

## Enterprise Architecture for Healthcare Organizations

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**Abstract:** Enterprise architecture (EA) plays significant role in public, private as well as other organizational systems, such as health care organizations, educational institute, cloud computing and e-government. EA can be use in any organization where IT and organization functionality (business functions) alignments are required. This paper investigates the role of EA in healthcare organizations. Finally a better framework for creating integrated healthcare information EA model is suggested. The proposed framework is obviously suitable for different level of health organizations including the small, medium and large size. Moreover the framework is both suitable for the newly developed organization, as well as already developed organization.

**Key words:** Information System (IS) • Enterprise Architecture (EA) • Enterprise Architecture Framework (EAF) • Electronic Medical Record (EMR) • Information technology (IT)

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### INTRODUCTION

Enterprise architecture is a method or procedure that links business and IT. Enterprise Architecture (EA) is a tool for the planofactions, the main task of EA is to define the layout of Organization's components and relationship among them as well as align IT and Business [1]. EA provide guidelines for decision making within the organization. Enterprise Architecture can perform radical changes in organization. The intention of Enterprise Architecture is to provide broad picture about how business operations and IT solutions work combine within a framework to help the organization. The goal of Enterprise Architecture (EA) is improve managerial decision making and this can be achieved by coordination of different components of organization such as technologies, Business Functions, operational activities. EA enable organization to better understand IT capabilities by aligning business functionality with relevant IT resources [2]. Enterprise architecture expressed by standards, vision and principles that provide guideline about development and acquire technology within an organization, Enterprise Architecture Framework is an instrument which is used to design IT architecture, logical structure and organizing

complex information of organization. An enterprise architecture framework provide environment for software, network and hardware to work jointly. Framework also addresses IT/IS and business needs of an organization. There are many EAF, but the first EAF was proposed by Zachman in the article entitled "framework for information systems architecture" [3] and later named Zachman Enterprise Architecture Framework.

**Background:** There are many architecture frameworks which are use in development of organization's enterprise architecture, four top architecture frameworks are briefly define as under:

**Zachman Framework:** suggested a logical structure to classify and compose the detailed description of organization. A basic intention of the Zachman framework is to bring an infrastructure which helps the enterprise in developing, integration, design, management and access organization's information system. This framework concern with information technology in organization and usually depict as a 6 x 6 matrix. In which rows show perspective such as Scope (Planer), Enterprise Model (owner), System Model (designer), Technology Model

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(builder), Detailed Representations, Functioning Enterprise (Subcontractor) ) and columns represent six basic questions (What, How, Where, Who, When, Why) in the scenario of perspective [4].

**Federal Enterprise Architecture Framework (FEAF):**

It is developed by employing the classification of five models which are for references namely (i) The Performance Reference (ii) A Business Reference, (iii) A Service component reference, (iv) Data Reference, and (v) Technical Reference Model. This framework facilitates U.S. Federal Agencies to share information and design common process between other agencies. The FEAF also focus on functional roles and EA core team member's responsibilities.

**Treasury Enterprise Architecture Framework (TEAF):**

This framework is inspired with Zachman Framework and assists Treasury's business activity. TEAF provide guideline for developing and redesign business methods for different departments in order to fulfill requirements of modern legislation in an expeditiously changing technology environment. TEAF describes four basic actives (i) enterprise architecture strategy (ii) enterprise architecture management process (iii) enterprise architecture approach (iv) development of enterprise architecture repository.

**The Open Group Architecture Framework (TOGAF):**

It is based on "United State Defense Department Technical Architecture Framework" for Information Management and introduced in 1995. Any organization may use TOGAF freely to design enterprise architecture. TOGAF enable any organization to evaluate and build the right architecture. It is divided in four categories Business architecture, Data architecture, Application architecture and Technical architecture. The essence of TOGAF is Architecture Development Method (ADM) and the Architecture Content Framework [5].

