ORIGINAL

Business process model: a social construction for military organizations

Modelo de procesos de negocio: una construcción social para organizaciones militares

Modelo de processos de negócio: uma construção social para organizações militares

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ABSTRACT

This article aims to identify the enabling factors for the implementation of a business process model to be adopted by military organizations, which face great challenges in order to respond to environmental pressures, provide quick answers in a resilient manner, besides promoting innovation. With the implementation of institutional actions within a Military Organization between 2011 and 2013, a comprehensive, systemic action research project, based on the principles of the anthropo-pedagogical model of André Morin, was developed. After applying the intervention instruments through systemic methods of analysis, many architectural artifacts were generated in order to distinguish the key components of the management system, the key actors involved and affected, as well as the current organizational configuration. These results could reveal a strong tendency to supply the business process model with command and control mechanisms that, when combined with the contextual and relational aspects, like the coordination and organizational learning instruments, provide the organizational effectiveness.

Keywords: Anthropo-pedagogical approach. Process management. System thinking. Action research.

The acronyms and abbreviations contained in this article correspond to the ones used in the original article in Portuguese.

RESUMEN

Este artículo tiene como propósito identificar factores habilitadores para la implantación de un modelo de procesos de negocio para la adopción en organizaciones militares, donde los desafíos son enormes para acomodar presiones ambientales, proporcionar respuestas rápidas y de modo adaptado, además de emprender innovación. Con la implementación de acciones institucionales en el ámbito de una Organización Militar, en el periodo de 2011 a 2013, fue desarrollado un proyecto de investigación-acción integral y sistémico, pautado por los preceptos del modelo antropopedagógico de André Morin. Después de la aplicación de los instrumentos intervencionistas, a partir de métodos de análisis sistémicos, muchos artefactos arquitecturales fueron generados en el sentido de distinguir los componentes clave del sistema de gestión, los principales actores envueltos y afectados, además de la configuración organizacional presente. Esos resultados revelaron una fuerte propensión en dotar el modelo de procesos de negocio con mecanismos de comando y control que, aliados a los aspectos contextuales y relacionales, como los instrumentos de coordinación y de aprendizaje organizacional, proporcionan la efectividad organizacional.

Palabras clave: *Abordaje antropopedagógico. Gestión de procesos. Pensamiento sistémico. Investigación-acción.*

RESUMO

Este artigo tem como propósito identificar fatores habilitadores para a implantação de um modelo de processos de negócio para a adoção em organizações militares, cujos desafios são enormes para acomodar pressões ambientais, prover respostas rápidas e de modo resiliente, além de empreender inovação. Com a implementação de ações institucionais no âmbito de uma Organização Militar, no período de 2011 a 2013, desenvolveu-se um projeto de pesquisa-ação integral e sistêmico, pautado pelos preceitos do modelo antropopedagógico de André Morin. Após a aplicação dos instrumentos intervencionistas, a partir de métodos de análise sistêmicos, vários artefatos arquiteturais foram gerados no sentido de distinguir os componentes chaves do sistema de gestão, os principais atores envolvidos e afetados, além da configuração organizacional presente. Esses resultados puderam revelar uma forte propensão em dotar o modelo de processos de negócio com mecanismos de comando e controle que, aliados aos aspectos contextuais e relacionais, como os instrumentos de coordenação e de aprendizagem organizacional, propiciam a efetividade organizacional.

Palavras-chave: *Abordagem antropopedagógica. Gestão de processos. Pensamento sistêmico. Pesquisa-ação.*

1 INTRODUCTION

Age-old military, governmental or religious institutions, have at their origins a configuration that is typically pyramid-shaped, emanating command and control from its narrow top towards its broad base. Even though this may be justified by the rigidity and complexity of the organizational structures, many organizations, provide greater control to the detriment of flexibility, losing agility, competitiveness, and the power of innovation in the current global scenario, when they concentrate power in the high levels of the administration.

Organizations with structures that were purely functional have prevailed for over a century. In this context, one of the implications stated by Rummler and Brache (1994) is that many managers do not even understand their own businesses, jeopardizing the organizational development process. They do not understand with a sufficient level of detail the cycle of production and operation of their own businesses (NEUMANN, 2013).

A historical foundation has enabled many organizational configuration models to be revealed throughout the Twentieth Century. To Gharajedaghi (2011), the business architecture model is geared towards a logic that is predominantly functional (synthetic judgement) by structure (analytical judgement), or by processes (behavioral judgement). Considering the latter, when it is carried out by an organization, Peter Fingar warns that it is necessary to have some general knowledge about the activities of the business, the productive and coordination activities, that will enable one to perceive the relationships between the whole and its parts, the roles and responsibilities of the parties involved, as well as the distinction of the type of contribution of each process to the achievement of the desired results and for the proposal of a value to the business (SMITH; FINGAR, 2006).

When one thinks about the organizational development supported by the dominant logic of specialization of the structure, the analytical approach becomes evident, and this favors the organizational disintegration into functions (JACKSON, 2003). However, the lack of a systemic view of the organizational processes contributes, for instance,

to the definition of organizational structures of low cohesion, fragmented and geared towards silos. That said, when trying to reach their goals, each functional unit defines their own strategies of use and allocation of resources to achieve a superior performance, which are not always accompanied by a shared view. With this, a culture of optimization for the improvement of individual results is created, and it invariably leads to the inability of the organization as a whole to sustain itself (HARDIN, 1968; RUMMLER; BRACHE, 1994).

In order to obtain the full view of the process, one must break the functional barriers and resort to a holistic approach that champions the importance of the full comprehension of the phenomena, and not the isolated analysis of their components (JACKSON, 2003). In order to grasp the organizational and structural features of the management system, systems thinking becomes an instrument of analysis under the holistic perspective. This is because the world of technology and the business world are becoming more complex, and one of the goals of systems thinking is to manage this complexity.

Systems thinking is a contextual and relational frame of reference, a set of knowledge and tools developed throughout the past fifty years to shed light on the patterns as a whole and help us find out how to effectively change them (SENGE, 2013). It is not enough, though, to have a systematic point of view, with an analytical and mechanistic bias, geared towards events and restricted to the functional aspects; it is necessary to go beyond that, and try to reach a comprehension of the relational and contextual aspects, including the organicist bias, in order to be able to achieve a systemic view (ISON, 2008).

Before employing a practical approach to transform the organizations by means of processes management technologies, Rummler and Brache (1994) argue that the systems' view is the starting point for the creation and management of organizations that effectively respond to the new cybernetic reality, and that demands a greater ability to adapt and be resilient when it comes to facing the new challenges posed to companies in general (and to military organizations in particular).

In complex scenarios, in which the level of uncertainties, unpredictability, indeterminations and threats is high, the organization is susceptible to being ill-managed or ill-governed, in case there is a lack of comprehension of the dynamics of the systems involved, of the multiplicity of the existing relationships among the many endogenous and exogenous variables, and of the determinants and restrictions of the environment,

and that can unleash side effects over the performances of the individual and of the organization (LIMA, 2015).

