

# APPLYING THE ZACHMAN FRAMEWORK DIMENSIONS TO SUPPORT BUSINESS PROCESS MODELING

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*Business process models assist business and information technology managers while adapting, reengineering and optimizing the organizational processes through analysis, visualization and simulation. Despite the number of notations and techniques to support business process modeling, there is no agreement on the modeling criteria to be used by different organizational stakeholders. This paper describes a method to infer business activities in order to facilitate the consistent representation of business processes, thus facilitating their sharing, dissemination and analysis. The method relies on using a number of properties derived from the dimensions of the Zachman framework.*

## 1. INTRODUCTION

Process blueprints are fundamental to document, analyze and sustain organizational change, as documented by multiple works related to business process management (Davenport, 1990; Davenport, 1994; Hammer, 1990; Hammer, 2001; Grover, 1995; Labovitz, 1997). Process blueprints are developed according to specific goals as well as to the modeler's perspective. This means conflicting specifications may exist for the same process. However, and despite a number of notations and techniques assisting the modeling task, there is no agreement on the modeling criteria that can be used by different stakeholders. Organizations are then faced with disparate blueprints for the same process and no formal procedures to sort out their relevance. In fact, these models are probably accurate while representing the actual organization but from the modeler's view of that particular process. Given that business processes often cross multiple organizational units, they are often shared among different stakeholders and represented from multiple perspectives, such as quality, auditing, information technology and security. As a result, process blueprints must be able to address the different stakeholder's perspectives and interests (Towers, 2005) and their management and sharing may be simplified if they are handled by a process repository (Malone, 2003).

To tackle these issues, this paper proposes using a set of modeling criteria derived from the Zachman framework to model business processes activities. The proposal plays an important role in the Distributed and Collaborative Process Design

and Planning cornerstone of the Digital Enterprise Technology framework, since it details how multiple and independent stakeholders can design a consistent process blueprint. The Digital Enterprise Technology framework consists of the collection of systems and methods for the digital modeling of the global product development and realization process, in the context of lifecycle management (Maropoulos, 2002). It comprises five main areas that correspond to the design of product, process, factory and technology for ensuring the conformance of the digital with the real environment as well as enterprise design and logistics.

The outline of the paper is as follows: section 2 presents the fundamental concepts used in the paper related to business process modeling. Sections 3 and 4 describe a number of criteria for business process modeling derived from the Zachman framework, exemplified in Section 5. Section 6 introduces guidelines to design a business process repository to manage process blueprints. Finally, we draw some conclusions and describe ongoing research.

## **2. BUSINESS PROCESSES AND ACTIVITIES**

Multiple definitions of business process coexist in current literature such as:

- § A process is a course of action, a series of operations, or a series of changes (Simpson, 1989).
- § Processes represent the flow of work and information throughout the business (OMG, 2005).
- § A business process is a collection of activities that take one or more inputs and creates an output that is of value to the customer (Hammer, 2001).
- § Every organization exists to accomplish value-adding work. The work is accomplished through a network of processes. Every process has inputs, and the outputs are the results of the process (ISO, 1995).
- § A kind of process that supports and/or is relevant to business organizational structure and policy for the purpose of achieving business objectives. This includes manual and/or workflow processes (W3C, 2002).
- § Business process is the manner in which work is organized, coordinated, and focused to produce a valuable product or service (Laudon, 2000).

Based on these definitions, a business process can be inferred as a set of connected activities with inputs and outputs, which interact with people, contribute to achieving business goals, take place in a specific location and occur during a period of time. It is important to notice that while we refer to a process as a set of activities, both concepts are actually interchangeable. Such view implies a recurring usage of these terms but with similar means. The use of the different terms simply reflects the hierarchical relationship between them, being an activity part of a process. However, some major questions arise when modelling business processes:

- § How to identify top level business process?
- § How to establish business process hierarchy?
- § How to link activities into business processes?
- § How to identify activities?

