

Adopting the Practice of Enterprise Analysis in a Mid-Sized Company

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Abstract

This case study describes initial problems faced by Adaptis, a mid-sized company, when it adopted the practice of enterprise analysis. The first problem was to distinguish enterprise analysis from the practice of domain or business analysis. The second problem was to create straw enterprise models for collaborative modeling that were well-formed and, to the extent practicable, based upon stable industry standards. The study reviews approaches for solving these problems and how they were applied. The results show that a mid-sized company can successfully adopt the value-adding practice of enterprise analysis.

1. Introduction

Adaptis is a business process outsourcer (BPO) of administrative services for healthcare insurance plans. The range of services Adaptis supports includes claims processing, eligibility and benefit management, medical management, reimbursement and financial services, customer service, and decision support. The company, founded in 1996, now has over 150 employees with business operations in multiple locations, including offshore.

The company's success is based on personalized service, compliance with laws and regulations, meeting quality of service and service level agreement targets, and effective use of people, knowledge, and technology.

To successfully deliver outsourced services in a distributed processing environment, Adaptis must understand both its customers' business domains and the business domains that are central to Adaptis' own core competencies: operations management and support, professional services, account management, database services, networking, security, system

administration, product management, and system development and integration.

In 2004 Adaptis created an enterprise analyst position to facilitate building intangible corporate assets that foster competitive edge. The first-year goals for the enterprise analyst were to prepare the organization to use enterprise analysis effectively and to create straw models that would jumpstart collaborative modeling of the Adaptis enterprise.

This case study describes Adaptis' first-year experiences with the practice of enterprise analysis. It is structured as follows: section 2 describes initial problems faced in adopting enterprise analysis, section 3 describes sources investigated for problem-solving guidance, section 4 presents the problem-solving approaches applied and the results, section 5 presents future and related work, and section 6 presents conclusions.

2. Problems Faced

2.1. Defining the practice of enterprise analysis

A need of stakeholders (parties impacted by the success or failure of the practice of enterprise analysis at Adaptis) was to understand the differences between enterprise analysis and other types of analysis, such as domain analysis or business analysis. The terms *enterprise*, *domain*, and *business* are often not defined when used in literature or conversation. Another need of stakeholders was to understand the differences between enterprise analysis and enterprise architecture.

2.2. Developing straw models

The optimum means for eliciting requirements from subject matter is a collaborative workshop. However, in a lean and efficient service organization

that solves complex problems within short timeframes, subject matter experts are scarce resources unable to devote extended periods of time to modeling workshops. So, while enterprise analysis was viewed positively by stakeholders, day-to-day operations were viewed as more urgent and important. The enterprise analysis approach had to manage within this real-life constraint. Straw models [1] were viewed as a way to engage stakeholders and discover which enterprise analysis techniques and assets would be of value.

A significant challenge in developing the straw models was finding practical advice, examples, and best practices that addressed the specific practice of enterprise analysis.

Another challenge was locating industry conceptual models and ontologies at an appropriate level of abstraction for enterprise modeling.

As understanding of the environment in which Adaptis interacts increased, it became apparent that a stable enterprise model would require a higher level of abstraction than anticipated. It was then necessary to explain to stakeholders why a higher level of abstraction would add value.

3. Sources Investigated for Guidance

3.1. Dictionaries

Interpretation and application of guidance found in the professional literature was difficult because the same terms were used by different authors and authorities to convey different concepts. Dictionaries were consulted when such a situation presented itself.

3.2. Reference Model for Open Distributed Processing (RM-ODP)

The RM-ODP, a framework for the specification of ODP systems, was explored as both a means to distinguish between the kinds of analysis performed within the organization and, as suggested by [2], a means to “bridge communication gaps between stakeholders.”

The framework comprises five viewpoints: enterprise, information, computational, engineering and technology. The viewpoints specify different kinds of stakeholder interests (e.g., business requirements, information modeling, software design, system design, system installation and integration) [1]. Each viewpoint uses a viewpoint language to specify the system characteristics of interest to the owners or users of that viewpoint. For example, the concepts of *community*,

federation, *purpose*, *role*, *resource*, *process*, *policy*, and *accountability* are the focus of the enterprise viewpoint, whereas the concepts of *things*, *actions*, and *relationships* (described by *invariant properties* and *schemas*) are central to the information viewpoint [3, 4]. The following points [1] were perceived to be of particular importance to the practice of enterprise analysis:

- A complete specification consists of all five viewpoints, but not all viewpoints in a particular specification may have properties with interesting semantics.
- Different viewpoints are not more general or detailed representations of the same concepts.
- Abstraction levels are used to express a viewpoint at different levels of detail.
- Concepts specific to a viewpoint, as defined by the RM-ODP, may be used in other viewpoint specifications when it is useful to do so.
- All viewpoints expressed in particular specification should be consistent.

