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A Conceptual Framework For Structuring An IT Organization

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Abstract

Organizational efficiency and effectiveness result from aligning organizational needs and IT. Consequently, the structure of an IT Organization is crucial for obtaining good results, particularly in product and service delivery. However, in spite of the importance that IT Organization might have, no relevant documentation about its structure is found. As a result, using the Portuguese Navy as a case study to the design research, this paper aims at reviewing the main related research work and proposes a conceptual framework for structuring an IT organization. Through the proposed framework, it is possible to rationally structure an IT organization and, thus, contribute to the research in this area.

Keywords: IT Organization, restructuring, conceptual framework, task and roles, competencies and capabilities, skills

1. Introduction

Nowadays Information Technology (IT) and organizations are so merged that it is hard to determine where one ends and another begins. The alignment between organizational needs, IT products and delivered services is more than ever a requirement. Demands, opportunities and threats are constantly changing therefore organizations must adapt in order to face emergent challenges. Both the need of a perfect alignment and the high inter-dependence between IT and the organizations' structures place increasing pressure into defining a structure of an IT Organization able to meet these demands (Zacarias, Pinto, Magalhães, & Tribolet, 2010).

An IT Organization involves resources' management within its structures serving the whole organization and it is intrinsically linked to IT which, to a certain extent, corresponds to the domains in lower quadrants of Strategic Alignment Model of Henderson and Venkatraman (Henderson & Venkatraman, 1993): administrative infrastructure, processes, skills, and architectures.

Considering that "having the right organization is more important than having the right technology" (Thompson, 2002), the IT Organizations' structure (such as department, division, directorate, etc.) should be designed to accommodate organizational needs and IT. Consequently, only a correct IT Organization can be able to quickly deliver IT products and services, serving the organization and respective strategy (Clark, Cavanaugh, Brown, & Sambamurthy, 1997). It is, then, necessary to find an appropriate method. Similarly to what Weill stated, a "framework to encourage desirable behavior in the use of IT" (Weill & Ross, 2004), to align and develop IT Organizations' structure.

The definition of IT Organization has been addressed by several researchers (Dignum, 2004) and from different approaches like organizational models, alignment, strategy, IT governance, and relationship models. These theories have been used for several years now and whereas some focus on specific dimensions, others are applied to a relation among them. Although there are plenty of studies about exploring, planning, managing, and developing IT structures (Cross, Earl, & Sampler, 1997), no strong references to

"how to" redistribute and define an IT Organization to be aligned with business strategy and IT infrastructure were found. There is even less documentation on restructuring IT Organizations in research literature. Using the Portuguese Navy as a case study, a review of the main dimensions in a framework to redesign an IT Organization is presented throughout this paper. The analysis will include key elements, their relationships and alignment.

First, our approach is to design a reference framework in order to construct an ontology of concepts, which constitute the dimensions of a defined internal domain of IT boundary. After, we develop a model combining the defined dimensions in a proposal framework. In section 2, the research methodology, that conducted all the work and the organization of this paper, is shown. Afterwards, in section 3, the case study and the motivation guidelines are presented. Section 4 discusses previous work on structuring an IT Organization and identifies a gap in the current knowledge. In section 5, the background and the adopted definitions used throughout the paper, which constitute the foundation of our proposal framework, are explained. Finally, section 6 is devoted to reviewing the strengths and limitations of the present work, to drawing conclusions and suggesting some further research.

2. Research Methodology

The methodology applied throughout the present study was Design Research for we had no initial theory or previous experience in this research area. In addition, we also had to evaluate our development and validate the proposal framework. Typically Design Research is a problem-solving paradigm. It seeks to create new or innovative ideas, using a process with five interactive steps, awareness, suggestion, development, evaluation, and conclusion (Hevner, March, Park, & Ram, 2004; Oates, 2006).

Design is both a process and a product, describing the world as acted upon (processes) and as sensed (products) (Hevner et al., 2004). For this reason, the applied methodology was divided according to two design processes - build and evaluate - and four design products. The two processes were developed in five steps (Oates, 2006; Takeda,

Veerkamp, Tomiyama, & Yoshikawa, 1990; Vaishnavi & William Kuechler, 2007): Awareness, as the recognition of a problem; Suggestion, which results from further research and offers a tentative idea on how the problem might be addressed; Development, an innovative attempted to face the problem; Evaluation, examines the developed proposal; and Conclusion, where the results from the design process are associated and confirmed. The research design process is illustrated in Figure 1, in which the research methodology is mapped with this paper's sections.