**Role of Ea in Healthcare Organizations:** Health care organizations are facing number of problems, the major problem in these problems are medical error and providing health services where doctors are inexperience or not available. An urgent need to reduce medical errors, providing health services using latest technology system and development of Electronic Medical Record (EMR). The healthcare industry addresses the lack of interoperability and integration among systems; it will

never get advantages of EMR. Many healthcare organizations operate Electronic Medical Record system independently. These systems are incapable to communicate other system because of different business, application and technology architecture. Enterprise Architecture provides way out of this problem [6]. Decent and timely information about health is very necessary for making strategic decision that improve health providing services and save lives. EA provide support to achieve and ensuring this.

**Ea Integration in Healthcare Organizations:**

EA plays very important role in the integration of healthcare organization's resources such as people, technology and process. In current era different healthcare organizations are working on joint projects in collaboration manner to provide maximum healthcare. In this scenario they face integration problems because of different background and different IT/IS infrastructures. These problems are categorized as Business process level and IT/IS level. Business process level problem occur because of two or more healthcare organizations make collaboration and these companies use different business process architectures and enterprise modeling languages to represent their enterprise models and IT/IS level problem is occur when two different healthcare organizations communicate using different IT applications/infrastructure. Business process level problems overcome by using Unified Enterprise Modeling Language (UEML) and the IT/IS level problem solution is Enterprise Service Bus [7].

**Enterprise Interoperability in Healthcare Organizations:**

After 1990s the concept of enterprise integration is converting in new emerging concept Enterprise interoperability [8]. To share data, information, knowledge, within or across organizational boundaries by using ICT systems and business processes is called Interoperability [9] and Interoperability between two or more organization's departments is called enterprise interoperability. Healthcare Organizations need to access information from different recourses in this context organization face Information interoperability problem. Several healthcare organization store their important and valuable information on different location such as distributed database form and conflicting formats, that creates data management problem. This problem can be solved by standardization of multiple systems, Intersection principle [10] and Interlinking principle [11].

### **Togaf and Knowledge Based Medical Diagnosis System:**

To develop EA Model for Knowledge Based Medical Diagnosis System for providing good health services to common people using latest technology, The Open Group Architecture Framework (TOGAF) is best, because Zachman is not proper framework for creating a new architecture because of lack of step by step process. Zachman framework is more a taxonomy and therefore it is not enough to develop new enterprise architecture [12, 13]. TOGAF divides enterprise architecture into four categories

- *Business architecture* explain the processes used for the business to achieve its goals Business architecture of Health information system: Health Services (Patient registry Individual health record, Classification disease, symptoms and procedures, diagnosis report, advice, Treatment plan and prescription) Knowledge Management: (collect information about disease several sources such as (books, web, and experts/professionals), Create new knowledge, manage repository)
- *Application architecture* deals with the development of different applications and interaction between them. This architecture is highly applicable in the designing and development of relevant software require for interfacing in the healthcare system for example, standard data collection instruments, data communication services, data analysis as well as modeling and report generator .
- *Data architecture* explain methods of data storage and retrieval, Data models, Metadata dictionary, Classification standards and systems
- *Technical architecture* explains how software infrastructure and hardware infrastructure support applications and their interactions, Local/wide area networks, Operating system Interoperability, and web technology.

### **CONCLUSION**

On the basis of detailed and critical review it is concluded that Integration and interoperability are the most important parts of healthcare organization and system. Healthcare Organizations and system need to access information from different recourses, in this context organization and system face Information interoperability problem and EA provide solution of these

problems. The Open Group Architecture Framework (TOGAF) is best to develop Integrated Healthcare Information System as compare to Zachman, because of lack of step by step process and more a taxonomy. On the other hand TOGAF provides verified methods, shared vocabulary for understand information in organization, knowledge about an organization for enabling manager or system to make better informed decisions and increases sharing of data, enhanced reliability of the solutions as well as easier maintenance.

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