The first three issues are fundamental to process modelling but are out of the scope of this paper, although they have been widely discussed in the literature (Hammer, 1990; Porter, 1985). However, approaches to tackle the last issue seem oversimplified, since the task is usually left to the modeller's discretion, which often results in disparate results (Coelho, 2005). This paper focus on how to consistently

identify activities, particularly on how to specify when an activity should be further decomposed. Having a consistent decomposition mechanism ensures a sound representation of the same process across different perspectives.

Activities comprise a number of atomic tasks, and it is up to the modeller to decide how to aggregate them into activities. This means different modellers can compose tasks into activities differently, leading to different representations of the same process. As an example, consider the design of the “Requirements Definition” process to support the development of an information system. If both the client manager and IT quality manager are asked to design such process, two different results will probably emerge: while the client manager is focused on documenting the information entities related to the process, the quality manager is concerned with the activities that allow controlling the overall process (v. Figure 1).

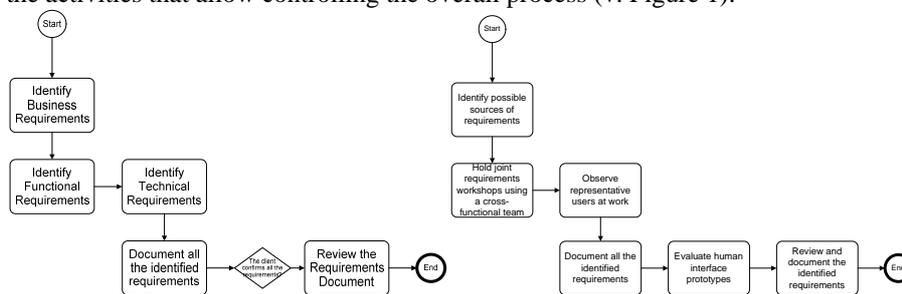


Figure 1. Quality Manager's Perspective (left); Client Manager's Perspective (right).

### 3. THE ZACHMAN FRAMEWORK

The Zachman framework for enterprise architecture proposes a matrix-like structure for classifying and organizing the representations of an enterprise (Sowa, 1992; Zachman, 1987). The rows consider six different *perspectives* on the enterprise, representing its major stakeholders: visionary, executive leader, architect, engineer, implementer and the organization worker. The columns specify six contextual *dimensions* summarized in Table 1.

In the context of process modeling, two out of the six basic properties of the Zachman framework apply (Pereira, 2004; Pereira, 2005; Sousa, 2004; Spewak, 1992; Sowa, 1992; Zachman, 1987). First, the framework is recurrent in the sense it can be used to further specify the contents of each cell. Second, each cell must be described with the sufficient level of detail so that it accomplishes its purpose. Therefore processes must be defined in this cell since business processes are defined in the second row and second column (how/executive leader).

Table 1. Dimensions of the Zachman framework.

Dimension	Focus	Purpose
What	Data	The enterprise's data and how it is used.
How	Function	The process of translating the mission of the organization into its business and into successive definitions of its operations.
Where	Network	The geographical distribution of the organization's activities and artifacts.
Who	People	Who is related with the major artifacts of the organization: business processes, information and IT. Higher level cells refer to organizational units; lower level refer to system users.
When	Time	How each artifact relates and evolves with timeline.
Why	Motivation	The translation of goals into actions and objectives.

#### 4. CRITERIA FOR ACTIVITY DECOMPOSITION

A rule for identifying business process activities can be proposed by analysis of the six Zachman framework dimensions. This rule specifies that an activity  $\alpha$  can be decomposed into two or more distinct discrete activities if and only if one of the conditions stated in Table 2 is satisfied.

Table 2. Criteria for activity decomposition.