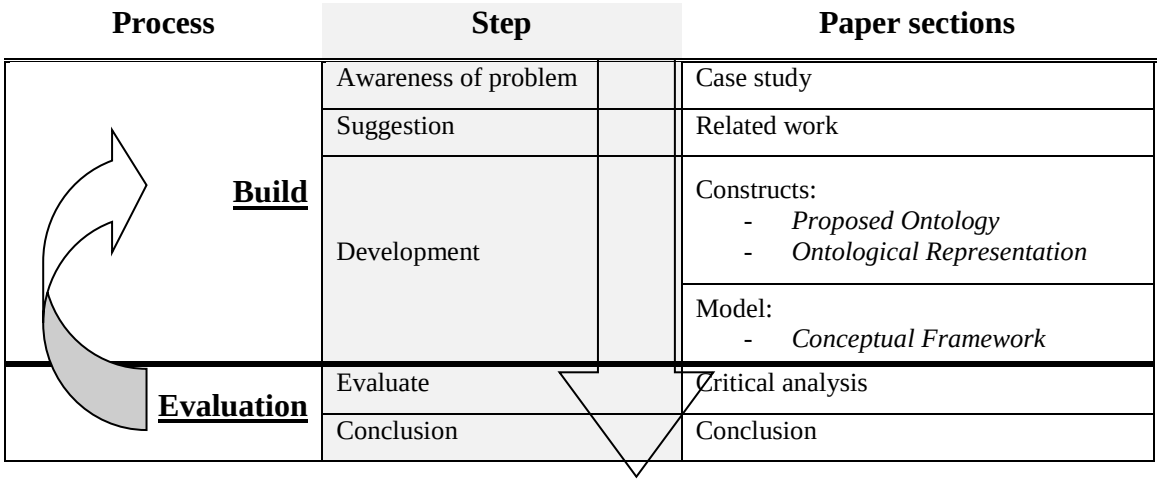

Figure 1- Research methodology

The first step launches the awareness of the problem that, from the Portuguese Navy case study, we realized is widespread. In the second step, from studied literature, we identified how this issue might be addressed and also grasped there is basically no scientific research in this area. The development, and third, step produces two *artefacts*: a "construct" and a "model". Following the Design Research we consider that a construct arises during the conceptualization of a problem, providing the conceptual vocabulary and symbols used to define problems/solutions within a defined domain. A model expresses the relationships among constructs (Hevner et al., 2004; Takeda et al., 1990; Vaishnavi & William Kuechler, 2007). The construct has two main milestones: Proposed Ontology, in which the boundaries are established; and Ontological Representation, forming the specialized language and shared knowledge as a semantic data modeling

formalism (March & Smith, 1995). The other *artefact*, the Model, is the proposal Conceptual Framework, a set of proposals or statements expressing relationships among constructs (March & Smith, 1995). In the fourth step, we develop the Critical Analysis, or evaluation (Shanks, Tansley, & Weber, 2003). Finally, we present the results obtained so far.

Beginning with the Portuguese Navy case study and the awareness it caused, the research development will now be presented. Subsequently, we will show the theoretical background as the foundation to the proposal's dimensions and their relations in restructuring an IT Organization as well as the basis of the proposal framework. The development step follows with concepts definition which constitute a new construct of concepts around an ontology (Mukherjee, Ramakrishnan, & Kifer, 2003).

3. Case Study

The Portuguese Navy is a secular organization responsible for performing three fundamental functions: military defense and support to foreign policy; security, safety and state authority; economic, scientific and cultural development. The Portuguese Navy, despite being strongly concentrated in Lisbon, has a national geographical distribution and global presence. Until quite recently, the internal organization of the Portuguese Navy was supported by three main functional sectors: Material, Personnel and Financial. Around these sectors, the Navy has built its structures, ensuring the command and control of all establishments, commands, directorates, departments, and units and of more than 12000 people.

Information Technology (IT) has an historical presence in the Navy (for instance, the first Portuguese radio telegraph) and, currently, the administrative and operational activities are strongly supported by IT. Due to the Navy's activity at sea, one of the main technological issues is communications (data, voice and video) to and from the ships at sea as well as information security. Up to a few months ago, the IT Directorate (DITIC) was under functional dependence of the Material sector. Related to IT, there was another Directorate (DAGI) responsible for information management, web development, statistics

studies and operational research. Therefore, as illustrated in Figure 2, DAGI and DITIC were under different functional dependencies mostly because, ten years ago, it seemed reasonable to create two different structures in order to separate information management from technology support.

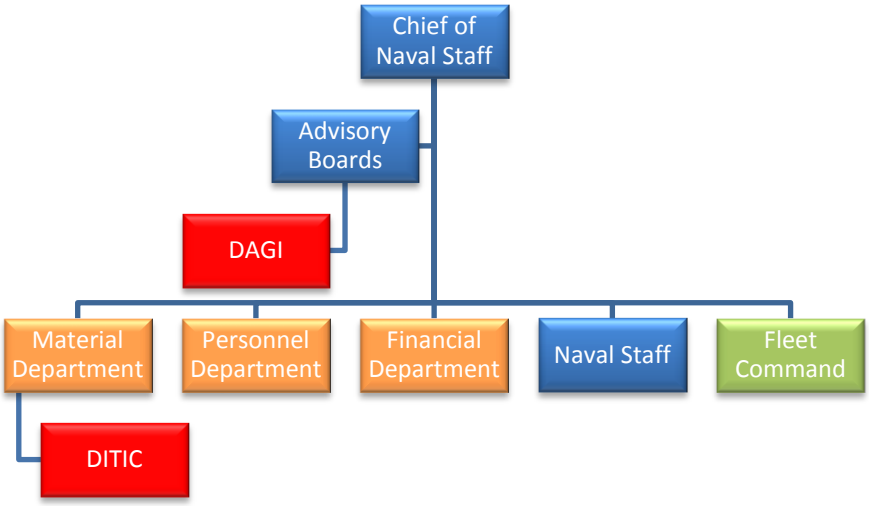

Figure 2- Simplified Organizational Chart of the Portuguese Navy

As a result, there were some constraints when studying this information given that data was created, captured, managed and controlled by DITIC. In addition, some subjects were simultaneously addressed by both organizations, which resulted in some misalignment between them. Another problem was the disagreement in the strategic goals and IT support: the tree of planned objectives, by drilling-down competencies, was confused and did not fit the requirements. Related to the problems described above, there were some user support constraints, for they often did not know which Directorate to address to solve support issues.

In the Portuguese Navy, due to national economic constraints, there are small budgets that make any development from scratch or outsource consultant work challenging. Furthermore, IT Governance follows a federated model (Brown, 1997).

On a different note, although some IT professionals work in key organizations, most are at an IT Organization. In fact, a very common aspect to IT industry is the high turnover rate of professionals. In 2002, studies revealed that the turnover rates in the Fortune 500

organizations were as high as 25% to 30% (Moore & Burke, 2002). This can lead not only to the decrease of available resources, but also to the loss of specific knowledge and skills. In the Portuguese Navy, particularly, the turnover is motivated by internal job rotation but the problem remains the same. The only way it can diminish is by establishing a well-defined job description and by clarifying the required skills to perform expected tasks. The human resources with IT skills are managed by the Personnel department, which distributes human competencies through all units. At this point, there is a lack of human resources in the organizations responsible for conducting IT in the Navy and, especially, a lack of skills to accomplish set goals.