In the military context, the reality is not different. The view that is strongly geared towards the functional architecture does not always come with the proper attention to the management processes. Consequently, the potentialities in terms of agility and adaptability to new scenarios tend to become compromised.

Considering the aforementioned information, and aiming at comprehending the strategic context and the context of command and control of a Military Organization, the present study has the main goal of evaluating the factors that enable the implementation of technologies of management based on processes, under a systemic perspective.

In order to achieve this goal, we have tried to broaden the horizons of evaluation of the object of the study through interventionist actions, in order to provide a better comprehension of the observed reality. Aware of the fact that an exact observation and description of an object must precede any explanation or interpretation, an action research project was created based on the methodological guidance of Morin (2004) and on the study developed at University of Brasília[1], and that culminated in an interventionist action of a pedagogic nature aimed at creating new knowledge based on practice.

The present article is divided into six sections. Initially, the motivational elements for the study are presented, including the systemic perspective of evaluation of the scenarios in order to analyze the management of processes within an organization. This introduction arises the need of discussing the systemic practice focusing on multiple approaches so that, subsequently, we can trace the research strategy based on the participatory action research and its operationalization in the form of a field research in an Military Organization. In the following chapter, we describe the descriptive and interpretive analyses of the obtained data through the application of research instruments; after that, the analyses are discussed and evaluated through the perspective of the adopted theoretical conceptions, culminating in the conclusion section.

2 SYSTEMIC PRACTICE BASED ON MULTIPLE APPROACHES

The development of systems thinking is a circular learning process that aims at substituting a reductionist,

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[1] The present article is based on the PhD thesis of the first author, written for the PhD in Electrical Engineering Program (PPGEE, in the Portuguese acronym) of University of Brasília, which was presented and approved in February 2015.

restrictive, short-term approach, a static worldview (LIMA, 2015; SENGE, 2013; STERMAN, 2000; VASCONCELLOS, 2013), for a broad, holistic, long-term and dynamic worldview in order to, subsequently, redesign proper policies, procedures and institutionalizations (JACKSON, 2003; STERMAN, 2000).

With the advent of flexible systemic practices and methods, many possibilities for the application of those approaches have been experienced (JACKSON, 2003). To Howick and Ackerman (2011), the combination of methods with a systemic focus has been gaining interest in the operational research for more than twenty years now. However, little has been produced about the combination of methods in practice.

By definition, a methodology is a structured set of guidelines or activities to help people conduct a research or an intervention (MINGERS; WHITE, 2010). In practice, what will determine the choice of a specific methodology is the combination of many criteria, namely: the nature of the problem to be investigated, the conception of the research, the convenience of the researcher, and the research scenario. Depending on the latter, if it is a complex scenario, multiple methodological approaches can be employed to broaden the evaluation horizons, so that the problematic situations can be dealt with more easily (JACKSON, 2003; LIMA, 2015).

Given the great number of cases that are employing multiple systemic approaches, there is proportionally a great diversity in the combination of methods (HOWICK; ACKERMAN, 2011). However, the authors have noticed the lack of well-defined criteria, or of a paradigm about how and why should one use different methods for structuring the problem in the operational research.

Even though there are many different methods available under systemic focus, empirical researches that actually demonstrate how they can be combined and put into practice simultaneously are scarce. Nevertheless, the multi-methodological approach is a facilitator for the quick structuring of the problems, for the analysis of alternative arrangements for the projects, for the mapping and configuration of processes, as well as for the specification and implementation of resolutions at the level of the systems (SMALL; WAINWRIGHT, 2014).

To Jackson (2003), the choice of a multi-methodological approach is conditioned to the following aspects: 1) creativity – initial exploration of the problem-situation; 2) choice – selection of one or many methodologies that are specific and suitable for the contextual and relational questions; and 3) implementation – making the appropriation of the methodologies that will be put into practice auspicious. According to Mingers and White (2010), understanding the strong and weak points of the different methods that compose each methodology is an important step, because it involves the need to reflect upon the intentionalities that guide the observational research and the interventionist actions.

The multiple systemic approaches promote the adoption of a diversity of methodologies that differ from one another both in complexity and in content (CHECKLAND; SCHOLES, 1990; JACKSON, 2003; MARTINELLI; VENTURA, 2006).

According to Small and Wainwright (2014), by choosing to use action research and the development of a contextualized multi-methodological approach, the stakeholders within the organization can take part in the undertaking of projects for new systems, and more rapidly adopt the technologies to approach the operational problems posed by the business areas in a more systemic and innovative way.

3 RESEARCH STRATEGY

Specifically because it is an organizational environment, which contains purposes, actions, disturbances and an intricate network of systems, including information, productive, operational and human activities systems, changes and transformations should be discussed according to the level of underlying systemic complexity (LIMA, 2015).[2]

It is in this sense that we intended to conduct the investigation, based on the principles of action research, which is generally operationalized by means of three interdependent stages, namely: diagnosis, action and reflection. With this, the underlying action research project implies some form of interventionist action, which can be of a social, educational (pedagogical), technical, or of some other nature (THIOLLENT, 1997).

Action research is a kind of participatory investigation that has as a peculiar feature the goal of planned action regarding the problems encountered (MARTINS; THEÓPHILO, 2009). According to Morin (2004), action research generally designates a method used to perform a strategic action and that requires the participation of the actors-agents collaborating in the field research.

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[2] For more information on the methodological position underlying the present work, read Lima (2015) and Morin (2004).

Action research is participatory in its essence. Unlike the positivist perspective, which is largely concerned with the experimental results, action research focuses on the process, on the social, cultural and educational relationships. The spirit of creation is at the core of action research without anyone ever knowing what will happen after all (MORIN, 2004).

With the goal of broadening the horizons of evaluation to the level of systemic complexity, we chose the anthropo-pedagogical action research approach of André Morin with a comprehensive and systemic focus. In order to do so, Morin (2004) warns that the following aspects should be observed: 1) it is a participatory research in every stage of the process; 2) the knowledge of the nature of the problematic situation; 3) the realization of the need for participation and of the nature of the problems; 4) the use of common and playful language; and 5) the development of an open participation agreement.

The systemic approach that guides the manner in which the field research is operationalized is based on the theories of information and cybernetics and on their usefulness in the organizational structures. Its instrumentation proposal is broad and diversified, and is capable of settling conflicts, oppositions, contentions and ill-defined situations (DEMO, 2014), mainly with the goal of trying to study the dynamics, the boundaries and the relationships contained within the limits of the system of interest.

Action research enables the researcher to formulate theories and strategies that arise from the field and are subsequently validated, compared and challenged within the field, and that may provoke desirable changes in terms of better solving or questioning a problematic situation (MORIN, 2004).

The methodological position adopted in the present article is devoted to the development of a comprehensive and systemic action research that is in agreement with the proposal of Morin (2004), combined with the Soft Systems Methodology of Checkland and Holwell (1998) and the systemic assistance methodology of Aun, Vasconcellos and Coelho (2012).

