Organizational Views applied to the Operational Dimension

Carlos Páscoa\textsuperscript{a,c,*}, João Cardoso\textsuperscript{a}, José Tríbolet\textsuperscript{b,c}

\textsuperscript{a}Department of University Education, Portuguese Air Force Academy, Sintra, Portugal
\textsuperscript{b}Department of Information Systems and Computer Science, Technical University of Lisbon, Portugal
\textsuperscript{c}CODE – Center for Organizational Design & Engineering, INOV, Rua Alves Redol 9, Lisbon, Portugal

Abstract

It is important for organizations to have flexible, personalized and specific views, in order to ensure the availability and visualization of important data that, integrated into the information system, can bring an increment of organizational self-awareness, adaptability, flexibility and agility to the Organization. The creation of a system of views for the information architecture of the Portuguese Air Force is important because it ensures the availability of the necessary information for each user, aiding decision making in real time, given the constant change in the external environment. The lack of appropriate views to the various levels of the Organization defined the problem. The research conducted intended to identify what information had to be seen by the different stakeholders and develop an integrated system of operational views (missionboard), that could improve the operation and introduce a link between the strategic, tactic and operational levels.

© 2013 The Authors Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
Selection and/or peer-review under responsibility of SCIKA – Association for Promotion and Dissemination of Scientific Knowledge

Keywords: Dashboard; Information; Information System; Views; Operational Triad; Portuguese Air Force.

* Corresponding author. Tel.: +351-214 726 129
E-mail address: cjpascoa@gmail.com.
1. Introduction

Nowadays, organizations worldwide face multiple and serious crises, some economic, political or social. Increasingly, the 'rationalization of resources' should be taken in account in the organization’s decision making.

In several Information Systems (IS), which contain the same Informational Entities (IE), the duplication of information is a problem that affects many organizations.

The Portuguese Air Force (PRT AF) is no exception and contains several IS, which makes it difficult to obtain a specific set of information. To improve this situation, it’s proposed the creation of a new system of operational views for PRT AF, contributing to the improvement of the IS inserted in the ‘Apoio à Gestão da Força Aérea’ (SIAGFA), by creating a system of views linking IE to the stakeholders. And, as a result, there is an increase of the Organizational Self Awareness (OSA).

It was deemed to be of high importance the creation of organizational views to improve the operation of PRT AF’s resources, covering all the operational components in the three organizational levels.

The research showed that PRT AF hasn’t the appropriate views for each of the organization’s levels. Therefore, it’ll be determined to what extent the integration of a system of views applied to SIAGFA benefits the PRT AF’s Operational Organization.

Section 2 explains the most important concepts and applications of this subject. Section 3 describes the development of the model for the new system of views for the PRT AF. Section 4 has the conclusions.

2. Concepts and Application

This paragraph describes the theoretical framing that supports section 3, bridging Organizational Engineering to other scientific theories, principles and models directly relevant and necessary to approach the subject, namely the development of a System of Organizational Views.

2.1. Organizational Self-Awareness

The Organizational Self-Awareness is quite important nowadays since individuals from organizations require a big amount of information to have the OSA needed to perform their tasks. A greater access to information and important data leads to an increasing of the OSA.

Having good views to the organizational information allows the existence of a proper OSA in both dimensions. The first dimension refers to the ability of the elements. The second dimension is about the congregation of the interaction between individuals, organization, resources and procedures [1]. An organization might be called self-aware when the organization and his individuals are in congruence. When these two dimensions are completely achieved, there are the required conditions for the mission accomplishment to be successful.

Agility is the capacity to continuously monitoring the needs of the market, quickly responding to new products, services or information, quickly inserting new technologies and promptly modifying the business processes [2]. Agility might create tangible benefits too many aspects of the organizational performance, such as, an increasing of the innovation, shorter development cycles, faster availability to the market and the decreasing of the risks.

Flexibility is the “capacity to achieve the success in different ways” [2]. This characteristic allows the companies to create a large variety of methods to reach their goals, sooner identifying the changes on the environment, reducing the risk, predicting many possible futures and economizing time in contingency plans.