It is clear that facing a number of complex systems, applications and needs with few human and financial resources, we must do something to manage, integrate and deliver what is expected from an IT Organization. In short, the IT Organizational structures do not currently fit its purposes and requirements. There are problems in performance, communication and roles, among others. To better the service level, the Portuguese Navy must improve DAGI and DITIC's coordination and deeply restructure its IT Organization. Therefore, the main aim of this paper is to answer the following questions. How can we restructure the Portuguese Navy IT Organization to overcome the above-mentioned problems and manage information as a corporate resource? Furthermore, how can it be done without stopping the current work, incrementing costs or increase personnel?

While addressing these issues, we felt that, despite the importance of developing and establishing an efficient IT Organization, there is a lack of academic references and scientific work related to this subject. Indeed, we did not find any strongly supported framework. That is why we had to design the basis to one. In the following section we present the needed background for further research.

4. Related Work

In this section, we will analyze different approaches from organizational theory to relations established between more recent researches. All these methods contribute to our proposal in different areas, as presented below. We will start with some classical

references in organization theory, followed by alignment approaches to structures. Finally, this section will also consider strategy authors, IT governance and skills framework, and conclude with a summary.

4.1 Classical references

The principles of bureaucracy identified by Max Weber, one hundred years ago, are still applied to most organizations. They are:

- Specialization of labor by standardization of tasks, employment and rules;
- Hierarchies based on legal and relational authority;
- Formalization by explicit procedures, acts, decisions and rules.

Lined up with bureaucracy guidelines, Henri Fayol and his scientific management proposed organizational principles according to which all subordinates receive orders from one manager only (creating a clear hierarchic order). Similar activities were grouped under the same hierarchical superior too (leading to a division of labor and supervision unity). The main goal of bureaucracy was to improve efficiency by allocating people to tasks (departmentalization) and integration but, instead, it promoted rigid organizations supported by functional divisions. This approach led to a structuring of IT Organizations that supports vertical objectives and business units. Consequently, IT roles, capabilities, skills, processes and budgets are focused on discrete projects to address specific business activities.

The departmentalization of organizations, based on functional division, aims to increase efficiency by combining functions and skills. However, this rupture promotes the presence of functional silos within organizations, each trying to find different solutions. For this reason, IT function has been recently viewed as a monolithic structure, primarily focused on finding the best option to manage the IT infrastructure and to deliver solutions. It attempts to answer functional needs but without facing corporate solutions, inhibiting the development of transversal processes (Gama, Mira da Silva, & Tribolet, 2007). IT Organizations are not able to work effectively because projects are scoped and

implemented without understanding the business processes altogether (without a corporate view). So, opportunities to apply efficient solutions are lost.

In 1946, Peter Drucker visited General Motors and evaluated its corporate structure. Drucker noticed that "information and decisions must flow continually in two directions: from central management to the divisions, from the divisions to central management" (Drucker, 1946). One of the major responsibilities for any IT Organization must be information management so organization structure has to integrate sufficiently flexible and clear communications channels. Henry Mintzberg proposed a framework to structure organizations through correlating five parts: technical core, technical support, administrative support, top management, and middle management (Mintzberg, 1979). These five basic parts perform the subsystem functions of production, maintenance, adaptation, management, and boundary spanning. Organizational effectiveness results from the balance of these five parts (Daft, 2004). To understand organizations, from an organizational theory point of view, we identified several structure determining factors (Daft, 2004):

- The environment, which may imply the need for quick changes and correspondent flexibility;
- Strategy, since different strategies require different structures;
- Technology, involving skills, tools, applications and knowledge used in organizations;
- Human resources, in accordance with number and skills.

These determinant factors, that can be structural or contextual (Zacarias, Pinto, & Tribolet, 2007), lead to what Daft described as organizational design traits (Daft, 2004). Context is viewed as an influence to organizational structure involving culture, environment, strategy goals, size, and technology. The structural dimension involves formal documentation of the organization as, for instance job description, specialization, hierarchy, centralization, professionalism, and personnel ratio.

4.2 Organizational Models

Organizational models comprise how organizations structure their IT function based on authority models (Agarwal & Sambamurthy, 2002):

- Centralized - authority of IT decisions located on top management;
- Decentralized - authority decision on functional IT units;
- Federal - dispersed control and authority IT decisions.

These models, though, oversight our chief need: how to deploy a structure (Agarwal & Sambamurthy, 2002; Sambamurthy & Zmud, 2000). Clark (Clark et al., 1997) proposed an organizational model based on vertical alignment in which skill and capabilities are fundamental concepts of IT Organizational design. This model groups tasks that require the same knowledge, skills, and resources. Clark's approach promotes the above-mentioned functional divisions with a narrow departmental focus and silos' creation.

4.3 Alignment

This approach emphasizes the relevance of the organizational structure through different perspectives in order to enable alignment efforts (Henderson & Venkatraman, 1993; Zacarias et al., 2010), such as: between IT and a multiple of views of the organization (Agarwal & Sambamurthy, 2002; Brown, 1997; Cullen & Orlov, 2005); between IT functions and business (Clark et al., 1997); and IT integration (Agarwal & Sambamurthy, 2002; Broadbent & Weill, 1993; Henderson & Venkatraman, 1993; Premkumar & King, 1994; Weill & Ross, 2004). In addition, we also evaluated the connections (following a social dimension) between technology, organization and management (Brown & Magill, 1994; Laudon & Laudon, 2006; Peterson, 2004; Tavakolian, 1989), organizational issues and technological infrastructure (Croteau, Solomon, Raymond, & Bergeron, 2001; Duncan, 1995), and IT investment and business (Reich & Benbasat, 2000). These associations are focused on how to effectively supply IT services and manage IT operations.

As we advanced in our study, we realized that the majority of the alignment and relation perspectives did not cover all dimensions we considered necessary for an effective IT Organization structure. On the one hand, over attention to the alignment can lead to the

development of a rigid organization, incapable of adapting to the necessary changes (Agarwal & Sambamurthy, 2002). On the other hand, the alignment between different dimensions is always partial and requires conscious and continuous efforts to be maintained. Nevertheless, these perspectives show the importance of identifying and linking different dimensions to enable alignment.