According to Morin (2004), the research with educational or pedagogical purposes in a real situation that was not constructed is way too complex for one to accept as the truth a set of experimental instruments; by doing so, one would dismiss the amalgam of human interactions. Even when it is necessary to partially separate the object, one needs to do it with the will of uniting and studying the relationships and the purposes of the components. It is the moment in which the researcher should reflect upon the action in practice.

The field research was developed as part of a project to improve the business processes, and it is linked to an Military Organization of the Brazilian Air Force (FAB, in the Portuguese acronym). This Military Organization, henceforth called Aerial Operation Agency, performs activities of direction, command and control regarding the preparation and employment of the vectors and of the aerial effort. All of the research design and methodological direction are in agreement with the study of Lima (2015).

### 3.1 Operationalization of the Field Research

The choice of methodological direction allowed us to define the courses of action to conduct the field research. In order to operationalize the field research, the investigative process was developed based on an organizational development project aiming at the implementation of a systematics of mapping and modelling of business processes in the Aerial Operation Agency, which contributes to the definition of the management model based on processes.

Due to the existence of many dimensions of evaluation of the environment of the implementation of an institutional Project, since there can be different views within the same reference system, depending on the position of the observer, and on the fact that for every new view a new set of points of view can arise from the observed reality, Gharajedaghi's (2011) systemic principle of multidimensionality is an enabling factor for the undertaking of the action research project.

Based on the interventionist model proposed for the present study, which is of a pedagogical nature, three systemic approaches were chosen, and they represent three branches of the development of systems thinking to contemplate the levels of abstraction presented in Figure 1. The following are the contributions of each approach.

- Soft Systems Methodology (SSM): focus on the discovery of the problem-situation and subsequent mapping of the system defined around the problem (CHECKLAND; HOLWELL, 1998);
- Critical Systems Heuristics (CSH): reflective practice to identify and discuss boundary judgments (ULRICH, 1987); and
- Viable System Model (VSM): a perspective of the systemic cybernetic theory that has the goal of modelling the viable system through the assumptions of communication and control (BEER, 1984). It is an instrument for the diagnosis and design of organizational processes.

Figure 1 - Information system implied by the learning of the action in practice.
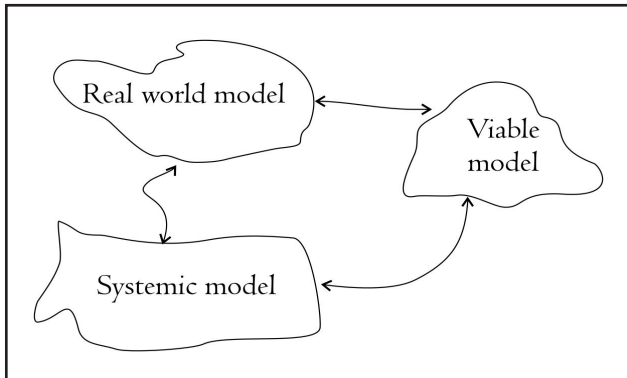
Source: Adapted from Checkland and Holwell (1998).

4 RESULTS

Based on the definition of the multiple systemic approaches for the evaluation of the institutional project of mapping the business processes, we could develop the action research using the applied collection and diagnosis instruments, as is displayed in Chart 1.

The multidimensionality principle of Gharajedaghi (2011), combined with Checkland and Holwell's (1998) information system learning perspective, with Morin's anthropo-pedagogical approach, and with the conceptual foundations of the methodology of Aun, Vasconcellos and Coelho (2012) triggered the formation of the stages of the systemic and comprehensive research plan. It is, therefore, a proposal of a methodological direction that gives purpose to the development of the activities of prospection, data collection, descriptive and interpretive analyses, as well as the discussion and reflective evaluation, through the following steps:

- prospection of the context;
- distinction of the system defined around the problem; and
- pedagogical (interventionist) action.

4.1 Prospection of the Context

To study the possibilities of prospection and the contextual circumstances that emerge from the observed realities under the perspective of different evaluation aspects contributes to the exploration of the real situations and problems. Realities are built through conversations, social interactions and in an environment of intersubjectivity (VASCONCELLOS, 2013). Each aspect grants access to a slice of reality. Therefore, the prospection of the context encompasses the following activities (LIMA, 2015): 1) prospection of the contexts of the observed reality (MORIN, 2004; THIOLLENT, 1997; VASCONCELLOS, 2013); 2) identification of the system defined around the study's problem-situation, and of the new system that will arise for the solution of this problem (CHECKLAND; HOLWELL, 1998); and 3) identification of the main needs in order to conduct the research (MORIN, 2004).

In this step, two initial stages of the Soft Systems Methodology (SSM) of Peter Checkland (CHECKLAND; SCHOLES, 1990) were developed, and they are responsible for the description of the actual context of the Military Organization, which served as the object of study.

Chart 1 - Applied diagnosis and collection instruments.

Sources/Resources	Collection instrument	Frequency/ Average duration	Record
Workshop: - High Command, Division Headship and Sectorial Headship - Process analysts	- Participant observation	5 sessions/ 30 min	- Field diary - Copy of the support material
Seminar (Planned Action): - Division Headship and Sectorial Headship - Process analysts	- Participant observation - Discourse analysis	10 sessions/ 1h 30 min	- Field diary - Pedagogical intervention guide
Digital Library: - Legislation - Institutional and Sectorial Plans of the Aerial Operation Agency	- Content analysis	-	- Copy of the selected documents

Source: The author.

4.1.1 Definition of the problem-situation – stage 1 of the SSM Methodology

One of the biggest concerns regarding the management model in the military context refers to the comprehension of the business processes flows that culminate in the delivery of the service and/or products that characterize the mission of the Aerial Operation Agency. Thus, an organizational development project was developed with the goal of modelling the business processes of an Military Organization. The project lasted for 14 months, and ended in September 2013. A work group was formed to develop the activities of the project, and it was composed of many different roles: process analysts, information technology analysts, researchers, as well as business experts.

The investigated Aerial Operation Agency has a strictly hierarchical functional structure with a well-structured organization chart. All of the organizational units have a standard norm regarding how they are run, and it is exclusively based on its main functions, and clearly defines the roles and responsibilities of each sector and each civil or military servant. Beyond the internal regulation devices, which include other normative instruments, guidelines, regulations, and codes of conduct, the Aerial Operation Agency has at its disposal a vast body of doctrinaire knowledge that is highly useful for the guidance and preparation of its leaders and of those who are led.

