

The Zachman Framework, the Owner's Perspective & Security

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Abstract – *The Zachman Framework is one of the oldest Enterprise Architecture Frameworks. It is a unique approach to provide a logical understanding of ever increasing size and complexities of information systems. This paper aims to introduce the Zachman framework in general. Also this paper aims to provide details about the Owner's perspective of the Zachman Framework. This paper also address the security requirements for the Owner's Perspective of an enterprise.*

Keywords: Enterprise Frameworks, Enterprise Security Planning, the Zachman Framework.

1 Introduction

Nature of business has changed in the past half century. Most businesses have grown from region-specific to global. Goals of business, business processes, supplier chains and business economics have changed from simpler to complex. With globalization, these caused rapid changes in organizations and in their structure. Businesses are now also focusing and relying more on Information Systems. It became more obvious and evident to have a more structured system and architecture for information flow and its integration with business.

The Zachman Framework precisely addressed these requirements and provided logical structure for such a flawless integration. This paper is logically divided into 4 sections. In the first section, the history of the Zachman Framework is introduced. In the second section Zachman Framework is explained. The third section talks about the Owner's perspective in more detail and the following section analyzes general security requirements from the Owner's

perspective. The next section discusses the criticisms to the Zachman Framework. And finally, conclusions are given.

2 History of Zachman Framework

The Zachman Framework has evolved over time. Although the framework structure still remains the same, it has changed on the graphical representations to gain more generalization and logical representation [1]. This section provides noticeable events in the history of the Zachman Framework.

1984: John Zachman created first draft of the Framework. It had only 3 columns. This framework was titled as "Information Systems Architecture". This was a composite model. He used Chen, Bachman, and IMS Root-Segment diagram.

1987: The Zachman Framework was first published in the 1987 IBM Systems Journal. It still represented Information Systems; hence it contained only 3 columns.

1992: It is still referred as the Zachman Framework for Information Systems Architecture. It was published in IBM Systems Journal. It revolutionized the Information Systems concept that existed at this time. John added the words "Planner", "Owner", "Designer", "Builder", "Sub-Contractor" to Rows 1, 2, 3, 4, and 5 for clarification.

1993: It has only 3 columns. It has used the adjectives "Contextual", "Conceptual", "Logical", "Physical" and "Out-of Context" defining the Rows.

2001: This version was widely distributed.

2002: Updated representation of The Framework to make it more attractive aesthetically. It still contained Information Systems terminology, adjectives.

2003: This version is probably the most widely distributed version of the Zachman Framework.

2004: This version is also known as the Zachman Framework 2. Earlier versions used Information systems terminology, while this one uses Enterprise Architecture terminology. This version further moved Enterprise Architecture out of the I/T domain and shifted it back into the business domain.

2008: This version is the current and most accurate version of the Zachman Framework.

3 The Zachman Framework

John Zachman published a new approach towards system development. Traditionally business processes are represented as a series of steps. Zachman proposed a new way for representing these processes. He organized them around the points of view taken by the various participants. [1][2].

The Zachman Framework provides a comprehensive approach towards the Enterprise Architecture. It tries to classify various aspects of business with distinct point of views. This makes it a two dimensional matrix to collect facts, to help make and justify decisions.

The framework is depicted in figure 1 [1][2].

The framework has 6 different views (Perspectives); each one of the perspectives is depicted as a row in the framework. Each perspective addresses various aspects depicted here as columns.

There are six perspectives.

1. The **Planner's Perspective** represents viewpoint of the group who has undertaken the business in a particular industry. The planners define the scope of the work to be done. It is usually high level abstract information.
2. The **Owner's Perspective** represents the viewpoint of the group who are business owners. Once the planner defines the scope for each of the aspect, the Owner provides some more details about business specific things. This would provide raw data points for the Designer.