4.4 Strategy

According to this method, the main drive is strategy which influences organizational design choices, but is still concerned with alignment (Agarwal & Sambamurthy, 2002). The strategic alignment model suggested by Henderson and Venkatraman (Henderson & Venkatraman, 1993) places special relevance in coordinating components such as business strategy, IT strategy, organizational infrastructure and technological infrastructure. Despite organizational infrastructure having been defined as the relation between administrative infrastructure, processes and skills, Henderson and Venkatraman did not outline how the administrative structure should be defined and how to correlate the three components (Henderson & Venkatraman, 1993). Likewise alignment is a key driver in strategy perspectives, relating IT and strategy (Agarwal & Sambamurthy, 2002; Braga, 2009; Henderson & Venkatraman, 1993) and business and IT strategy (Bergeron & Raymond, 1995; Chan, Huff, Barclay, & Copeland, 1997; Tavakolian, 1989). Labovitz (Labovitz & Rosansky, 1997) also explores the benefits of alignment between strategy, processes and people. This author distinguishes two types of alignment: vertical and horizontal. A vertical alignment is determined when employees understand the organization and their roles in it, whereas a horizontal alignment is achieved by meeting customer's needs in the business process.

Concluding, strategy is a key dimension to consider when structuring an organization. On the one hand, strategy takes shape through products and services and is influenced by users and suppliers (Porter, 2008). On the other hand, internal competencies ensure a defined strategy while business processes guarantee the alignment between strategy and customer's needs too. However, neither of the above approaches gives us an answer as to how to structure an IT organization.

4.5 IT Governance

IT Governance main internal focus is on decisions mechanisms and not on structuring (Haes, Grembergen, & Guldentops, 2005; Weill & Ross, 2004). Effective IT governance can be arranged using a combination of structures, processes and relational mechanisms (Grembergen, 2003; Haes et al., 2005):

- Structures are defined as the set of roles and responsibilities, which are combined in the IT Organization structure, Boards, IT strategy committee, and IT steering committee(s);
- Processes encompass the strategic information systems planning, balanced (IT) scorecards, and frameworks (COBIT, ITIL, IT alignment / governance maturity models);
- Relational mechanisms involve cross-functional, active participation and collaboration between stakeholders (Gama, Mira da Silva, Caetano, & Tribolet, 2007; Weill & Ross, 2004).

Nevertheless, IT Governance approaches do not offer a solution to our problem because it does not provide any ideas as to how to structure an IT organization. However, it does reinforce the idea that to enable IT Governance, we must clarify IT Organization and its internal domain relationships.

4.6 Skills Framework

Another interesting approach is provided by Skills Framework for the Information Age (SFIA, 2010). It provides a common reference model for the identification of the skills needed in an IT Organization. SFIA framework is a tool for assessing and managing skills, mapping in one axis the whole set of capabilities grouped by categories and relates them to another axis with different levels of competence or attainment achieved by IT experts. This model is complex and only useful for analyzing skills, as it does not provide a full insight on human resource management within the organization. Nevertheless, SFIA is a good reference to list skills and to adopt a common definition.

4.7 Summary

None of the above approaches provides a framework or methodology that might structure an IT organization, but they do draw our attention to several important issues to follow and bear in mind, namely:

- A description of the most important dimensions to consider in an IT organization;
- The need to ensure the alignment between different organizational dimensions;
- The development of IT skills to fulfill organizational goals;
- A provision of alignment principles and integration, essential to a complete approach;
- IT Organization must reflect and meet strategic aims;
- The organization's dimension must be coordinated in order to achieve its aims and reflect calculated objectives;
- IT Organization dimensions should be defined, specifically: strategy, structure, processes and personnel skills;
- Functional divisions are needed to support organizational structure;
- External factors (such as context or strategy) are determinant to structure an IT Organization and internal factors (like structural dimensions and competencies) are at the root of this structure.

Another conclusion is that organizations have several dimensions that must be clarified and linked. These correlations should be modeled for a better understanding of the organization itself.

5. Proposed Ontology

We started off by defining the main concepts accepted by all parties. For example, skill, process or task must mean the same to different people so our goal was to adopt easy to understand and apply definitions. Etymologically, the word ontology is composed by "onto", meaning "what exists", and "logos" or "knowledge about". It is precisely what we need: a specific meaning of concepts that provides a global understanding and allows the creation of new concepts while expanding existing ones. Ontology is part of a broader conceptual framework for the alignment between individuals and organizations. Our

interest is in what is defined by Henderson and Venkatraman (Henderson & Venkatraman, 1993) as **internal domain**.

Internal domain involves administrative structures (functional and divisional organization design), design of business processes (product and service delivery, and correspondent quality), and human resources skills for achieving the required organizational competencies and accomplish defined tasks. Internal domain is limited by choices concerning the organizational structure's logic, the specific design of business processes, and the development of skills needed to attain required competencies and the expected output (Henderson & Venkatraman, 1993).

Considering the study undertaken by Mintzberg and Porter (Mintzberg, 1989; Porter, 2008), strategy is an important dimension for organizations and their structure must be prepared to support and respond to strategic changes. However, we consider strategy decisions to be out of the scope of this work because our focus is in defined internal domain. The definition of internal domain formerly provided is in line with Broadbent and Croteau (Broadbent & Weill, 1993; Croteau et al., 2001) in whose work organizational structure involves three dimensions: organizational design (including structure, roles, responsibilities, and reporting relationships); processes (defining organizational activities, as stated by Daft (Daft, 2004)); and skills (which indicate the capabilities of organizational members needed to accomplish the tasks that support organizational strategy).

Based on previous research and in accordance with Clark (Clark et al., 1997), we define **IT Organization** structure as the relationships in the internal domain of IT boundary, namely, between organizational chart, people (IT staff), task and roles, processes, competencies and abilities, and products and services. In short, it is the how we structure and align different organizational dimensions (exemplified in Figure 3) to achieve an organization’s goals.

An **organization chart** refers to hierarchical relations and vertical divisions based on a combination of functions to organizational optimization (Daft, 2004; Morton, 1991). It is

a structure representation that defines how people are grouped in functions, their competencies, reporting relationships, hierarchic levels and authority.

