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. However, and despite the number of notations and techniques to support business process modeling, there is no agreement on modeling criteria that can be used by different stakeholders. In this paper, we will propose a method to infer business activities to facilitate the consistent representation of business processes, thus facilitating their sharing, dissemination and analysis. The method relies on using a number of properties from 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) However, every process blueprint is developed according to specific goals as well as to 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 common 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 and representing the actual organization but from the modeler's view of that particular process. Given that business processes often cross multiple organizational departments or units, this means they are often shared among different stakeholders and perspectives, such as quality, auditing, information technology and security. Therefore, and since business process management is a key component of enterprise architecture (Towers, 2005) processes representations must be able to address the different stakeholder's perspectives and interests. To simplify

their management and sharing process blueprints should be 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 consistently 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. We emphasize the following:

- 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 linked 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 recursive usage of the 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 have been addressed by other authors (Hammer, 1990; Porter, 1985), often in non-specific terms. However, approaches to tackling the last issue (Coelho, 2005) seem oversimplified, since the task it is usually left to modeller's discretion, with little or no impact in the business process blueprint. In this paper, we will focus on how to consistently identify activities, thus specifying when an activity should be decomposed further. Having a consistent composition mechanism ensures a sound representation of the same process.

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).

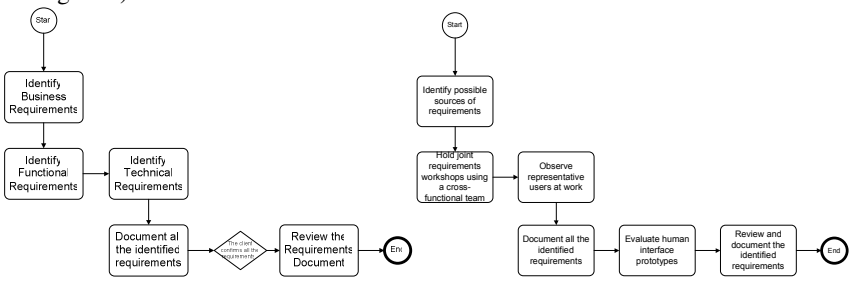

Figure 1. Quality Manager's Perspective (left); Client Manager's Perspective (right).

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). Its rows consider six different *perspectives* on the enterprise, representing its major stakeholders: visionary, executive leader, architect, engineer, implementer and the organization worker. Its columns specify six contextual *dimensions* summarized in the Table 2.

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 recursive 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, and since business processes are defined in the second row and second

column (how/executive leader), this means all processes must be fully defined in this cell.

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

From this rule, many observations can be formulated For example, if activities α and β are supported by different information systems, it normally corresponds to a change in the "how" column, since it clarifies how the business is done. Other case is when α and β display different security levels, meaning there is a relationship between the "what", "who", and "how" columns. The proposed rule can be used to

facilitate different business actors to model the same process with a minimum of differences as exemplified in Figure 2.

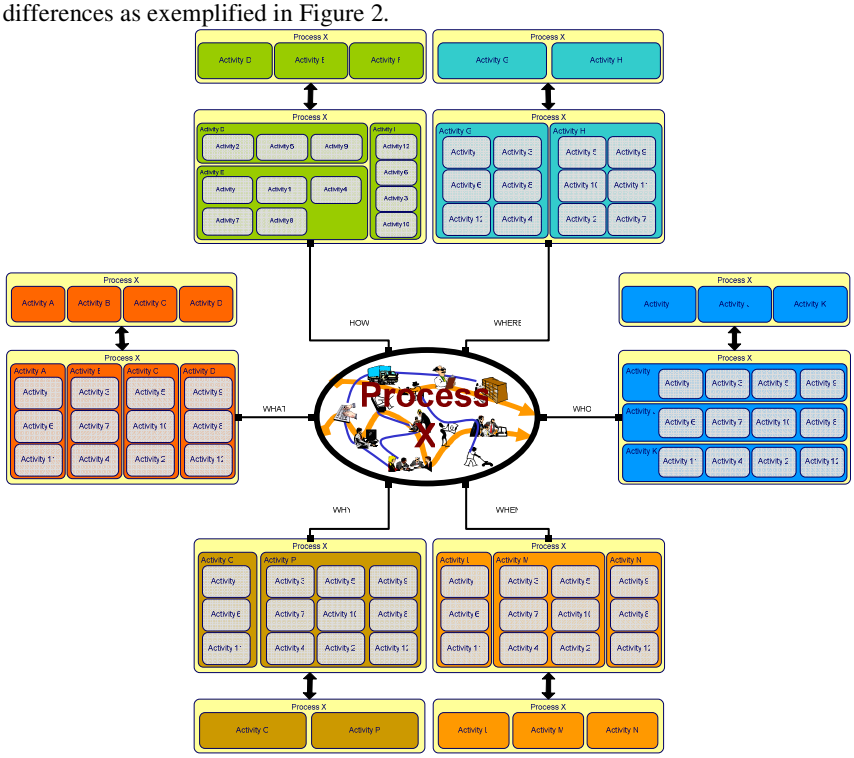

Figure 2. Six perspectives on business process representation.

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.

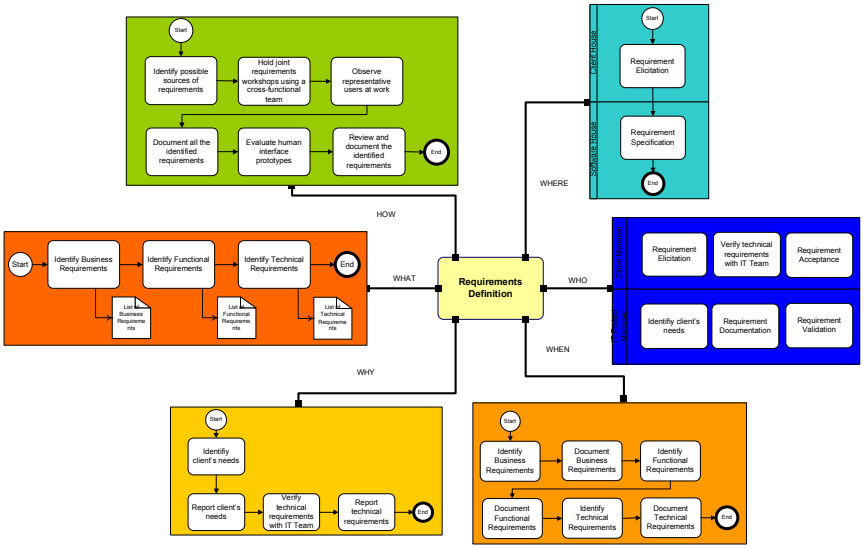

Figure 3. Generic representation of the process.

This example shows the different process blueprints that each approach potentially leads to, using the framework's six dimensions as the only rule for activity composition. 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

In most organizations business processes are shared by different stakeholders. Each stakeholder has different concerns and requirements for process analysis. A business process repository is an enterprise-wide tool that supports the management and sharing of process blueprint. However, most business process repositories[i] 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 models 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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