Furthermore, the adaptability refers to the “capacity to change the strength of the organization and his working processes when it’s needed according to the changes of the situation and/or the environment” [2].
The organizations are adaptable when they can change the way how information is shared and when they can involve different parts in collaboration and planning sessions. They are adaptable when they can find new ways of dealing with new partners. The condensation of the organizational structures and the creation of conditions that allow the leaders to adjust the direction of the organization are also important points that make one organization to be adaptable. However, to be adaptable requires reorganization and internal redistribution in what matters to disposition, functions and information fluxes [2].

2.2. Organization’s Layer and Dimensions

The way organizations are usually structured and interact is proposed by Thompson [3] that defends the existence of an institutional top in the organization’s pyramid, the strategic top, where high level decisions, which will have long term impact, are made. In the body of the pyramid there is a directional level, where intermediate level decisions that will have an impact in the medium term occur. At the base, we find the operational level, where decisions that relate to the execution of business activities are made. However, military organizations exchange the second and the third level.

As such, the PRT AF, as a military organization considers that, at the top of the pyramid lays the strategic level, in an intermediate position, the operational level, and at the execution, the tactical level. This is the layout that is used throughout this paper.

The PRT AF also considers dimensions such as the operational dimension, which is responsible for executing the missions, the logistics dimension, which is responsible for handling maintenance and support activities, the personnel dimension, which is responsible for managing the personnel careers, etc.

“…The fundamental elements of the operational dimension are: mission, aircraft and crews…” [4]. These concepts, named the operational triad, relate with each other following a specific order. The Mission convenes the necessity of having aircraft and crews. Crews use / manage the aircraft, which in turn is used to accomplish the Mission [5].

For the purpose of this paper, the operational triad and operational views apply to the operational dimension and the strategic, operational and tactic levels refer to the organizational levels.

2.3. Information Architecture

Information Architecture is the structure of IE necessary for the pursuit of the organization’s business processes. In other words, information architecture defines which IE are required and how do they relate. With that, IE is equivalent to the business concept, meaning the information required for the business.

It’s now important to define that IE can mean anything (person, place, or something physical, etc...) That is meaningful in the business’ context and is relevant to the organization. It is characterized by having a name (simple noun), a unique identifier, whereby their occurrences are uniquely recognized in the organization, a simple description and the processes and relationships with other entities and IS.

Regarding the information’s management, its main principles are the acquisition, classification, storage, editing, quality control, preservation, distribution and the information analysis.

The nature of the information must be appropriate to the various management levels: Strategic, Operational and Tactic (or directional). The strategic management level covers enterprise decisions in the medium and long term, requiring global information quarterly, biannually and annually, and these are mainly aimed at managing innovation, resource definition and finally solving important problems. The directional management covers coordination and planning decisions of a subject in the short and medium term, requires aggregate information on the subject to the month and quarter, focusing equally on problem solving, innovation and resource management. At the operational level, decisions are made concerning an activity with
immediate effect, requiring detailed information about the day and week. Its main area of action is the problem solving, using the resources and dedicate as a last priority to the innovation.

Concerning the information taxonomy, data can be classified as historical or projected, primitive or derived and public or private. The different data types determine the characteristics of the access and the information systems that manage them.

The primitive data depends on a single fact or occurrence in the organization, for example, the record of the date, amount and stakeholders of each transaction. The derivatives depend on various facts and events in the organization. Data is calculated, aggregated and summarized. Historical data records what happened using accurate and correct values. There is an agreement on when or how to calculate it. The projected data is an estimate or forecast of events that will happen. The concept of right or wrong does not apply to projections. Normally there is no unanimity on how to obtain or calculate it. Finally the public data is the one which integrity is maintained by the organization, it may be the only record of a fact in the organization, and is relevant to several individuals in the organization. Private data reflects the immediate needs of each individual, is owned and interests to a single individual.

Information architecture follows the relationship between users, content and context. The context refers to the organization's objectives, policies, culture, technology and human resources. The contents mentions documents, formats / types, objects, metadata and the existing structure. And users contemplate audience, tasks, needs, information seeking behavior, experience and vocabulary.

According to [6], the information architecture defines a view of the information that actors need to develop their activities.