3.3. Zachman Framework for Enterprise Architecture

The Zachman Framework [5] is, according to [6], “a classification schema used to organize an enterprise’s artifacts, thinking, reasoning, and communicating among the participants of the enterprise.” The Zachman Framework describes an enterprise architecture using two independent aspects [7]:

- *perspectives* that frame the view of a business, a situation, an opportunity, or a system
- *dimensions* that specify a perspective based on the basic interrogatives *what*, *how*, *where*, *who*, *when*, and *why*

The planner and business owner perspectives of the Zachman Framework were perceived to be the most useful for the practice of enterprise analysis. The contextual view of the planner considers the complete problem area relative to a single perspective. The conceptual view of the business owner considers the boundary and area of concern of a project or enterprise [6].

3.4. The Open Group Architecture Framework Version 8 (TOGAF 8)

TOGAF 8 is an industry standard architecture development method and resource base that has been developed by members of The Open Group Architecture Forum. A core part of TOGAF 8 is the Architecture Development Method (ADM), an approach for developing a description of an enterprise architecture that meets the business needs of the enterprise [8]. Another core part of TOGAF 8 is the Enterprise Continuum, a repository concept that facilitates use of assets such as models and patterns during the process of developing an enterprise architecture. A third core part of TOGAF 8, the Resource Base, is a set of resources such as guidelines and templates that can help implement the ADM [9].

3.5. The Object Management Group Model Driven Architecture (MDA)

MDA is a systems development approach sponsored by the Object Management Group (OMG). MDA leverages the power of models by separating their use from specific development methodologies and specific technologies so as to preserve “a company’s core software assets in the constantly changing world of information technology” [8]. MDA also uses viewpoints, which are described as a technique for abstraction using a selected set of architectural concepts and structuring rules to focus on particular concerns within a system. Of particular relevance to the practice of enterprise analysis are the concepts of computation independent viewpoint and Computation Independent Model (CIM). A CIM [8]:

- focuses on the business environment in which a system will be used
- is commonly referred to as a domain or business model
- is oriented to the stakeholders of the system
- helps understand a problem and share vocabulary

Other points about the MDA that are relevant to the practice of enterprise analysis are: a CIM may consist of more than one model; a CIM typically communicates the RM-ODP enterprise or information viewpoint; and OMG envisions developing standard domain models for industries (e.g., healthcare) [8].

3.6. Ontologies

An ontology is a shared conceptualization of a particular domain that allows people to reason about concepts and to derive mappings for establishing semantically correct communication channels [10]. Reviews of the ontology literature were investigated to discover ontologies of enterprise concepts [10, 11, 12].

3.7. Industry-Specific Standards

Standards for specific industries were also investigated to discover enterprise-level concepts. Standards for clinical and administrative healthcare data are developed by Health Level 7 (HL7), a standards development organization accredited by the American National Standards Institute (ANSI) [13]. Healthcare insurance data standards for the exchange of information for healthcare administration are developed by the ANSI Accredited Standards Committee (ASC) X12 [14]. Other sources investigated are the works of the XML.org Insurance and Healthcare focus groups [15] and the OMG Healthcare and Insurance domain task forces [16, 17]. The North American Industry Classification System (NAICS) was investigated as a means to conceptualize the industries with which Adaptis interacts [18].

3.8. Off-the-Shelf Models

Two kinds of off-the-shelf models were investigated as a potential source of enterprise concepts: universal data models and process maps. According to [19], a universal data model is “a generic or template data model that can be used as a building block to jump-start development of the corporate data model, logical data model or data warehouse data model.” Healthcare, insurance, and professional services universal data maps [20, 21] and SAP Business Maps for healthcare and insurance [22] were of particular interest for this effort. Another source investigated was the Process Classification Framework (PCF) developed by the American Productivity & Quality Center (APQC). The PCF is a high-level, industry-neutral enterprise model that allows organizations to view activities from a cross-industry process viewpoint [23].