However, the low competence in terms of the management of processes and the lack of culture about processes and projects complicates the conduction of the activities of management and governance, and also strengthens inefficiency, the repetition of work, the overlapping of tasks, and miscommunication. The prevalence of the logic geared towards functions partially explains the difficulties encountered. Even though there is not a clear understanding on the part of the Sectorial Headships regarding the potential benefits that the management of processes could bring to that Military Organization, the High Command understands that that the mapping of the processes and their subsequent modelling could contribute to the decision-making process in terms of direction; they also allow for the measuring of the organizational performance indicators. Given this scenario, and having the Command of the Aerial Operation Agency as its main interested party, the project for modelling processes was developed with the goal of mapping and modelling the business processes in order to contribute to the definition of a management model based on processes.

4.1.2 Presentation of the problem-situation – stage 2 of the SSM

The problem-situation is better visualized by means of a rich picture, which corresponds to a highly contextual graphic representation that includes actors, structuring questions, problems, processes, relationships and conflicts of interest that give an idea of the mood and of the real situation (CHECKLAND; SCHOLES, 1990). Therefore, the rich picture captures the essence of a situation, and helps identify the relevant subjects and ensure a common understanding of the different perspectives of evaluation of the problem.

It is through the rich picture that the real situation and what surrounds the problem or question of interest can be expressed visually (CHECKLAND; SCHOLES, 1990). Figure 2 shows a panoramic representation that refers to the conduct of the Aerial Operation Agency at the level

Figure 2 - Panoramic representation of the problem-situation.
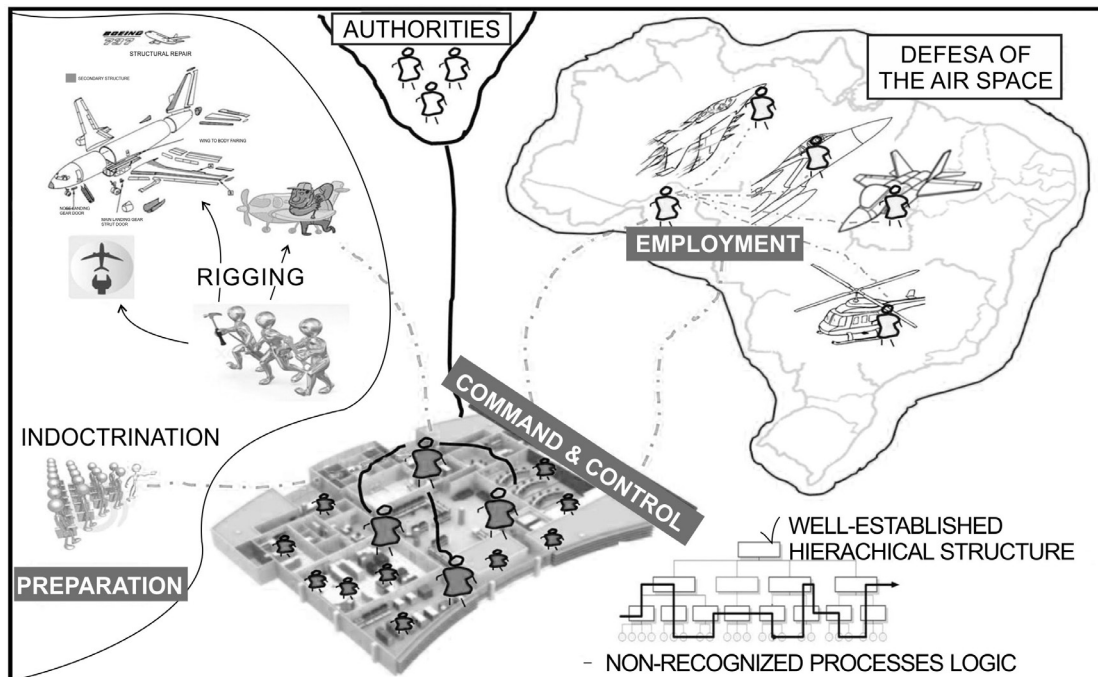
Source: The author.

of preparation and planning, as well as at the level of employment and operation. The preparation requires an indoctrination code and a preparation structure, while the employment of the aerial means requires a command and control structure. In this context, there is a recognizably clear organizational structure, but the same thing is not observed regarding the way in which the governance and management processes are organized and mapped by the Institution.

4.1.3 Cognitive mapping (SODA)

Strategic Options Development and Analysis (SODA) is an approach employed for the solution of decision problems using cognitive mapping. Cognitive mapping is a modelling technique to represent the space of the problem through a series of interconnected components and causal maps (GEORGIOU, 2010). Starting with the main goals intended for the project, and with the resources and potential means that contribute to reaching the goals and the activating actions that initiate the respective strategic fronts, Figure 3 identifies and displays in an aggregated way the tributary relationships that each component presents regarding the strategic options that were mapped.

4.2 Definition of the system that involves the research problem

At this stage, we make the definition of the System Defined Around the Problem (SDTP) of the research. Vasconcelos (2013) argues that through interactions and conversations emerges the problem-situation, whose observer, defining the situation as problematic, shares his/ her definition. Thus, the problem-situation is built though conversation, through the social construction of reality.

This stage involves the introduction of the problem-situation combined with the identification of the persons, the culture and the norms, through interviews and discussions, observations, brainstorming, and rich picture (CHECKLAND; SCHOLES, 1990). The purpose, therefore, is to move forward in the comprehension of the problem-situation by means of analyses that allow one to distinguish the SDTP that contains the scenario of the business processes mapping.

The results of the analyses conducted during the first stage of the project enabled us to explain the magnitude and the extension of the problem, since the research actors could express themselves regarding the situation, with their respective points of view. The determinants of the environment, the institutional issues, and the way in which the research actors and the other parties involved participated were important for us to understand what each one required or had to offer, their roles, their interests, and their main expectations.

This stage comprises the following activities: 1) comprehension of the goal of the business processes mapping project; and 2) conduction of an accurate research about the situation through many different types of descriptive analysis instruments, which are discussed and progressively interpreted (MORIN, 2004; THIOLLENT, 1997). Stages 3 and 4 of the SSM methodology were applied with the goal of outlining the systems model.