	DATA <i>What</i>	FUNCTION <i>How</i>	NETWORK <i>Where</i>	PEOPLE <i>Who</i>	TIME <i>When</i>	MOTIVATION <i>Why</i>
Objective/Scope (contextual) <i>Role: Planner</i>	List of things important in the business	List of Business Processes	List of Business Locations	List of important Organizations	List of Events	List of Business Goal & Strategies
Enterprise Model (conceptual) <i>Role: Owner</i>	Conceptual Data/ Object Model	Business Process Model	Business Logistics System	Work Flow Model	Master Schedule	Business Plan
System Model (logical) <i>Role: Designer</i>	Logical Data Model	System Architecture Model	Distributed Systems Architecture	Human Interface Architecture	Processing Structure	Business Rule Model
Technology Model (physical) <i>Role: Builder</i>	Physical Data/Class Model	Technology Design Model	Technology Architecture	Presentation Architecture	Control Structure	Rule Design
Detailed Representation (out of context) <i>Role: Programmer</i>	Data Definition	Program	Network Architecture	Security Architecture	Timing Definition	Rule Speculation
Functioning Enterprise <i>Role: User</i>	Usable Data	Working Function	Usable Network	Functioning Organization	Implemented Schedule	Working Strategy

Figure 1 The Zachman Framework

3. The **Designer's Perspective** represents the viewpoint of the group who are systems analysts and wants to represent the business in a disciplined form. The Designer provides logical structure to the raw data points by defining the relevance to these data points. This perspective becomes an architect of the whole enterprise.
4. The **Builder's Perspective** represents viewpoint of the group who implements specific technologies to solve the problems of the business. Once the designers have provided designs / architecture, builder implements the design. In other words, builders are responsible for translating the design into reality.
5. The **Sub-contractor's Perspective**, represents the viewpoint of the group who are hired to do certain specific tasks. Sub-contractor's perspective depends on the builder's perspective. In various cases, domain specific expertise is required for implementation. Sub-contractors are used in those cases.
6. The **Functioning Enterprise** is the system itself. Once all these operations are done, the result is a functioning enterprise.

Each of these perspectives has 6 different aspects, depicted as columns. According to the Zachman, "What", "Why", "How", "When", "Who" and "Where" provides a complete understanding of the subject.

1. "What" or "Data" column addresses the understanding of the enterprise data.

2. **"How" or "Function" column** describes various processes involved in dealing with the "Data" columns.
3. **"Where" or "Network" column** describes geographic locations and logistics between the entities.
4. **"Who" or "People" column** describes the people participating in the organizational activities.
5. **"When" or "Time" column** describes when the "function" should be performed.
6. **"Why" or "Motivation" column** describes the end goals, constraints, rules and regulations.

3.1 Rules of the Zachman Framework

The Zachman framework defines some rules to alleviate effectiveness of the framework. Following is the list of rules with a brief description. [2]

3.1.1 Do Not Add Rows or Columns to the Framework

Who, What, When, Where, Why and How are the six primitive interrogatives. According to linguistics, answers to these questions could provide a comprehensive understanding about a subject or an object. Hence all of them are required. In this paper, they are also referred as aspects. Similarly each subject could be explained with 6 different perspectives, depicted as rows. Adding or removing them would either create duplicates or discontinuities. Hence the first rule states that framework will NOT be modified..

3.1.2 Each Column Has a Simple Generic Model

Each column describes a single and independent aspect of the Enterprise. Therefore the basic model for any of the columns is simple and generic.

3.1.3 Each Cell Model Specializes Its Column's Generic Model

As each of the columns has a simple and generic model, each cell tends to provide information or perspective that is specific to the row. Therefore each cell model specifies the generic model for each column.

3.1.4 No Meta Concept Can Be Classified Into More than One Cell

In the Zachman framework, each row is unique and so is each column. Therefore each cell is unique. Each meta-concept will be specific to the cell; therefore it is logical that none of the meta-concepts can be classified into more than one cell.