Dimension	Criteria
What	$\alpha$ is composed by two or more activities which receive/create different data entities.
How	$\alpha$ is composed by two or more activities which are processed using different applications.
Where	$\alpha$ is composed by two or more activities which occur in different locations.
Who	$\alpha$ is composed by two or more activities which are managed by different business actors.
When	$\alpha$ is composed by two or more activities which are performed in distinct periods of time.
Why	$\alpha$ is composed by two or more activities which exist to satisfy different purposes.

Several observations can be formulated from these rules. For example, when activities  $\alpha$  and  $\beta$  are supported by different information systems, it normally corresponds to a change in the "how" column, since it expresses how the business is done. Other case is when  $\alpha$  and  $\beta$  have different security levels, meaning there is a relationship between the "what", "who", and "how" columns. The proposed rule can then facilitate different business actors to model the same process with a minimum of differences as exemplified in Figure 2.

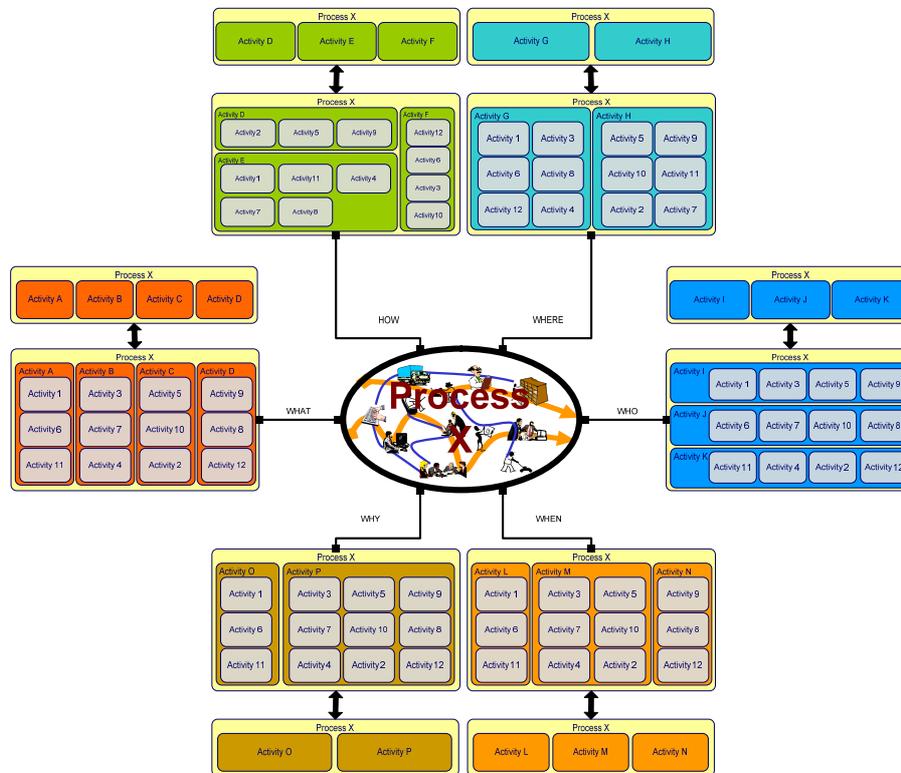


Figure 2. Six perspectives on business process representation.

## 5. EXAMPLE

This section describes the application of the decomposition rule to the requirements definition process previously introduced. Figure 3 represents the representation of the process reached by the multiple stakeholders according to the following scenario.

### Case 1: What?

The information entities needed to be managed during the Requirements Definition, since there are different classes of software requirements used in existing specification structures. This leads to different activities related with Requirement Identification that create different type of data entities, namely List of Business Requirements, List of Functional Requirements and List of Technical Requirements.

### Case 2: How?

The modeler is concerned with the specific activities that are performed in a distinct way creating value to the overall process.

### Case 3: Where?

The modeller is concerned with the location where each activity is performed, meaning activities performed in different locations must be disjoint.

### Case 4: Who?

Actor responsible for performing each activity within the process must be clearly identified.

#### Case 5: When?

The modeller is also concerned with representing the sequence of activities of the process that take place in a specific period.