Figure 3 - Analysis and development of the strategic options – cognitive map.
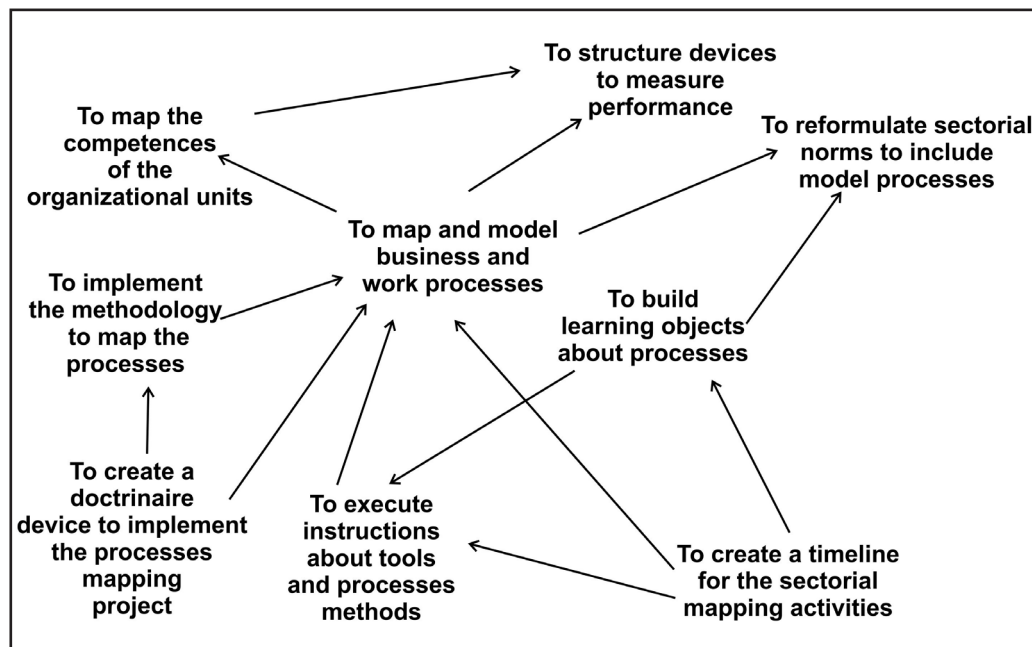
Source: The author.

4.2.1 Essential definitions of the relevant system – stage 3 of the SSM methodology

It is an instrument of analysis proposed by Peter Checkland (CHECKLAND; SCHOLES, 1990), which aims at summarizing the essential definitions to model the SDTP. In order to develop the analysis, the following evaluative questions were considered:

- which are the different perspectives of comprehension of the problem-situation?
- considering each perspective, what could be done, to whom, to what, with which presuppositions, and in what kind of environment?

In order to do so, we have adopted the CATWOE[3] technique, combined with the TASCOI[4]

technique (ESPEJO et al., 1996) to typify the system of interest. Both approaches are described together in Chart 2.

4.2.2 Conceptual mapping – stage 4 of the SSM methodology

Once the initial questions to describe the SDTP have been defined, the conceptual modelling allows us to reflect upon the composition and structuring of the key concepts, as can be seen in Figure 4. The goal is to represent the concepts that stand out in the problem-situation in order to comprehend the questions, their relevant aspects, and the kinds of relationship that exist.

Chart 2 - Key definitions of the relevant system.

Definitions	Approaches	Definitions
Worldview	CATWOE	Continuous improvement of the intelligence of preparation and employment of the aerospace means.
Actors	CATWOE, TASCOI	High Command of the Agency; Sectorial Headships; Sectorial employees; Process Analysts.
Suppliers	TASCOI	Companies that provide specialized and support services. Companies that supply equipment and subsistence and logistics items.
Clients	CATWOE, TASCOI	Presidency of the Republic. Brazilian public federal authorities. Teaching institutions and the command of the Brazilian aerial defense system. Society.
Owners	CATWOE, TASCOI	The Brazilian State and society.
Interveners	TASCOI	The State, through the judicial system and the constitutional principles directed at the Public Federal Administration.
Environmental restrictions	CATWOE	Inexistence of a structure of governance of the processes. Code of conduct based on the principles of hierarchy and discipline. Asynchronous institutional relationships.
Transformations	CATWOE, TASCOI	Execution of the intersectorial communication. Implementation of the strategic goals. Activation of the performance indicators.

Source: Adapted from Checkland and Scholes (1990, p. 35).

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[3] CATWOE is the acronym for Customers, Actors, Transformation, Weltanschauung (worldview), Owner and Environment.
[4] TASCOI is the acronym for Transformations, Actors, Suppliers, Customers, Owners and Interveners.

Figure 4 - Map of the SDTP concepts.
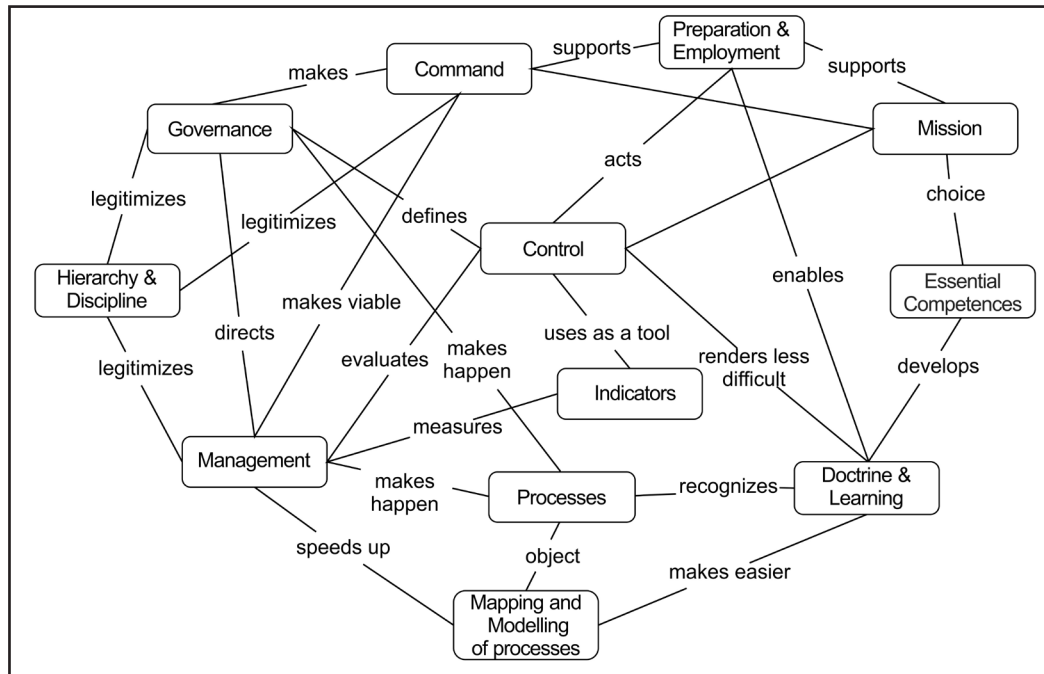
4.2.3 Aspects of Ulrich's boundary analysis

Werner Ulrich proposes an instrument for the boundary analysis of the reference system in order to make the diagnosis of the Critical Systems Heuristic (CSH), allowing for a reflective practice based on systems thinking and on practical philosophy (ULRICH, 1987). The CSH is an approach that uses a reference system to determine which observations (facts) and evaluations (values) are considered relevant when the merits and deficiencies of a proposal are evaluated (GARROSSINI, 2010).

The application of this instrument is for the improvement of the abilities of cognition and of argumentation, providing through the multiple points of view of the SDTP, whose situation-problem is not limited to its boundaries, and the possibilities of solution go beyond the traditional ways of understanding the analyzed reality (LIMA, 2015).

The mapping of the SDTP and of its design can be performed through many different techniques. We chose here to use the relationship map to build the possible relationships among the actors. The map has the goal of describing the relationships among the actors of the process that will be described. Moreover, it provides a point of view about the entrances and exits through which the functions of each actor flow, enabling one to find the gaps or, in the case of the present work, the failures in the communication process associated with the interested parties and with the executed activities, highlighting the defining aspects that characterize the relationships of power and influence, as it is described in Chart 3.