3.1.5 Do not Create Diagonal Relationships Between Cells

The Framework is described in plain English. Each perspective defines its own semantics for the aspects or columns. Therefore creating diagonal relationships could lead to semantically in-complete communication. This could lead to big disasters and hence there must not be any diagonal relationships.

3.1.6 Do Not Change the Names of the Rows or Column

Each name has a semantic meaning, changing names would, in effect, change the meaning for the row or column. In that case, the framework would not be a Zachman Framework anymore.

Naming should be as follows,

For *Generic Frameworks* rows should be named as *Scope, Owner, Designer, Builder, Out-of-context, Product*. And Columns should be named as *What, How, Where, Who, When, Why*.

For *Enterprise Specific Framework* rows should be named as *Scope, Models of the Business, Systems Models, Technology Models, Detailed Representations, Functioning Enterprise*. And columns should be named as *Data, Function, Network, People, Time, Motivation*.

3.1.7 The Logic is Generic and Recursive

The Framework itself is generic enough to classify descriptive representation of anything and therefore it is enough to analyze anything relative to its architectural composition.

4 The Owner's Perspective

Row 2 in the Zachman Framework depicts the Owner's perspective. This perspective is very important because it is defined by the business people who run the organization. This perspective provides a high level design and organization of the enterprise. The Idea here is that the Owner works closely

with the planner to provide a high level description of the organization and core guidelines for the business.

The Owner's perspective defines following details for different aspects [3] [4].

In the "WHAT" column the Owner defines the requirements of important data points or documents for the organization. The comprehensive list of these data points provides a Semantic Data Model for the enterprise. Based on this model, a data audit model could also be developed.

In the "How" column the Owner defines the process of the enterprise. Essentially this is the place the Owner defines the Business Process. It is the core part of an organization. It uses the data points defined in "WHAT" column to produce a more relevant output. This may be used to generate dependencies and to trigger processes. All the processes could be classified with the level of criticality.

In the "WHERE" column the Owner defines the location of the business entities. These entities may exist in geographically diverse locations. This leads to the most critical "communication" part of the business. The Owner must consider various scenarios before defining the locations for the entities.

In the "WHO" column the Owner defines roles and responsibilities attached to each person. Here clear distinction between working units are materialized into various departments. This is a generic guideline for defining more granular roles and responsibilities by lower level rows (i.e. Designers & Builders). Typically this aspect addresses the human resources within the enterprise by creating an organization chart. This chart provides information on the desired flow of work-related responsibilities within the enterprise by clearly outlining the characteristics of who does what work.

In the "WHEN" column, the Owner describes the time dimension within the enterprise. Typically this is the place where the Owner defines 'what activities could occur in what sequence?' Typically this is called 'Corporate Calendar'. In all the enterprises there are certain processes which are time critical. The Owner also defines the Master Schedule based on the business processes. This master schedule contains sequences of major events in the business process.

In the "WHY" column, the Owner describes the corporate ethics and business competition, which play a central role in

enterprise decisions. Apart from that, this is the place where the Owner defines enterprise-wide standards in order to have a complete control over the quality of the outputs. This also defines the various industry-wide constraints and justifications of various processes. It is also referred as "Constraints" column.

5 Security and Owner's Perspective

The Zachman Framework defines as many as six distinct aspects for each of the perspectives; however it fails to clearly define the security requirements for businesses. In today's world, security must not be underestimated. It is as important, if not more, as the other six aspects. So it is imminent to address security requirements of businesses.

If we consider security as an aspect of each perspective, we could actually add an extra column in the framework. This is in direct contradiction with rule 1 "*Do not add rows or columns to the framework*". If we consider security as a new perspective, there are two major problems with that: First it contradicts with rule 1, secondly it is not logical to view security as a new perspective altogether. This could pose a big question about the holistic approach of the framework.

In both cases above, we considered security as supplement to the framework, which is not viable. So the next question is: Could we consider security as an integral part of the framework? The idea here is to consider security parallel to each Meta concept. There are no rules denying that.