2.4. Modeling

A model is any simplistic interpretation of reality, helping to understand the system to be developed. Modeling presents a set of fundamentals that are necessary to note, so one can understand the context in which it is run.

It begins by defining the universe of discourse, or system, which is the fragment of the real world about which tasks modeling and construction of the system are focused. Their identification requires knowledge of the system boundary and its real-world entities. It is necessary to take into account that there may be different types of systems.

The modeling concept has a structure consisting of a set of basic abstractions that allow the identification and characterization of the entities represented. Examples of these concepts are: Entities, IE; Classes; Aggregates; Events and Relations.

Regarding the modeling language, this has to do with the structuring and specification of the concepts, in one or more languages that can be formal or informal, textual or graphic creating an unambiguous association between the structure of concepts and the respective modeling language. The level of graphic modeling languages, it should be noted the notation, which consists in the visual presentation of various components of the concepts underlying structure.

The model is the junction of interpretation and conception of a system, depending on different points of view, and their specification involves a certain level of abstraction and detail. In turn, a scheme is the specification of a model, using a particular language that can be formal or informal, textual or graphical, and in cases of graphical representation, it is given the name of the diagram. Models present themselves as a simplified interpretation of reality, allowing a better understanding of the system to be developed, especially in cases of complex systems, and must have the ability to meet various needs in accordance with the interests of different stakeholders. To illustrate different representations of the model are used views, one view is the
representation of a system from a perspective relates to a set of interest, since the viewpoints consist of a conventions for specifying the construction and use of views.

The modeling technique is a well-accepted and proven engineering today, which presents several benefits, including the fact that enable knowledge sharing between users and technicians and between different types of technicians, also enables better management of projects, providing cost and time, allows the visualization of a system over time, can specify the structure and behavior of a whole system, and documenting the decision making undertaken.

The modeling is based upon a set of four principles. The first argues that the choice of models to create has a profound influence on the way the problem is attacked and consequently, as the solution is treated, the second suggests that each model can be expressed at different levels of precision / abstraction, the third principle states that the best designs reflect reality, and the final argues that no single model is sufficient.

2.5. Views

As well as the cockpit of an aircraft is intended to provide the crew with all the information necessary to maintain situational awareness, the organizational cockpit similarly supplies OSA, with the most appropriate information.

The cockpit, already referenced, brings together a variety of indicators that provides all the information to the crew through supervision of aircraft instruments. In an aircraft are still available mechanisms for correction and adjustment. The adjustment mechanisms, for example the power handles from the engines of the aircraft, confirming a change in behavior of the aircraft in correspondence to changes in the external environment. Referring now to PRT AF and citing Páscoa [4]: "... the organizational cockpit must traverse the fundamental elements of organization’s performance, Mission, Aircraft and Crews, in other words, contain all relevant elements for driving the strategy in achieving its stated objectives, and also hold the adjustment mechanisms that allow, among others, to recognize when to change the configuration or when to change artifacts inside the configuration.”

So, the organization needs to design and establish the mechanisms that are essential. From multiple restrictions, passing through the needs of real-time information organizations have. Not forgetting the many possible configurations for managing the complexity associated with the management.

The dashboard is a representation tool, which includes charts and diagrams with associated measures of meaningful information to the organization and may have a better perspective of goals and objectives. Resembling instruments of an aircraft’s cockpit, where the color marks indicate a hazardous area or normality [4]. This tool can harmonize all the useful information of the organization in a single level, thereby facilitating its access and visualization, with the creation of custom views. The graphics carrying information are “worked and exposed so that, who is looking at them, has an easy perception of its contents” [7]. The anticipated perception of potential problems and reacting to regularize the system is directly linked to the aid in decision making. Predict and react are two of the best uses of a dashboard. Few [8], states that the dashboard is a view of information relevant to the goals, or targets, previously defined, making it a relevant piece in a way of conveying this information.

These two concepts are examples of views, as a view is by definition a representation of a system from which it is intended to obtain a perspective. [4] This perspective that is a set of information related to certain interests [9].

The organization’s views serve to help the user to focus only on what interests him at a given moment. They should be built and updated automatically. On the one hand a dashboard is an interface that organizes and presents information in an organized and easy to view and percept way. On the other hand the cockpit is a
tool possessing a set of monitoring indicators. It should contain key elements of the organization, in PRT AF’s case, mission, aircraft and crew [4].