4.3 Pedagogical Action

Once the dimensions of the SDTP were known, the efforts were made with the goal of making the pedagogical action viable as an interventionist device in that reality. Based on the presuppositions of the anthropo-pedagogical method of Morin (2004), the intervention model makes an anthropological recovery in order to subsequently define the parameters that will be adopted in the process of the orienting action. The other stages of the SSM methodology – from 5 to 7 – were developed at this point.

The following are the activities proposed for stage 3: 1) dissemination of the results and definition of the achievable goals through concrete actions (MORIN, 2004; THIOLLENT, 1997); and 2) presentation of the proposals that may be negotiated among the interested parties (MORIN, 2004; VASCONCELLOS, 2013).

At this stage, we tried to equalize the desired changes and the feasibility of the systemic model before the real world to then negotiate and develop the improvement interventions regarding the system of human activity linked to the project.

The analyses developed in the three previous stages provided a set of information and traces that enabled us to make the following ascertainments:
- low culture of processes and projects;
- strictly hierarchical structure, with low fluidity in terms of business processes;
- norms for operational procedures focused on functions;
- inexistence of corporate architecture and information technology; and
- dissatis factory number of business and IT experts.

Chart 3 - Aspects of Ulrich's boundary analysis.

ASPECTS
PURPOSE [INTENTIONS, DESIRES, GENERAL INTERESTS] [Where does the concept of purpose and value come from? Which purposes have been served; and whose purposes are those?]
. Tactical-operational intelligence
. Preparation and employment of the force
. Operational excellency

POWER [GROUPS OF INTEREST AND DECIDING LEVELS OF THE SYSTEM OF MANAGEMENT OF PROCESSES] [Who controls the means and the resources? Who controls the situation and who is necessary for the success?]
. Presidency of the Republic (PR)
. Ministry of Defense (MD)
. Joint Chief of Staff of the Armed Forces (EMCFA, in the Portuguese acronym)
. Commander of the Mother Force
. Commander of the Aerial Operation Agency
. High Command of the Aerial Operation Agency
. Heads of the Divisions of the Aerial Operation Agency
. Heads of the Sectors of the Aerial Operation Agency
. Team of Experts of the Aerial Operation Agency
. Support team of the Aerial Operation Agency

KNOWLEDGE [THEMED AXES AND FIELDS OF KNOWLEDGE] [Which knowledge and experiences support the decision-making process? Which source of expertness contributes with the necessary information?]	
AXES	**DESCRIPTION**
▪ Competences in Aerial Operations	To launch the means and the technologies to manage the aerial operations.
	To launch the means and the technologies for the preparation and employment of the intelligence
▪ Competences in Command and Control	To launch the means and the technologies for the organization of the theater of operations.
	To launch the means and the technologies to ensure the fulfilment of the mission.
▪ Competences in Personnel Management	To launch the means and the technologies for the indoctrination of personnel and technical preparation.
▪Competences in Support and Logistics Management	To launch the means and the technologies to support the administrative processes and the information systems.
	To launch the means and the technologies to support the operations and aerial facilities logistically.
▪ Competences in Planning and Intelligence	To launch the means and the technologies to establish strategic goals and define the programmatical action plans.
▪ Competences in Safety and Defense	To launch the means and the technologies to protect and maintain the order in the aerial facilities.
	To launch the means and the technologies to prepare the aerial facilities.

LEGITIMIZATION [LINES OF ACTION AND LEGITIMIZING AGENTS] [What provides legitimization?]	
▪ Brazilian Federal Constitution	Constitutional legality of the action of the Joint forces - PR, MD, EMCFA.
▪ Institutional Action of the Agency	Commander of the Mother Force – offers explanations in terms of performance and productivity.
▪ Budget and Finance	Commander of the Mother Force, Chief of Staff of the Mother Force, Secretary of Finances, Direct Administration of the Federal Government.
▪ Personnel and compensation of the employees	Head of Teaching, Commander of the Mother Force, Direct Administration of the Federal Government.
▪ Adoption of management practices and IT governance	Logistic Support Agency (Head of IT), TCU, SLTI/MP.
▪ Process of acquisition, hiring contracts	Chief of Staff of the Mother Force, Secretary of Finance, CGU, SLTI, TCU.
▪ Practices and policies for information security	SIC Committee, TCU, DSIC/GSI-PR.
▪ Technological definition of IT	Logistical Support Agency (Head of IT), Brazilian Public TI Companies (SERPRO, DATAPREV and TELEBRÁS), private IT suppliers.

Source: Adapted from Ulrich (1987).

4.3.1 Possible and desired changes – stages 5 and 6 of the SSM methodology

Comparing the actual context with the SDTP (Figure 1), it is possible to identify the changes desired by the sponsor (the high command of the Aerial Operation Agency) of the institutional project, and the changes that are culturally feasible – stage 5 of the SSM (CHECKLAND; HOLWELL, 1998). Once this analysis had been performed, we could visualize the set of changes (Chart 4) that served as the parameter for the definition of the intervention method.

After a joint evaluation by the processes and information technology analysts and the business experts and the research actors to make the proposed changes viable, the three first changes were the only ones that were considered feasible, after the prior conditions for analysis and the ability to act under a systemic perspective were observed. They are: 1) low culture of processes and projects; 2) a strictly hierarchical structure, with low fluidity in terms of business processes; and 3) the norms for operational procedures focused on functions.

