Adaptation of business models to the *Structure-in-5* organizational style

Hugo Estrada[2], Alicia Martinez[1], Francisco Barrera[1], Blanca Vazquez[2], Karen Najera[2]

[1] National Center for Research and Technological Development, CENIDET, Morelos, Mexico.
{amartinez, franciscobr11c}@cenidet.edu.mx
[2] Information and Documentation Fund for Industry, INFOTEC, Mexico City.
{hugo.estrada, blanca.vazquez, karen.najera}@infotec.com.mx

Abstract. One of the main issues with the activities related to modeling and improving business processes is the complexity of the current organizational structures. In many cases, an enterprise could improve its performance if it could align its processes to a specific architectural style, as this would facilitate the analysis tasks and the subsequent design of information systems. However, currently there are few guidelines to systematically adapt as-is business models to a certain organizational style. In this paper, a methodological approach is presented in order to identify the organizational style closest to the business model of an enterprise and to provide a guide for adapting a specific business model to the *structure-in-5* style. The proposed approach has been applied in several real case studies.

Keywords: organizational styles, structure-in-5 style, organizational modelling.

1 Introduction

Nowadays, the organizational modeling in the early requirements phase has been recognized by software engineers as a way of accurately determine the needs of software systems, concerned with the understanding of a problem by studying an organizational setting [1]. In the context of organizational modeling, different patterns and organizational styles have demonstrated to be useful in practice [2] [3] [4], so that an organization may benefit upon adopting the architectural style that most closely resembles its business structure. Organizational style guides high-level system design and drive the composition of a system from particular types of components [4]. Mintzberg argues that a correct implementation of a style influences the effectiveness and efficiency of the organization [5]. Hence, the adaptation of an organizational model towards an architectural style could improve the fulfilling the business goals. Mintzberg's *Structure-in-5* is an organizational style that consists of the typical strategic and logistic components generally found in many organizations. The main advantages of this style are: a) the existence of different levels of abstraction addresses the need for managing predictability; b) improves the coordination among actors by differentiating the data hierarchy; and c) the definition of five configurations where any organization can be mapped [2] [4] [5]. In many cases, an enterprise could im-

prove its performance if it could align its processes to a specific style, as this would facilitate the analysis tasks and the subsequent design of information systems. However, currently there are few guidelines to systematically adapt as-is organizational model to a certain style. The objective of this work is to provide a methodological approach that allows the identification of an organizational style (based on the *Structure-in-5* style) closer to a particular business model, as well as to provide guidelines for the adaptation of the current business model to an organizational style. Eight variants based on the *Structure-in-5* style were developed and subsequently an adaptation process was developed. In order to validate the adaptation process, case studies with real organization models were carried out. The research has been conducted in the context of Tropos, a comprehensive software system development methodology [9].

2   Objectives of the research

The objective of the research was to define a methodological approach to analyze a current enterprise model (representing the as-is business model view) to determine its proximity to the *Structure-in-5* style, and then, to adapt the enterprise model to one of the eight specific variants of this organizational style (generating the to-be business model view). To do this, the following sub-objectives must be fulfilled: a) to use Tropos in order to model the configurations of the *Structure-in-5* style. b) To define patterns for the identification process of the closest organizational style to the analyzed business model, and c) To define guidelines that direct the adaptation process of an organizational model represented in Tropos to a variant of the *Structure-in-5* style.

3   Scientific Contributions

The proposed methodological approach consists of four phases. In the first phase, we have analized the Mintzberg's proposal to identify organizational styles and their main characteristics. In second phase, we have developed patterns to identify the organizational style closest to the business model of an enterprise. In third phase, we have proposed a pattern identification process, and finally in the fourth phase, we have proposed a guidelines-based adaptation process to modify the current is-as business model to be adapted to a specific organizational style.

3.1   Phase 1: Analysis and modelling of Mintzberg's configurations

Structure-in-5 is a theory of organizational design proposed by Mintzberg [5], this theory describes the several configurations that an organization may have, which have been named *styles*. The *Structure-in-5* is a generic structure that describes that any organization is divided into five basic parts: the Operating Core, the Strategic Apex, the Middle Line, Techno-structure and Support Staff. From these parts, five typical configurations emerge, those are: Simple structure, Professional Bureaucracy, Mechanical Bureaucracy, Professional Bureaucracy and Adhocracy. The analysis and modelling of Mintzberg's configurations has been using the Goal-Refinement Tree