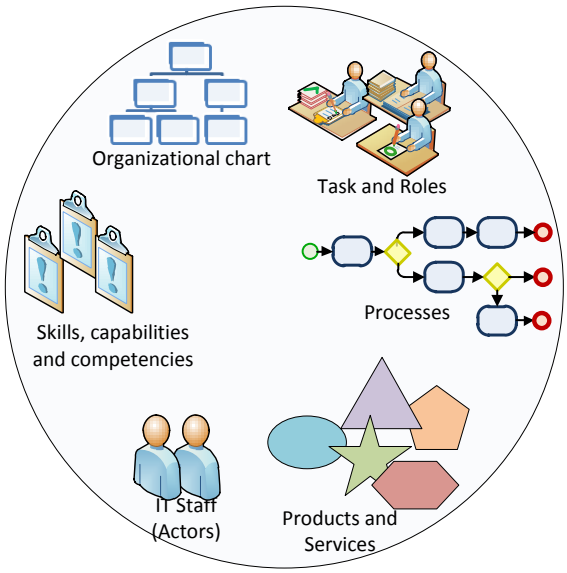

Figure 3 - IT Organization structure - internal domain of IT boundary

Following Ko (Ko, 2009) and OGC (OGC, 2007), we define **Process** as a triggered sequence of value-added tasks performed by actors that, by the use or consume of resources, transform a set of inputs into predictable outputs in order to accomplish a defined goal. The process should be monitored, compared against the previous results and controlled so as to improve in a continual cycle. Figure 4 illustrates the process' definition.

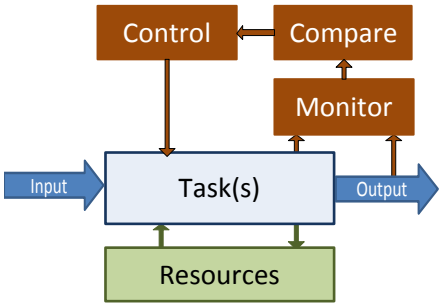

Figure 4 - Meta-model of a Process (adapted from (OGC, 2007))

Measurement in a process is vital to ensure permanent improvement (OGC, 2007), like user satisfaction or on-time project delivery. As commonly stated, "Without

measurement, we are not able to manage" and we must, at least, measure the process' critical parts (Jeston & Nelis, 2006). Each process should be prepared for measurement and so, metrics definition takes on an important part.

Resources are entities (physical or abstract). They can be actors, tools or information. In short, resources are conceptually defined as enablers for the organization operation or inputs to processes (Ljungquist, 2007; Zacarias et al., 2010). Some examples of resources are: IT staff, servers, operational information, programming skills. According to Oh (Oh & Park, 2003), there are some differences between **role** and **task**, having different conceptual meanings. Role focuses on the actor while task places emphasis on the activity.

We define **task** as a fundamental unit of activity work, a job function. Tasks are assigned to individual or grouped actors (IT staff) through their job positions in processes (Oh & Park, 2003). Examples of tasks are purchase approval or sales decision. Tasks are also associated to roles for they indicate the skills required to execute them (as illustrated in Figure 6). Moreover, tasks are defined in terms of three key features: properties, relational nature, and time. These definitions were built based on the work of Zacarias et al. (Zacarias et al., 2010).

Activity, as a process, is a collection of tasks granted to an actor, at some point in time, in the scope of particular interaction contexts (Jeston & Nelis, 2006; Zacarias et al., 2007). This concept has no relevance or value to be considered independently so it is disregarded in our proposal.

Job description (position) implies the characterization of tasks that each worker performs and the degree of responsibility. An actor's "job" may comprise several tasks, depending upon the organization or processes.

Actions define atomic tasks performed by single actors that change the state of a resource. The basic set of action types is defined after an observation period. Decompiling tasks entails discovering action and identifying recurring action-resource sequences (Oh & Park, 2003; Zacarias et al., 2007).

We synthesized the relation between role, task, and action in Figure 5.

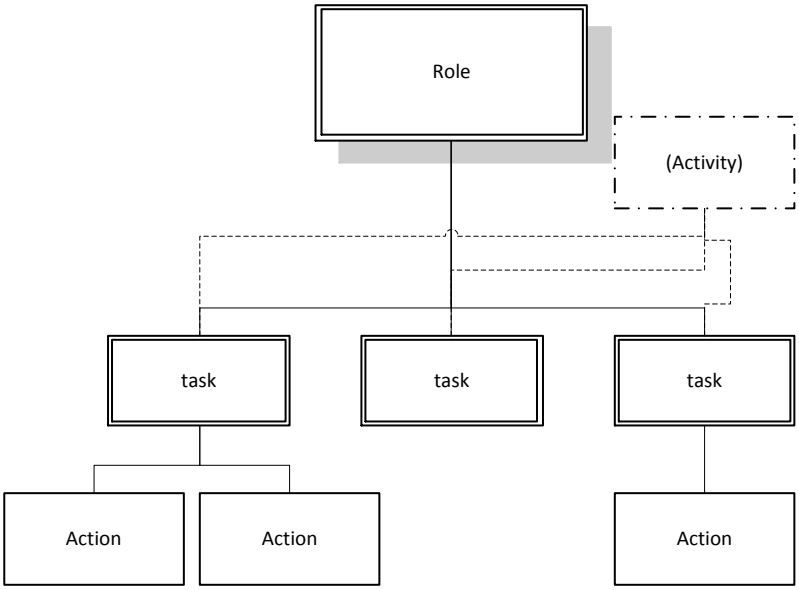

Figure 5 - Relation between role, task and action

A **function** is the organizational representation of a set of similar job descriptions and it provides us with a way to structure tasks and roles. Specializing is likewise still important to gain synergies and perform certain types of work. Aggregation and hierarchical dependencies remain having accountability for function results, for the maintenance of proper skills and for the assignment of correct resources to each project (OGC, 2007). We clarify and adopt the definition of **division** as an organizational unit responsible for a set of functions working with a defined objective and usually using the same resources.

Roles name a set of tasks performed under a defined organizational function (explicit on the organization chart) that is accomplishment by the development of certain skills (Jeston & Nelis, 2006; Oh & Park, 2003). A role is a generic term and is defined at a higher level than job description (Jeston & Nelis, 2006). Roles definition may be an iterative process, grouping tasks into roles, discussing them with actors, and then reorganizing until they satisfy all new role definitions. Once this is achieved, we can write the role description (e.g. IT function) (Jeston & Nelis, 2006).