5 DISCUSSION

The interventionist actions were planned and executed in articulation with each other, taking into consideration the desirable and feasible changes of the institutional project – which are described in the top three lines of Chart 4, as well as the purposes of the researcher who conducted the action research project – summarized on the main goal of this study.
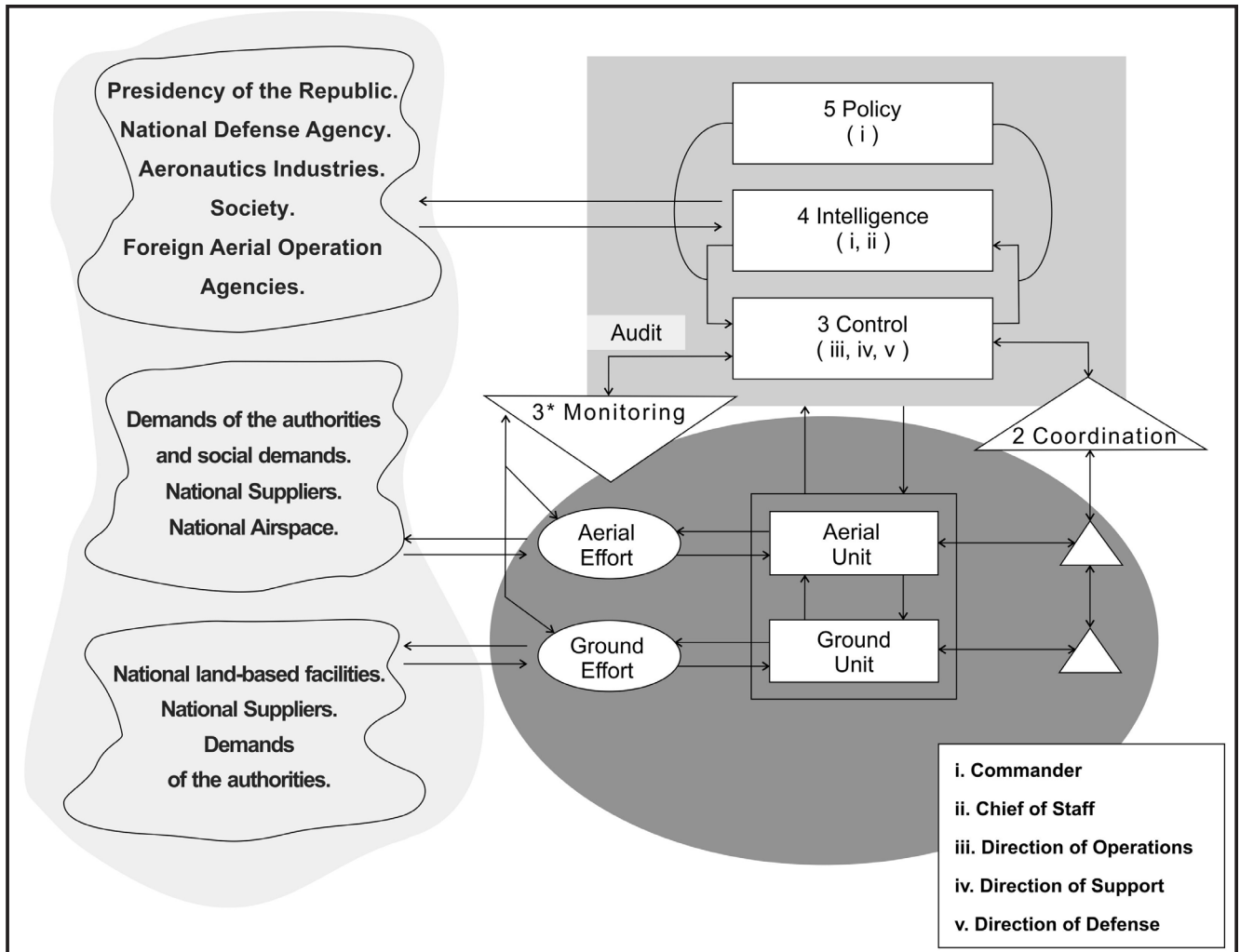
The results accomplished and the repercussion of the interventionist actions are summarized in the following constructs:

- analysis of the feasibility of the systems;
- summary of the results of the executed action; and
- actions for the improvement of the problem-situation.

5.1 Analysis of the feasibility of the systems

Through the evaluation made based on the Viable Systems Model (VSM) created by cybernetician Stafford Beer (BEER, 1984), the SDTP can be examined according to the subsystems that compose the VSM (Figure 5): policy, intelligence, control, monitoring, coordination and operational units. Out of those, only the coordination system is not formally established in the Military Organization studied here, even though it is executed in an unintentional and cumulative way by the three main Divisions of the Aerial Operation Agency.

Chart 4 - Desirable and feasible changes.

CHANGES	DESIRABLE	FEASIBLE
Implementation of activation workshops for the sectorial headships.	Yes	Yes
Implementation of a work and business processes mapping methodology.	Yes	Yes
Mapping and modelling of the work and business processes.	Yes	Yes
Definition of the devices to measure performance.	Yes	No
Proposal of a structure of work and business processes for the sectors of the organization.	Yes	No
Definition of the devices for the innovation of processes.	Yes	No
Mapping of the crucial competences for the sectors of the organization.	Yes	Yes
Sizing of the organization's technical ability for operational conduct.	Yes	No
Definition of the intersectorial communications plan.	Yes	No
Structuring of an office for the management of processes and projects.	No	No
Training and application of management technologies.	No	No

Source: The author.

Figure 5 - Analysis of the feasibility of the system.

5.2 Actions for the improvement of the problem-situation – stage 7 of the SSM methodology

The results obtained from the interventions performed in the SDTP are summarized in Chart 5. It is at this stage that the discussion and reflective evaluation about the action in practice (intervention model) and about the practice in theory (construction model) are conducted.

The organizational configuration of the Aerial Operation Agency indicates that the coordination system has the role of making viable the alignment between the intelligence and operation systems. As long as the principles of self-organization and adaptability are observed, any regulation function of the organizational system requires the effective action of the systems of control and monitoring in order to maintain a condition of stability.

With the implementation of the field research project, we can verify that the command and control devices are strongly geared towards the functional and operational aspects, even though they are not aligned with the strategic actions for the improvement of the business processes.

Even though the organizational architecture is primarily functional in the Aerial Operation Agency, the network phenomenon is present in the human activity system when the way of working, thinking and interacting is evidenced, generating the need to adopt beforehand an approach based on the management of processes. Even though the organizations are part of a network context, the power of the administration's traditional hierarchies can inhibit new spaces for learning, innovation, and constant adaptation. One way to overcome this limitation is to seize the technologies for the management based on processes.

The circle of learning in a spontaneous, dynamic and significant model consists of an action followed by a reflection. In the present work, the future actions

Chart 5 - Summary of the results of the performed action.

Topics for Analysis	Results	
Programmed Actions & Executed Actions	Implementation of activation workshops for the sectorial headships.	The headships satisfactorily received and assimilated.
	Implementation of a work and business processes mapping methodology.	Many difficulties were encountered when employing the methodology due to: new concepts, the logic of the processes, and unavailability.
	Mapping and modelling of the work and business processes.	First version of the mapped work processes. Low productivity and little involvement.

Benefits Achieved	- Bolstered the internal discussion about the work flows of the sectors of the organization.
	- Enabled the reflection about the existing anomalies:
	    ▪employed resources in some activities; and
	    ▪Miscommunication among the adjacent activities within the same project, executed by different sectors.
	- Possibility of defining goals and indicators for the processes.
	- Inclusion of the processes map as an extension of the operational norms.	

Difficulties Encountered	- Low maturity in terms of the employment of the notation for the mapping of processes.
	    ·The mapped process is incoherent with the actual process.
	- Logic based on the functional structure.
	    ·The Organization's focus hinders the reasoning based on the processual view.
	- Reduced team of processes analysts.
	    ·Requires proper preparation to support the experts.
	- Concealed macroprocesses of the Agency.
	    ·Limited perception of the processes restricted by the functional view.
	    (Rules and Operational Procedures).	

Source: The author.

for the improvement of the problem-situation are organized as a guiding map, as Figure 6 shows.