[10]. Each configuration has been described using a template that indicates: style name, classification, context and model structure. Additionally, the related style has been also indicated. The result of this analysis was the development of eight variants derived from the *Structure-in-5* style, the developed variants are: Simple Structure (3 types), Professional Bureaucracy, Mechanical Bureaucracy, Divisional, Administrative Adhocracy and Operative Adhocracy. Each variant identified is composed of specific actor types and dependencies. For example, the Simple Structure type 1 is composed by a Strategic Apex and some workers in the Operating Core. While, the Simple Structure type 2 is composed by a Strategic Apex, supports staff and workers in the Operating Core. The Simple Structure type 1 and 2 are presented en Figure 1 (the other six structures have been omitted due to space [1]).
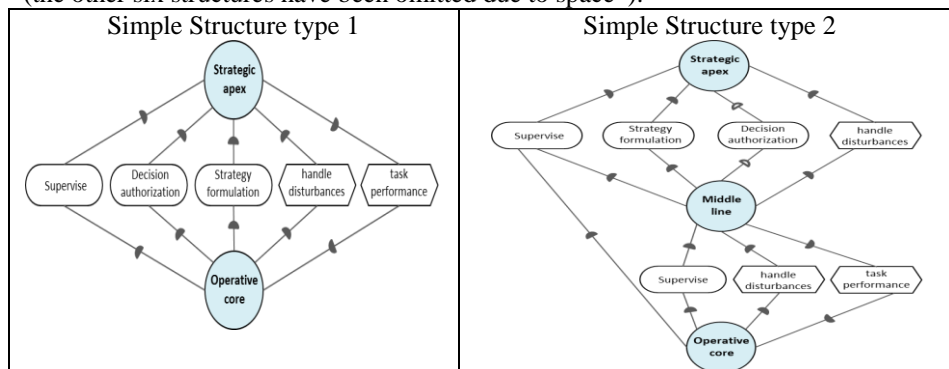

Fig. 1. Two variants of the *Structure-in-5* organizational style

3.2 Phase 2: Pattern definition process

The pattern definition process is composed by two steps: 1) the analysis of coordinating mechanisms of each variant of the *Structure-in-5* style and 2) the analysis of the configuration of the structure of each variant. These analyses were based on the design parameters described in [6] adding the use of organizational patterns described in [7]. The coordinating mechanisms [5] are the fundamental ways in which the work can be coordinated, such as direct supervision, work standardization, standardization of skills, product standardization and mutual adjustment. The aim of the first step was to define the coordinating mechanisms of each variant. Whilst the configuration of the structure is referred to the substructures that compose each pattern. In order to define the patterns, the coordinating mechanisms of each variant and the structural configuration of the variants represented in Tropos have been analyzed. In addition, the roles of the coordinating mechanism have been determined along with the key component of each of the variants from the *Structure-in-5* style. The key component corresponds to the one having the largest number of dependencies as the Mintzberg's typical configuration. For example, in the case of the pattern of the Simple Structure, the direct supervision has been determined as the coordinating mechanism. This indicates that

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[1] The rest of variants of the *Structure-in-5* organizational style are available in http://www.semanticwebbuilder.org.mx/Variants

the apex element is the actor with most of the dependencies and thus, it is a model based on centralization. The coordination mechanisms and the key components of each variant are presented in table 1, which is based on Mintzberg's proposal [5].

Table 1. Coordination mechanisms and key components for each variant

	Simple Structure	Mechanic Bureaucracy	Professional Bureaucracy	Divisional Form	Adhocracy
Coordination Mechanism	Direct supervision	Work standardization	Standardization of skills	Product standardization	Mutual adjustment
Key Component	Strategic apex	Techno-structure	Operative center	Midline	Support

3.3 Phase 3: Pattern identification process

The process to identify the pattern for an organizational model is as follows: 1) classifying the actors of the organizational model into the substructures considered in the *Structure-in-5* style: the Strategic Apex, the Midline, the Operative Center, the techno-structure and the support, additionally we include those actors detected in the analysis of *Structure-in-5* style: Division, Staff of Experts, Staff of Workers, Staff of Administrators and Clients. 2) Once the actors of the model have been classified, the substructures are compared by applying the set of guidelines that take into account the type of actors that composed the remaining model, for example, if the model contains only the Strategic Apex (with most of model dependencies) and the Operating Core, then the model is classified as Simple Structure (Fig. 1).

