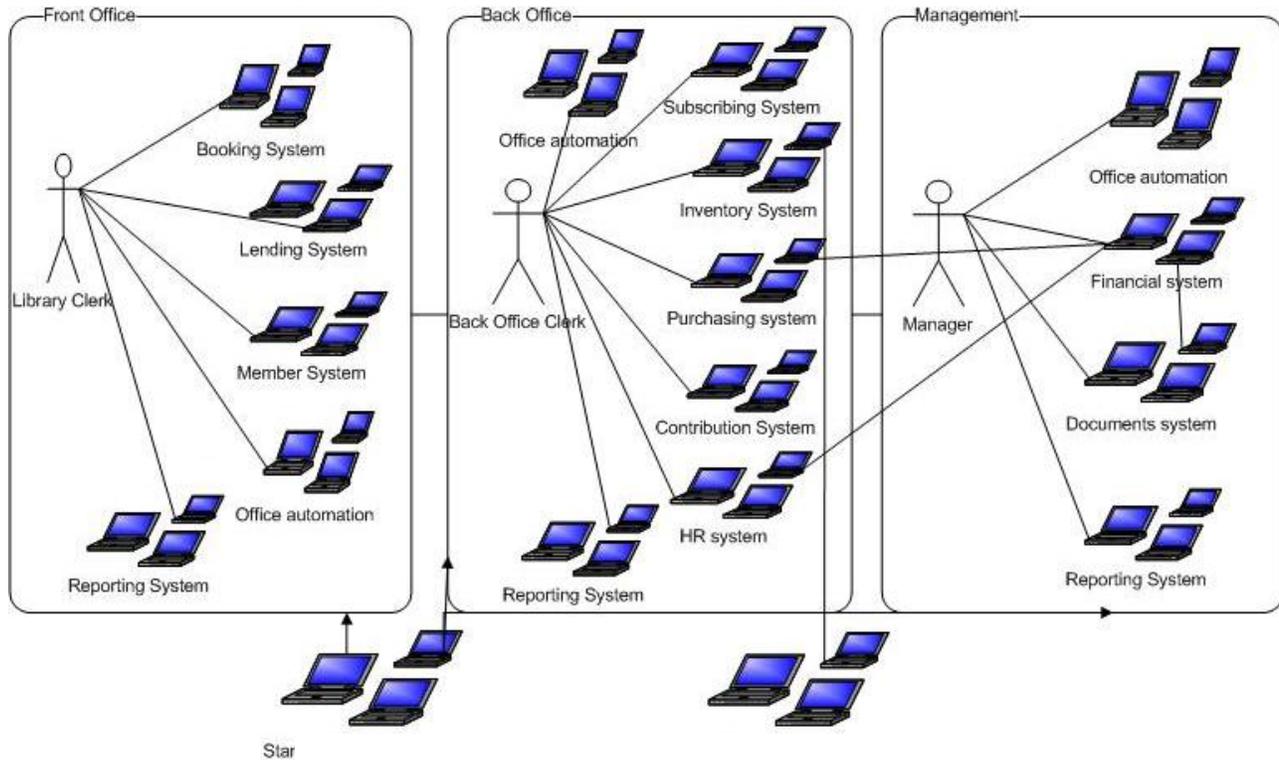


Figure 7. Applications system perspective by using FEAM

Table1- System Specifications

Step	Specification	Remarks
Detailed Design	<ul style="list-style-type: none"> - Collecting information from EA desired architecture (To-Be) - Customers divided into 3 major groups: Individual, Corporation, Organization - Users divided into 2 major groups: users with high authority and users with low authority - Describing users relations and customer relations - Describing system integration - Others 	Process Models
Data Design	<ul style="list-style-type: none"> - Design Data models of users and customers 	Class Diagrams

	<ul style="list-style-type: none"> - Design Data structure of users and customers - Others 	Database architecture
User Interface	<ul style="list-style-type: none"> - Design menus and items - Design forms and fields - Design relation between menus and forms - Others 	System Overview
Development	<ul style="list-style-type: none"> - Develop application 	Configuration Management
Evaluation	<ul style="list-style-type: none"> - Functional Test - UAT (user acceptance test) - Is it applicable? If yes then deployment; otherwise, need more detailed - Others 	Test Documents Change Management
Deployment	<ul style="list-style-type: none"> - Application installation - Evaluation for future changes - Others 	Installation Guideline

As shown in Figure 6 and 7 there are several applications inside the project, but we focus on one of them as sample. We chose member system for representing ability of the proposed method. Table1 represents the implementing steps of member system.

4. Discussion and Future Works

The main objective of this research is to developing an agile based Enterprise Architecture Management in order to reduce the

complexity of EA implementation practices. In this regards, this research mainly focuses on using the appropriate practices and processes of agile architecture into the proposed EA management. Although the application of proposed EA management has been checked in one case, it would be better to extend the usage of proposed EA management in other enterprises by different type of activities.

Meanwhile, the following research topics could be considered for future works on this area of EA management:

- Providing appropriate documentation plan for EA management
- Developing an management tool for better understanding the implementation
- Developing an specific model notations for modelling the EA management
- Formulating an evaluation model for evaluating the implementation of EA management

5. Conclusion

This paper represents new method for managing EA project up to implementing phase. The novel feature of the proposed method is that both conciseness and comprehensiveness are higher order which means that it is easy to capture template pattern and use it. FEAM is flexible method and can be used with most other EA methodologies because it completes them by addressing concerns which the other methodologies do not address. The following results are obtained by implementing agile

management method which it represented in this study:

- Reducing complexity of EA project by providing holistic support up to implementation
- Supporting developing application by providing particular flexible method
- Flexibility to utilized with all existing EA frameworks and methods
- Bridging the gap between strategic planning and implementation
- Ability to support future changes by providing continuous method

Furthermore, proposed method explicates the method in order to complement activities performed in an EA implementation methodology with activities carried out more systematically. Finally, it is key success factor for continual implementing EA.

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