6 CONCLUSION

If, on the one hand, the findings obtained through systemic prospection enabled us to distinguish the key components of the intended management system, the main entities of the environment, the production cycle, and the new organizational configuration, on the other hand, the results reveal a strong tendency of providing the management with control devices strongly geared toward the functional and organic aspects. All of that, however, without developing instruments for activation and organizational learning, guided by the dynamics of the system of human activity that acts on a given Organization.

Generally speaking, the results obtained with the implementation of the first stage of the project of mapping and modelling processes, though in a preliminary way, point to a better comprehension and acceptance on the part of the business experts of the investigated Aerial Operation Agency, given their predisposition to collaborate on the process of institutional development. Therefore, the multi-methodological evaluation made with a systemic focus enabled us to comprehend the problem-situation and the main determinants and restrictions that had an impact on the daily tasks and on the human activities of that Military Organization, making it more prepared in terms of efficiency and systemic feasibility.

When we evaluated the systemic feasibility conditions for the implementation technologies of management based in processes, we identified an important weakness in terms of the constitution of a coordination system, since it was not properly consolidated within the core of the organizational structure, which makes the interfunctional and intersectorial communications process more difficult.

When we proposed the action research project, the goal was to facilitate the access to the environmental, social, political, cultural and technological contexts that had an impact on the management system
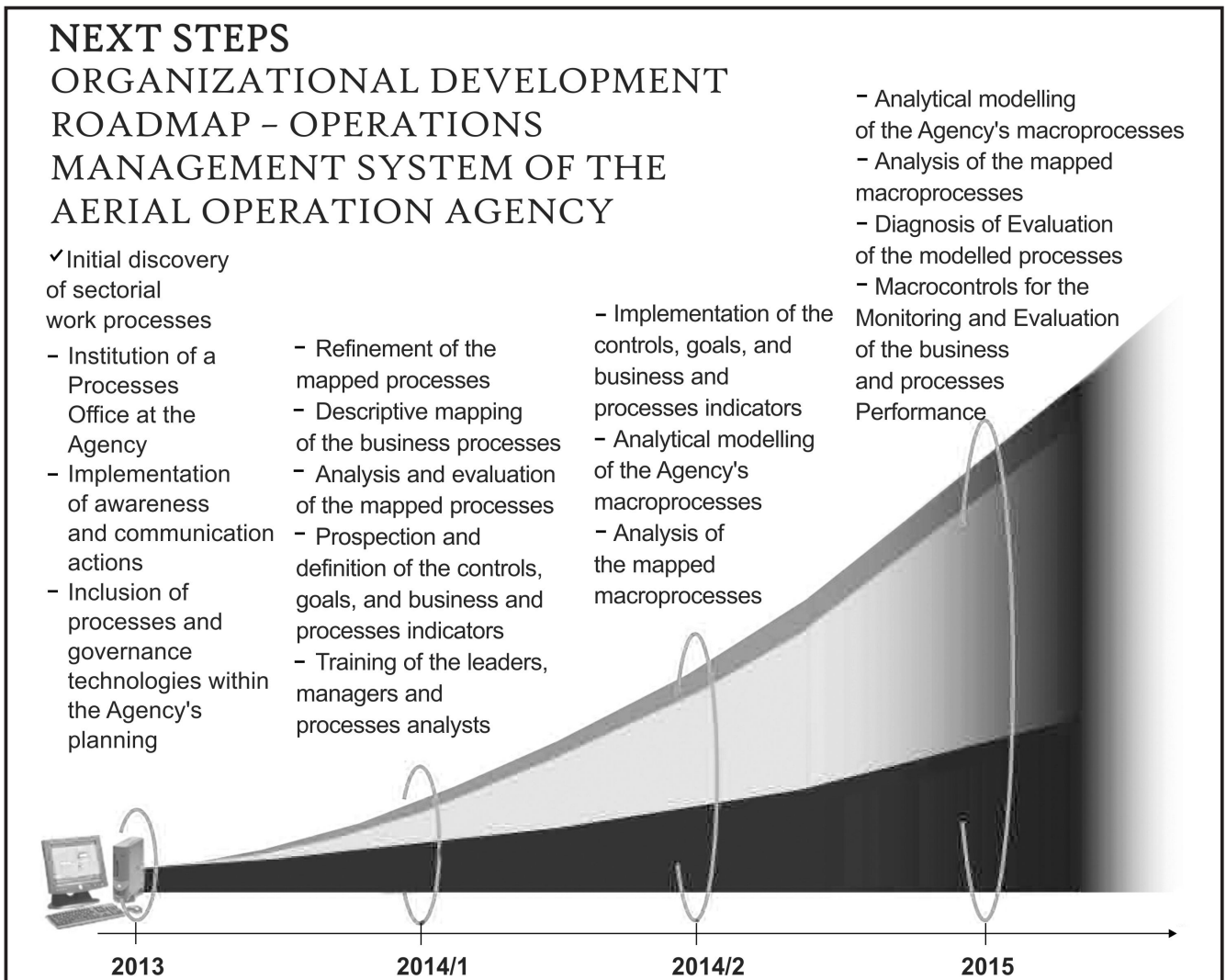
of the Aerial Operation Agency, so that we could apply an intervention model focused on actions of a pedagogical nature. Consequently, the very same definition of the subsequent steps of the processes modelling project can be conceived based on a guiding map containing the main developments and prospective actions.

The results of the investigation could reveal a strong tendency of supplying the business processes model with command and control devices that, combined with the contextual and relational aspects, such as the

coordination and organizational learning instruments, provide the organizational effectiveness.

Once an *in vivo* research style, rather than an in vitro research style, is adopted, with it comes a concern with the assimilation of the perceived realities that act as the stage for organizational changes to take place. Therefore, rather than passively observing facts and phenomena, the action within the practice of a military organization enabled us to reinforce the principles of the permanent flow and of the untimely implication, which are very characteristic of systems thinking.

Figure 6 - Actions for the improvement of the problem-situation.

NEXT STEPS
ORGANIZATIONAL DEVELOPMENT
ROADMAP – OPERATIONS
MANAGEMENT SYSTEM OF THE
AERIAL OPERATION AGENCY

✔ Initial discovery of sectorial work processes
- Institution of a Processes Office at the Agency
- Implementation of awareness and communication actions
- Inclusion of processes and governance technologies within the Agency's planning

- Refinement of the mapped processes
- Descriptive mapping of the business processes
- Analysis and evaluation of the mapped processes
- Prospection and definition of the controls, goals, and business and processes indicators
- Training of the leaders, managers and processes analysts

– Implementation of the controls, goals, and business and processes indicators
- Analytical modelling of the Agency's macroprocesses
- Analysis of the mapped macroprocesses

- Analytical modelling of the Agency's macroprocesses
- Analysis of the mapped macroprocesses
- Diagnosis of Evaluation of the modelled processes
- Macrocontrols for the Monitoring and Evaluation of the business and processes Performance

2013   2014/1   2014/2   2015

Source: Lima (2015).

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