Skills are a set of individual characteristics resulting from the acquisition, training, and development of knowledge and abilities required to effectively develop assigned tasks (Henderson & Venkatraman, 1993).

We define **capability** as the capacity of a team or individual, with technical knowledge, a distinctive set of skills and cumulative know-how, to perform in a coordinated way and create intangible synergies with value to the organization or a loss without them/him (Clark et al., 1997; Hamel, 1994; Ljungquist, 2007; OGC, 2007).

Like mentioned in Birchall et. al, an organization cannot actively manage core capabilities and, at the aggregate level, competencies if there is uncertainty and a lack of consensus regarding what those capabilities actually are (Birchall & Tovstiga, 2003). We illustrate capacity and its components in Figure 6. Capability can be described as: code, skills and tasks, among others.

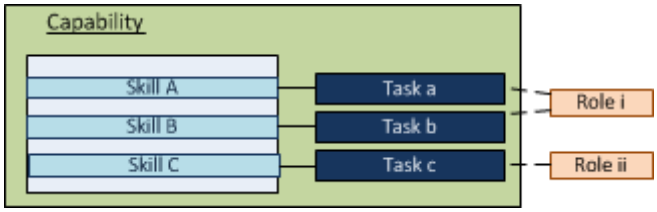

Figure 6 - Concept Capability relationship

Competence is "a cross-functional integration and co-ordination of capabilities" (Ljungquist, 2007) possessed by actors, individual or groups. It implies a quality inherent to a cumulative hierarchy and is usually assigned to roles (IT function units). The competence definition regards development and improvement as a primary focus. Competence is the aggregation of capability, skills and roles as illustrated in Figure 7.

Customer and user have different meanings: **Customer** is the one who buys, defines, and agrees to the cost and service level targets; a **user** handles IT Services on a day-to-day basis (OGC, 2007). To simplify the reference to these terms in this paper, we consider user and customer as the end point of service delivery and adopt the term "user" to refer to both concepts.

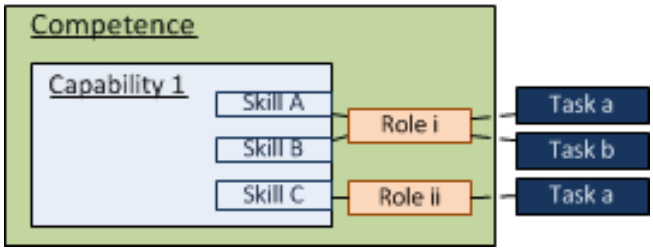

Figure 7 - Concept Competence relationship

A **service** is a means of delivering value by facilitating outcomes users want, without the ownership of specific costs and risks (OGC, 2007). A **product** is something tangible, required, and for which users are willing to pay. For convenience, and because for the purpose of our work the difference is not important, we adopted the term "service" to encompass both products and IT services delivered.

IT staff (IT professionals) are the key players, or the actors, with a broad recognition in research literature. They are the human capital of an organization and represent its most important strategic asset supporting organizational needs (Roepke, Agarwal, & Ferratt, 2000). IT staff encompasses all people working in an IT organization with technical skills to deliver IT services. They support processes and fulfill tasks via the production and/or use of resources. IT staff complete their job functions to achieve the organization's goals.

An **actor** (identified with nouns) is usually a person or a team with special skills that enable them to fulfill tasks. Actors are interventional resources and perform three kinds of actions: management, development, and maintenance. By performing management acts and coordinating activities, they contribute to the achievement of the organization's purpose or mission. When carrying out development acts, they enter into commitments about production activities such as providing, consumption, management and varying resources. Finally, through maintenance performance acts, they support monitoring, coordination and changing activities (Dietz, 2006; Zacarias et al., 2007). Actors are associated to tasks that indicate their required skills. They fulfill different tasks and interact with other actors through defined processes. Still on this topic, it must be clearly defined who will execute the tasks, the goals and what the expected performance is (Jeston & Nelis, 2006; Zacarias et al., 2007). Various actors can complete the same work

simultaneously or at different times. Actors may perform, activate or put on hold one or several tasks. However, an actor only has one active task in a particular time period (Zacarias et al., 2010).

The concepts described above are the foundation for different dimensions, which constitute the proposal framework to structure an IT organization. Each of these dimensions allow for different viewpoints that define the set of models that represent them. Every single model is designed by a particular type of stakeholder and addresses a particular concern (Lankhorst & al., 2005).

In the following section, we will link the different dimensions of internal domain, developing the ontological representation and the conceptual framework.

6. Ontological Representation an Conceptual Framework

As mentioned by Dietz (Dietz, 2006), an ontology provides a foundation for understandable knowledge. It also helps the internal relationships, by defining business rules, enterprise policies, and context described in a logical way in order to support processes' composition and execution. Hence, ontology plays an important role in defining object classification, metadata and object relations. An ontology is expressed by conceptual modeling grammars (constituted by vocabulary plus meaning) that construct representations of the real-world or of a particular knowledge area. It thereby reflects its formalization and could benefit not only all the organization's dimensions, but also clients, users and stakeholders (Dietz, 2006; Shanks et al., 2003).

An ontology is a formal and explicit specification of a shared conceptualization among a community of people (and agents) of a common area of interest (Dietz, 2006). An explicit graphical depiction of an actual implementation allows for the (1) uncovering of problems related to particular work practices rather than process design; (2) tracing of the real relationships between actors with organizational tasks, resources and other actors; (3) assessing of the alignment with designed processes; and, (4) evaluating how work evolves with time (Zacarias et al., 2007).

Besides, an ontological reference of concepts is preferable to a graphical representation in which people recognize the links between concepts in different dimensions or views. A graphical representation outlines a conceptual representation clarifying ambiguous semantics in the model (Shanks et al., 2003). So, a graphical depiction of an ontological representation is a model.

Models are effective artifacts to support communication and to enable understanding (Zacarias et al., 2007). Our proposal of ontological correlation between concepts in the internal domain is represented in Figure 8.