So in this section we will add security parallel to the Meta concept of each of the cells in the Owner's perspective.

In the "WHAT" column the Owner has defined the important data points. Security could be added by classifying this data into various security categories or levels. For example, let's say there are three security categories for data: *Highly sensitive*, *Sensitive* and *Public*. *Highly sensitive* data is available to only few people across the enterprise and is stored securely. *Sensitive* data is available to everyone in the enterprise but not outside of the enterprise, and is stored securely. *Public* data is available to everyone. Based on these categories various security services could be included. For example, *authorization*, *access-control*, *non-repudiation*, *confidentiality* and *availability*.

In the "HOW" column the Owner defines the process security. This cell defines the core business processes. So securing the processes will guarantee the robustness of the

process and will provide fail-safe measures. For example, the validation of the inputs of the processes. If the input is faulty, it is hard to validate the output from a process. In business scenarios, one process (say p1) may depend on another process (p0); failure of the process p0 could lead to failure of p1. To handle such scenarios defining access-control and authorization on processes could help modify the processes or the sequence of the processes.

In the “WHERE” column the Owner has defined the location of the business entities, communication channels and logistics. The security here would be to ensure that there is no disconnection among business entities, physical security of the locations, buildings and logistics under any conditions. For example, avoiding building facilities in seismically active zones; providing strong enough infrastructure to withstand highest predictable quakes; providing redundant wired and/or satellite communication channels to ensure connectivity; providing multiple logistics channels. Also there must be backup entities that could be used in case of complete failure of one entity.

In the “WHO” column the Owner has defined the roles, privileges and responsibilities of each person. Each department has specific functions and has various access control mechanisms in place. This whole setup would provide a structure in the organization. The strength of the enterprise is as good as its structure. This affects the access control and the authorization of “WHAT” column, the robustness of the processes in “HOW” column and the logistics between entities in “WHERE” column.

In the “WHEN” column the Owner has defined time dimension with respect to the availability of data points, processes, network setup, people recruitment and various deadlines of business objectives and constraints. In general it's called a corporate calendar. The security in a corporate calendar is to assess the risks associated with each time line and mitigation of those risks in worst cases.

In the “WHY” column, the Owner has defined a logical reasoning for business decisions. The security here should be the probabilistic validity of the decisions and mitigation in case of failures.

Based on these security requirements the Designer will define a security structure. The precise definitions for security in the Owner's perspective will increase the robustness of this overall security structure of the enterprise.

6 Criticism

Although the Zachman Framework provides a perfect tool for classification of artifacts and delegation of responsibilities, it fails to provide any step-by-step process for building the reference model and Enterprise Architecture [5]. The Zachman Framework is a generic framework and does not add value to the business objectives. For businesses, cost is one of the major decision-making factors, the framework fails to address this [6]. Enterprises in general have become global now. This led to rapid dynamic changes in organization. The Zachman Framework lacks the agility to handle these rapid changes.

Other frameworks may include DoDAF (Department of Defense Architecture Framework), TOGAF (The Open Group Architecture Framework), FEAF (Federal Enterprise Architecture Framework) etc. Each of these architecture frameworks have been designed to be used in specific cases and hence provides value addition to the process of Enterprise Architecture.

DoDAF [7], has a specific use in defense department. DoDAF v2.0 provides as many as 52 models classified into 8 different views and a meta model that helps in choosing the specific model.

TOGAF [8], is process centric framework. It is a detailed method and set of supporting resources for developing an Enterprise Architecture.

FEAF [9], is a conceptual model that defines a documented and coordinated structure for cross-cutting businesses and design developments in the Government.

7 Conclusion

The Zachman Framework provides a holistic view of the enterprises. It provides a natural approach towards understanding the Enterprise Architecture. However it does not consider rapid changes on the enterprises. It provides a complete classification for enterprises but fails to provide any value addition to them. As far as security is concerned, it is shown that decisions taken by the Owner will impact the whole security of the enterprise.

8 References

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