3. The System of Views

This section is intended to explain the logic of building a model for the integration of the system of views.

3.1. Model Development

Anyone with responsibilities and having to make decisions in their function must have tools, like a view useful for IS that assists it in acquiring agility, flexibility and adaptability in a harmonious way. As a result he can monitor and integrate, in a gentle way, the environment in which it is involved and especially finding out expeditiously the information architecture and IE that are at his disposal in accessible information systems. There is a provision of IE that stakeholders need to perform their duties; the organization and individuals increase their degree of adaptability and flexibility, therefore improving agility.

A stakeholder, by definition is an individual or interested part; it can be an individual or a set of several people, which in this case are interested in information concerning to the information systems of PRT AF. Given this definition, it is easily observed that there are three types of stakeholders, corresponding to different levels of the organization. Different stakeholders will lack distinct dashboards (views) with different data and information, depending if they are on the strategic, operational or tactical level.

By creating a system of representation of information of information systems (views), the aim is to change how a stakeholder has access to a view most suited to its function. This point specifies the construction and use of its own views. The air operation through the operational triad connects the concepts of Mission, Aircraft and Crew, being it based on these three main IE [5]. All other data are part of the operational view, which are attributes derived from these three IE. A good view can aid in the visualization of systems, such as obtaining historical data, projected, primitive, and derived, according to the functional needs of each stakeholder [3].

Interpreting the metaphor “Flying the Organization” [10], the existence of a Cockpit serves to transmit information to the crew by presenting indicators that enable situational awareness. Connecting this definition with the concept of view, being the representation of the IS relevant to the operator, it is therefore upheld that any individual should have access to a specific, view shaped, organizational cockpit, for the IS (Dashboard). Making the analogy with the aircraft, individuals in the organization will also have a greater self-awareness, as a crew upon 'seeing' the cockpit. The main difference is that the cockpit, besides giving, information also has adjustment mechanisms, while a dashboard is a merely 'display' of information. Linking the cockpit and dashboard consequently creates a specific view for each stakeholder. These entities, possessing appropriate views, will win the situational awareness which is intended that all individuals in the organization have.

Dashboard is a cockpit without adjustment mechanisms, becoming a View.

There are views which are presently being used by various PRT AF stakeholders. However these stakeholders use personal views, specific, but built and managed by themselves, leaving aside the PRT AF’s IS views. As a result the views currently available with operational information only appear at a tactical level, being exclusive to certain users or, at the most, locally attached (these views are called missionboard). Not allowing, therefore, the passage of information throughout the organization. Despite the expenditure of resources and the duplication of information in PRT AF’s IS and other auxiliary systems produced by users, these possess some advantages, since they guarantee data processing, using all necessary information for their sole benefit [11]. Since there are not only benefits, drawbacks arise, such as a lack of uniformity in producing views and wasted resources in the creation and maintenance of several local views. Without the connection
with the upper levels, the chain of command does not have access to this tactical level information. Jeopardizing the OSA and the adaptability, flexibility and agility, due to lack of information which is really necessary and in due time, for decision making by the middle and high levels of PRT AF.

It is viable to construct a model structured on a system of views, being extremely important the existence of a views system for the operational organization. The amount of data and operational information present in this views system will enable stakeholders to identify and develop decision support indicators, to control the fulfillment of the goals and objectives of the organization and / or individual. A system of views of the operational organization should be appropriate to the context of the various levels and various entities. The views must embrace the IE, Mission, Aircraft and Crew.

3.2. Model Construction

In building a model, in the first instance, it matters to identify its logical construction. It has the following order: 1) Identify stakeholders; 2) Identify attributes, related to operational information; 3) Build a matrix; 4) Standardize the CRUD (create, read, update and delete) matrix (using parameters and concepts of information architecture); 5) Insert new attributes or stakeholders; 6) Group the attributes as IE; 7) Group the stakeholders, creating categories of stakeholders; 8) Relate the IE with the categories of stakeholders.