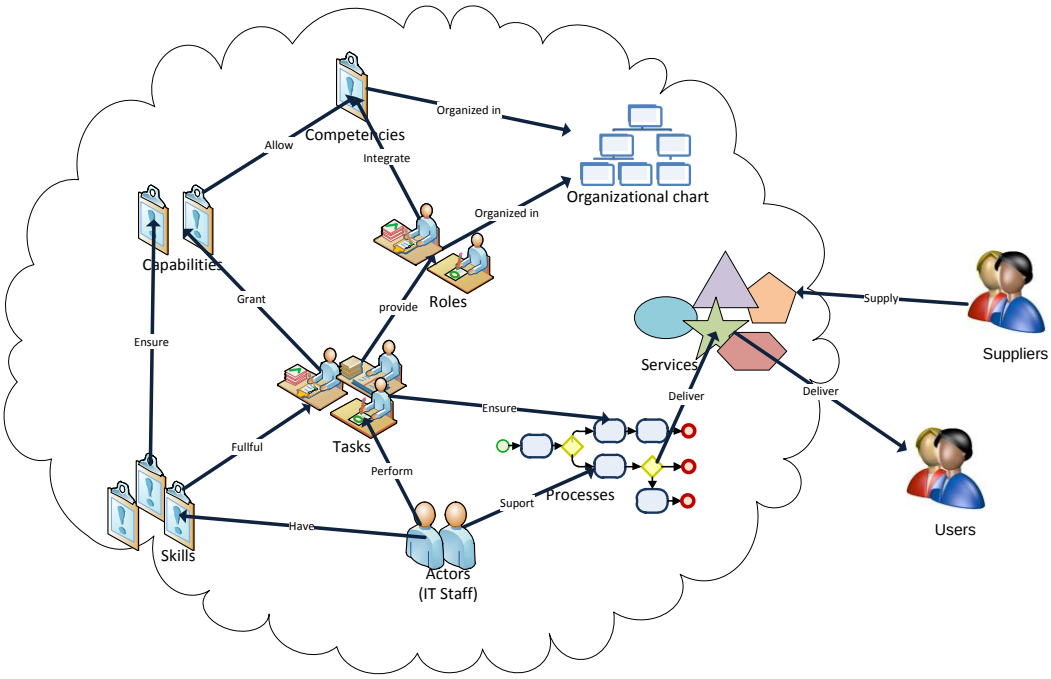

Figure 8 - Relations between dimensions in internal domain

At first, we believed that a framework with an ontological graphical representation would provide us with a reference and, thus, the end result should be aligned with this goal. However, in fact, frameworks have been developed to provide models, methods and tools that enable structure communication and organizations' processes (Zacarias et al., 2010).

The proposal framework shows the alignment of all dimensions of internal domain in organizations. Our proposal is materialized in a framework and defines the course of

action illustrated in Figure 9 that represents our conceptual model, the proposed meta-model of relation between dimensions.

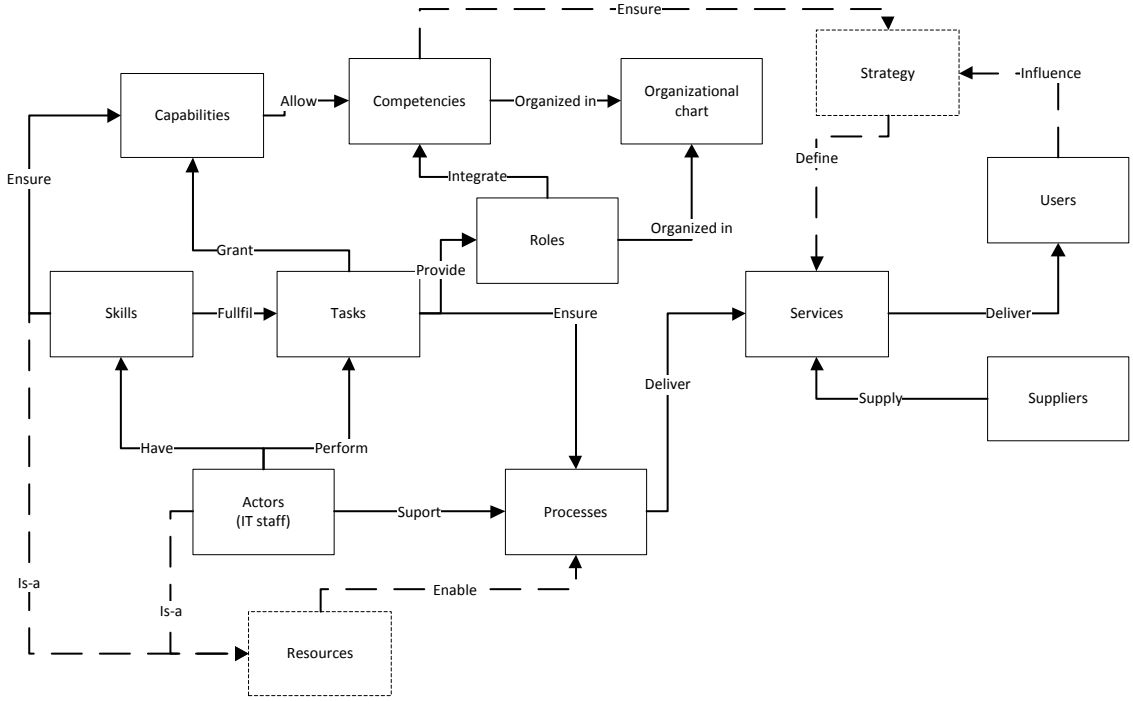

Figure 9 - Proposed conceptual meta-model

The conceptual model uses the conceptually defined modeling ontology that provides constructs for representing real-world phenomena and rules which define how these might be combined to represent focal domains (Shanks et al., 2003). The proposed framework is a lot about change and we must be aware of natural change resistance. Besides the need for total involvement and support from top management, we have to prove the importance of changing to all the organization, especially to those who will be affected by it. For that reason, for each dimension we should conduct an assessment. By resorting to a collection of facts, like complaints or surveys, that will prove the worth of improving and changing, this assessment would function as the diagnosis baseline from which we must develop and constitute the ‘‘as-is’’ state.