3.4 Phase 4: Model adaptation process

The model adaptation process of organizational models towards the *Structure-in-5* style requires to recognize the differences between the analyzed organizational model and the identified pattern in order to modify the model accordingly to make it more similar to the pattern. The model adaptation process is composed by three steps: 1) classifying the model dependencies, 2) comparing the dependencies and 3) adapting the model. Once the pattern corresponding to the model has been identified, the first step consists of classifying the organizational model dependencies according to the dependencies of the pattern, identifying in this way, classified and unclassified dependencies. The second step consists of comparing the number of classified and unclassified dependencies to obtain a comparative grade. The comparative grade is obtained through a comparative method [8] which is used to contrast the current organizational model with the variants of the patterns in the *Structure-in-5* style as follows: a) *superiority* occurs when the model has more elements than the pattern, b) *inferiority* occurs when the model has less elements than the pattern, and c) *equality* occurs when both models (pattern and current organizational models) are equal. Finally, the third step consists of adapting the organizational model according to the comparative grade obtained. For example, if the comparative grade of a model is superiority, it means that some dependencies in the model were not found in the pattern, then these dependencies are kept in the model since these dependencies represent particular activities in the business. On the other hand, if the comparative grade is inferiority, it means that some dependencies in the pattern were not found in the model, and then these dependencies are added to the model. Finally, if the comparative grade is equal,

it means that the number of dependencies in the pattern and in the model is equals, and then the model is kept without changes.

4   Case study

The objective of the case study was to determine if the proposed methodology would allow the adaptation of organizational models represented in the Tropos framework to the *Structure-in-5* style. In order to demonstrate the application of the methodology, five case studies have been performed. Following we present the details of one of these cases which is related with OXXO, the largest small format chain store in Mexico and Latin America with more than 30 years of service and more than 10,715 establishments across Mexico. It is important to note that the first and second phase of our approach were carried out only to identify the eight variants based on the *Structure-in-5* style and the adaptation process, therefore they were not carried out with each case study. In order to apply the approach, first, the OXXO store is represented as a Tropos model. Figure 2a shows the Tropos representation of OXXO stores. In this model were identified 3 actors: store manager, store attendant and general assistants. The model consists of 15 dependencies. We describe below the third and fourth phases of the methodology followed with the OXXO case study.
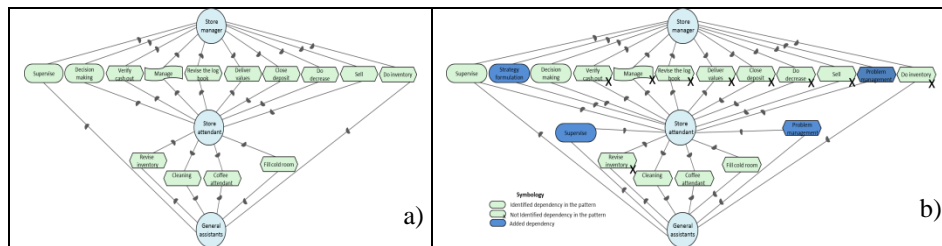

Fig. 3. Original is-as business model (a). Model adapted to Simple Structure style (b).

Pattern identification process: The actors of the OXXO model were grouped into the substructures defined in Phase 2. Therefore, the store manager was classified as the Strategic Apex, the store attendant was classified as the Middle Line and the general assistants were classified as Operating Cores. Applying the guidelines of the pattern identification process, the direct supervision is identified as the coordinating mechanism. The store manager has the majority of the responsibilities and dependencies with other actors; therefore he takes all of the relevant decisions. The model represents a business model with few actors, situation that is common in simple structures (Table 1). Therefore, the selected pattern for the OXXO model is Simple Structure which is composed by 8 dependencies.

Model adaptation process: Once the pattern corresponding to the model is identified, the adaptation process is performed resulting in: the OXXO model contains 14 dependencies, where 4 dependencies of the pattern of the Simple Structure give support to 6 dependencies of the model, 4 dependencies of the pattern were not found in

the model and 9 dependencies of the model which were not classified. According to the comparative method, defined in phase 4, the comparative degree of the OXXO model is of superiority, because the OXXO model has more elements than the pattern. Finally, we applied a set of guidelines to adapt the OXXO model which creates a new organizational model as result. For the case study, the adapted business model becomes as follows: the actors of the original model remain the same, 4 dependencies were added that give support to the pattern, also 4 dependencies of the pattern that were not found in the model are added, such as "Strategy formulation", "Supervise" and "Problem management". Finally, the 9 unclassified dependencies were added to adapted model because these represent particular activities in the OXXO store model. In Figure 2b, the Tropos model of the organization OXXO is shown which has been adapted to the Simple Structure pattern.

5   Conclusions and future works

In this paper, a set of eight variants of the *Structure-in-5* style where developed based on the Mintzberg work [5]. Aside from these variants, a process that permits the support of organizational modelling was created to guide the adaptation of the current business model to an organizational style. The adaptation of the models could benefits an enterprise to better align the organizational functions with the goals of an organization. Furthermore, an adapted model would facilitate the analysis tasks and the subsequent design of information systems. Moreover, for future work we propose to automate the process of pattern identification and model adaptation process.

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