#### Case 6: Why?

The modeller is concerned with the motivation behind each activity.

The result is exemplified in Figure 3, which depicts the six different perspectives shared by the different modellers.

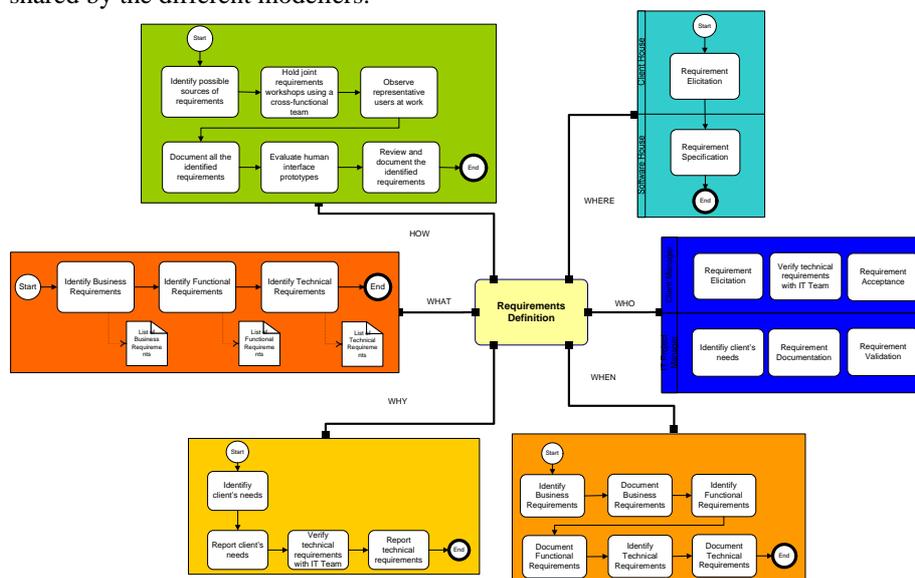


Figure 3. Generic representation of the process.

This example shows the different process blueprints that each approach may lead to using the framework's six dimensions as the only rule for activity decomposition. In a real scenario, the problem is far more complex because intuitively people take decisions based on combinations of two or more of such basic dimensions, some of which that may even be meaningless.

We have analysed some real cases where different blueprints were produced for the same business process and concluded that the modellers have considered different priorities in what concerns to these six dimensions. The initial problem was defining basic criteria so that different teams observing the same process would produce similar blueprints. We argue that most of the differences can be perceived by observation of the Zachman framework's six dimensions, and if process modelling criteria is defined over these dimensions, then similar blueprints can be produced.

## 4. USING PROCESS LAYERS IN REPOSITORIES

A business process repository is an enterprise-wide tool that supports the management and sharing of process blueprint. However, most business process

repositories<sup>1</sup> have limited query capabilities. One of the missing concepts is that of *layering*. Layers can be attached to each repository object so that users are able to filter objects according to the layers they belong to.

We propose defining six basic layers, each corresponding to each one of the six dimensions. For example, the Human Resource Department could view the “who” layer to have a perspective of how human resources were being involved in the process.

## 5. CONCLUSIONS AND FUTURE WORK

If no criteria for specifying activities are defined or even if the dimensions of the Zachman framework are applied without guidelines, the result will most probably be a number of different blueprints even if the actual business process is unique. To overcome this issue, we have proposed rules to specify how to compose business process activities regardless of the stakeholder’s perspective, thus facilitating the task of having different actors consistently modelling the same process. The rule’s conditions are based on the six dimensions defined in the Zachman framework.

We are currently evaluating this approach in real organizations using teams that are aware of the framework structure and who have agreed on the rules for activity decomposition. These results will be reported in the near future. Our ongoing work also includes understanding the relationships between the Zachman framework’s rows and columns as well as the joint criteria that can be obtained from them. It is also important to analyse the correct sequencing of the criteria in order to define a business process modelling method within a given context.

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