IT Organization exists to serve the users and to achieve strategic objectives. The interface between IT Organization and users are the services provided: the success of IT

Organization is the satisfaction of users. So, the services should decisively contribute to shape the IT Organization (despite products and services being mostly connected to strategy). The first step is evaluation.

The assessment is the diagnosis baseline that we must use to improve and to constitute a "photo" of the "as-is" state; it is characterized by:

- The evaluation of users satisfaction and weak areas, because the real objective of IT Organizations is to meet users' needs;
- Clarifying, identifying and recording problems, issues and unmet goals. The assessment must enable organizations to define the real causes of previously identified problems.

By implementing an evaluation system, we validate the need for a change. The following step should be the description of users, services and suppliers. One problem in this, though, may be the different viewpoints of "what a service is" and the inexistence of comparable granularity. Based on the work developed by Martilla al. (Martilla & James, 1977), we thereby propose to differentiate and prioritize users, services and suppliers by considering and relating different criteria: importance, performance and priority. This approach will allow us to understand our portfolio of users, services and priorities (Ainin & Hisham, 2008) making it possible to define a baseline.

From the existing services (in a reverse engineering procedure), we clarify and model the processes, which can be vertical or horizontal in nature, to support the aforementioned services development. Moreover, from the same processes, we identified the activities, tasks, and skills needed to those who complete the tasks (the actors). On the one hand, the vertical nature of hierarchic structures indicates its focus as primarily functional but without insight into what is needed to be effective. On the other hand, the horizontal nature indicates service provision across organizational entities. The identification of tasks sequence in the processes allows us to clarify vertical and horizontal dimensions.

For each process, besides identifying tasks, skills and actors involved, we also evaluate how they relate to one another. We use the RACI model to outline defining capabilities (ITGI, 2007). RACI stands for Responsibility (the owner), Accountable (the ones who approve it), Consulted (the information or capability needed), and Informed (those who must be informed). The known RACI (or RASCI) model was used to identify the links between tasks and skills and describes what is done by whom.

Through tasks' combination, we define roles and, consequently, IT Functions which can be described as: Code, [description], Competence and Developed Tasks. Further information, as category or others, should be associated to provide a better characterization. Job description, for instance, allows us to describe the performance of each actor. Having distinguished the competences and roles (IT functions), we are now able to define our organizational chart as well as the internal domain and the correspondent dimensions of IT Organization.

In a previous section, the situation that triggered the development of this work was presented: to answer a real need in the development of a proposal framework to restructure an IT organization. We considered valuable to define and adopt concepts under a common ontology as the foundation for a common knowledge and so, in this section, we have clarified all the concepts and their relationships in a Framework. After defining the concepts, it is now time to shed some light on how they are related.

7. Critical Analysis

Despite having already started the implementation of the proposal framework and of how much has been achieved (namely the importance of clear proposal dimensions), we have not yet finished our work and some aspects remain untested. In fact, we should implement and test all dimensions of the framework.

As Shanks stated, the validation of conceptual models is to generate high quality from the outset. A good ontology helps to ensure the selection of a first-rate conceptual model to the focal domain (Shanks et al., 2003). What's more, a suitable ontology can also be used

to better make sense of ambiguous semantics in conceptual models that need to be validated.

In order to face the difficulty we felt in the identification of some dimensions as services and users, it is better to promote a meeting sponsored by key decision-makers to clarify priorities in fundamental dimensions and avoid misaligned identification. The validation approach must equally combine both quantitative (via organizational maturity, suggesting that participants are able to successfully apply the framework) and qualitative. The common acceptance and validation of the proposed ontology was the first stage in the evaluation. The next stage will be the evaluation of organizational maturity (Silva, Mira da Silva, & Gama, 2010).

Before we implemented the proposal framework, we evaluated the organizational maturity using People Capability Maturity Model (P-CMM) and we shall compare the results with the previously obtained ones. We expect better results from this evaluation that can validate the worth of our work. After the conclusion of the framework's implementation, a more accurate evaluation is needed, especially to the common quality properties of the proposal framework as stated in Lindland, which consists in evaluating (Lindland, Sindre, & Solvberg, 1994): the modeling language (the statements that can be made according the syntax); the domain (which is all the possible statements that would be correct and relevant for solving the problem); the model (meaning the collection of statements actually made); and the audience's interpretation (the set of interpretation that the actors think the model contains).

8. Conclusion

To avoid an IT Organization structure as a mere organizational chart of units and positions, the structure design should involve different dimensions, making sense in a holistic way. Throughout this approach, we set up a structural organization in which actors (IT staff) are assigned to defined tasks and processes of the overall organization so as to develop an expertise in a particular technical area. This approach requires good

correlation between different dimensions supported by a standard methodology to ensure integration.

In modern organizations, with high turnover rates of IT professionals, it is very important to know and clarify the competences and skills needed to avoid personnel dependence - it is necessary stable, defined and structured roles (IT functions) supported by skills.

We believe that IT Organization should not exist by itself but to serve the purpose and strategy of the organization. Structure definition is not easy but if it does not fit the real needs in an effective and efficient way, problems will arise and, eventually, generate losses in performance and a bad service to users.

IT Organizations should not be dependent of technologies or people, but be sufficiently flexible to adjust to changes in strategy. However, the modeling of people is not easy and it requires an intensive and persistent work. Indeed, the IT Organization structure cannot be a simple chart of units and vertical positions, as it was in the past. Structuring should reflect the core capabilities and process, which describes how to apply state-of-the-art IT (defined baseline) to action.

Depending on the type of organization, dimension and even culture, there are many options and alternatives to IT Organization design. So, the framework must be as generic as possible to be appropriate to all. Moreover, the framework should produce good requirements to align and meet the needs and strategy of their IT Organizations. Only through clarifying the dimensions that compose a possible framework can we expect good results. With this work we are able to structure an IT organization from the linkage between different dimensions in a rational framework. The proposal framework constitutes a contribution to what we think must be considered in an IT Organization.

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