4. Problem-Solving Approaches and Results

4.1. Approach to define the practice of enterprise analysis

To sort out how the practice of enterprise analysis should be integrated with other organizational activities, such as enterprise architecture, domain analysis, and business analysis, the following questions were addressed.

What is an enterprise? A definition of the term *enterprise* that reflects the environment in which a BPO operates is: A group of people organized for a particular purpose to produce a product or provide a service [6].

What is a domain? The term *domain* is often used without formal definition, which implicitly assumes readers have a common understanding of its meaning. In practice, it is difficult to reach a common understanding of the term when it is used in the context of modeling. The following dictionary definitions reflect the two primary uses of the term found in the literature investigated:

- a sphere of knowledge, influence, or activity [24]
- a knowledge domain that one is interested in or is communicating about [25]

The first dictionary definition connotes the concepts of realm and dominion. An example of this use is found in [26], where a domain is defined as a “set of objects, each of which is related by a characterizing relationship to a controlling object.”

The second dictionary definition connotes a particular body of knowledge and associated semantics. An example of this use is found in [27], where a domain is defined as “an area of knowledge or activity characterized by a set of concepts and terminology understood by practitioners in that area.”

Although a quick Internet search revealed many uses of the term, it was concluded that, within the context of modeling an enterprise or business (in contrast, for example, with modeling a data base or network), the term *domain* connotes a realm of influence or a specific body of knowledge.

What is a business? The term *business* is also often used without formal definition. The following are two definitions found in dictionaries:

- a usually commercial or mercantile activity engaged in as a means of livelihood [24]
- a commercial or industrial enterprise and the people who constitute it [25]

The second definition fails to distinguish a business from an enterprise in a meaningful way. For the purpose of establishing context for the practice of enterprise analysis, the first definition best distinguishes a business (i.e., a means of livelihood) from an enterprise (i.e., a group of people organized to achieve a purpose).

What is the difference between enterprise analysis, domain analysis, and business analysis?

The following definitions clarified to stakeholders the differences between these terms:

- Enterprise models specify the purpose, processes, entities, and organization of one or more enterprises [28], and creating enterprise models is the practice of enterprise analysis.
- Domain models specify the important classes (i.e., concepts, including entities and processes) and vocabulary of a knowledge domain [27], and creating domain models is the practice of domain analysis.
- Business models specify the business and non-physical system requirements of a specific customer [27], and creating business models is the practice of business analysis.

The above clarification of analytical viewpoints and model content was helpful, because, in practice, a variety of positions (e.g., business architect, business analyst) routinely perform one or more of the above analyses depending upon the needs of a particular project. Clarification aligned efforts and prevented duplication of effort.

What remains problematical is defining level of abstractions to guide the universe of discourse [29] as customer business requirements are refined during a systems development project. The TOGAF 8 concept of Enterprise Continuum [9] and mappings between the RM-ODP, TOGAF 8, MDA, and Zachman Framework [30, 31] will be investigated to address this challenge.

How is enterprise analysis different than enterprise architecture? The following definitions clarified to stakeholders the differences between these terms:

- *Enterprise analysis* produces high-level, non-physical descriptions and models of an enterprise's motivations and strategy for survival; industry entities, events, processes, standards, and laws; industry business patterns, collaborations and use cases; and an enterprise's structure, including geographic sites and major communication nodes. The knowledge formalized by enterprise analysis aligns and informs marketing, product

management, architecture, business analysis, and system design activities.

- *Enterprise architecture* is the process of reasoning about the continual needs of integration, alignment, change, and responsiveness of the business to technology and to the marketplace through the development of models and diagrams [6]. Enterprise architecture builds the foundation needed to survive and adapt to present and future business challenges.

4.2. Approach to develop straw models

A BPO system may interact with systems from more than one line of business, more than one customer, more than one regulatory jurisdiction, and more than one industry. To facilitate flexibility and reuse, a BPO needs generic models that can be instantiated to specify the system's interactions within a particular environment. Creating these kinds of generic models requires mapping and harmonizing concepts and semantics across a wide spectrum of organizations. For example, each customer of a BPO has an enterprise viewpoint, each industry in which a BPO interacts has a generic enterprise viewpoint, and the BPO itself has an enterprise viewpoint.

The following describes the efforts taken to develop straw models, and in the process of doing so, achieve the understanding expressed in the preceding paragraph.

Getting started. The first step was to get gain perspective of the problem area. The Zachman Framework helped establish context and, when complexity began to cloud the mind, keep focused on the basic interrogatives of what, how, where, who, when, and why. Creating lists [6] of things to describe the planner perspective, though simple in practice, was a powerful tool.

Discovering stable conceptualizations. High-level, stable industry models helped discover and name enterprise concepts. Particularly useful were NAICS, universal data and process models, the PCF, SAP Business Maps, and ASC X12 standards for electronic data interchange. Although most industry ontologies and domain models were viewed as too immature for practical application during the timeframe of this case study, they will be investigated again as the straw models are verified and refined.

Finding a useful level of abstraction. The RM-ODP enterprise viewpoint provided insight on how to create well-formed, stable system specifications of the Adaptis enterprise and the multi-industry environment

in which it exists. Compelling arguments about the power of abstraction to manage complexity were helpful in persuading stakeholders to view enterprise analysis as an investment rather than a cost [1, 32, 33, 34]. The following describes the pragmatic course charted to develop straw models:

- To model the federation of communities with which Adaptis interacts (including entities, policies, relationships, and collaborations), produce an RM-ODP enterprise viewpoint specification.
- To specify an internal viewpoint of the Adaptis enterprise, produce a set of lists to specify the planner perspective of the Zachman Framework.
- To specify the business owner viewpoint, produce UML models suggested by mappings of TOGAF 8 and MDA to the Zachman Framework where they add significant value to the enterprise architecture.
- To harmonize industry concepts and processes, produce domain models that provide significant value to development projects.

5. Future Problems to Be Addressed

5.1. Modeling business events

The term *business event* is a first-order concept in day-to-day conversation with business owners. Conceptualization of business events, decisions, and event response processes is necessary for effective specification of the enterprise, system services, and workflow management requirements [35, 36, 37, 38, 39, 40]. Use of the RM-ODP viewpoints to model and communicate with business owners about business events will be explored (e.g., in the same vein that events are specified for the planner perspective using the Zachman Framework).

5.2. Modeling product management concepts

Product management concepts such as *product* and *marketing feature* need to be expressed and integrated more effectively in specifications and models of the Adaptis enterprise. The literature addressing the use of domain analysis as a basis for product framework design will be investigated to address this issue. An approach for integrating the product management concepts with the Zachman Framework, found in [41], will also be investigated. Patterns for specifying

product-related concepts, such as those found in [42], may also be helpful.

5.3. Solving wicked problems

The concept of *wicked problems* was proposed by [43] when, in the context of social planning, the wicked nature of ill-defined design and planning problems was contrasted with the relatively tame problems of mathematics, chess, or puzzle solving [44]. A central concept in solving wicked problems is *issue*. The use of issue-based information systems, therefore, is proposed by [45] to track the issues and decisions made during the nonlinear process of solving a wicked problem [46].

The reality of wicked problems became apparent during an Adaptis project in which the possibility of leveraging the knowledge formalized in the enterprise straw models to improve access to the Adaptis knowledge base was explored. When business analysts were asked what of kinds information they need to perform their knowledge work more effectively, they indicated their primary need was information about the history of a problem and the context and state of related artifacts (e.g., issues raised, decisions made, what still needs to be done, cross-project interdependencies).

As a result of this needs assessment, it became apparent that, to avoid making an existing information overload problem worse when enterprise analysis specifications and models are added to the Adaptis knowledge base, the means to organize, relate, access, and maintain corporate knowledge must be investigated. The use of RM-ODP concepts to model this problem will be investigated. The TOGAF 8 concept of Enterprise Continuum may also be helpful. An ontology for group memory [47] will be reviewed as a basis for creating an Adaptis ontology and classification scheme for specifications, models, designs, test cases, and procedures. Protégé-2000 [48], an open source ontology editor and knowledge base framework, will be investigated as a tool to support this effort.

6. Conclusions

There was sufficient guidance available in the sources investigated to successfully initiate the practice of enterprise analysis at Adaptis. It is expected that evolution of industry frameworks, standards, and ontologies will necessitate refactoring the initial models, even at the relatively stable enterprise-level of

discourse. The return on investment from enterprise analysis, however, is perceived to outweigh its cost and the risk of failure.

Preparing the organization for the integration of enterprise analysis has been a significant effort. Applying organizational change management best practices [49] was helpful in this regard, and management support was essential.

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