As can be followed by figure 1, the creation of dashboards through a view’s system for the operational organization brings more OSA, adaptability, flexibility and agility to any of PRT AF’s individuals, at all levels of the organization.

Fig. 1. Organizational Dashboard model [10].
This model supports that there should be a distinction of stakeholders depending on the organizational level to which they belong. In order to access and 'look' to flying activity according to its requirements. The model’s construction logic begins by identifying all the stakeholders of the three levels of the organization.

A dashboard is an interface that, as a cockpit, manages and presents information in an organized and easy visualization and interpretation form. With an individualized dashboard for each user, it is possible to fight the gaps in missing information. Keeping all users and stakeholders of the operational information, with the most relevant and updated information. Being relevant to carry out a survey of all attributes related to the operational information.

After possessing all operational attributes and all stakeholders, a matrix is built, relating these two variables in this single matrix. By making the standardization of the matrix, using the parameters and concepts of information architecture, the appearance of a CRUD matrix is possible. And always with the possibility of introducing new attributes or even new stakeholders. The attributes will be grouped together forming the IE. As a result we begin the construction of a CRUD matrix, creating a link between IE and stakeholders. With the standardization of the CRUD matrix, you can group the stakeholders, defining therefore user groups, or categories of stakeholders. A category of stakeholders is defined as an associated group, depending on the information that will be available. The IE is conferred to the groups of users.

As intended, the final CRUD matrix manages the correlation of categories of stakeholders with attributes. You can then create views with specific attributes for certain categories of stakeholders. It is through this matrix that dashboards are designed, thereby gathering for each group of users the operational attributes associated with it. Created the categories of stakeholders, thus generates several types of views, called dashboard. Through the CRUD matrix that relates the categories of stakeholders with attributes related to operational information, the views’ system should generate the operational view that is intended for insertion in the integrated system of operational management, thus reducing the duplication that exists on the ground, with multiple and different IS.

With a custom dashboard, but standardized and applied to SIAGFA, connecting users of the three levels of the organization. And it appears a more obvious connection between the phases of planning, implementation and monitoring and analysis, by providing access to information in a timely manner. PRT AF must resort to an information system that integrates the operational dimension IE, the Mission, the Aircraft, the Crew and all the attributes associated with the operational triad. Articulating them, as the organizations own employees update in real time their actions’ development so that the system is reliable and is always updated, having the stakeholder’s access to their dashboards in real time. The success of this system depends, mainly, on the users of the IS, since they play the leading role in the introduction and constant update of data in the system, in order to ensure the validity and real time of information, keeping the information available to all PRT AF in real time and giving credibility to the system of views and the IS. It is in the interest of all entities, regardless of the organizational level where they are, that all the information on missions, planned and executed, is recorded.

To make the organization more adaptable, flexible and agile, there must be a significant increase of organizational knowledge within the organization. This increase of OSA can be facilitated with greater access, ease and availability of relevant information available in the IS. As depicted in this model, availability of information must be individualized, what is intended is a greater organizational knowledge by individuals and also a better and faster decision making. The information viewing privileges shall be defined according to the position of each user in the organization, making a macro distinction between stakeholders from different organizational levels. For a strategic level individual needs to access other type of information that tactical level individuals. All IE related to flying operations are available in the IS. As observed, this operational triad is in the center of the model. And the stakeholders, the most interested in acquiring OSA, with the obtainment of information of the operation, can make decisions regarding the course of the operations of the organization.
The view will be composed by the informational and operational entities and by attributes that must be defined and assigned to each entity. The assignment of IE to stakeholders should be careful and well documented, not questioning what users intend to see, but what you really need for decision making in a given role.

With the creation of a single dashboard, for all operators of the IS in the operational dimension and the access control to those same dashboards, with the emergence of categories of stakeholders, the PRT AF obtained several advantages. The model of a new views’ system ensures uniformity, not only in terms of information but also procedures, working methods or activities. It creates a unique view to all stakeholders, changing only the visible information, depending on the type of login to the IS. Standardization of information available and how it is viewed, also standardizing processes and activities related to data insertion and visualization of the Air Force’s IS. With a single IS, duplication of information is unnecessary, resulting in an economy of effort and in a decreased likelihood of error or inconsistency of data. These views are transverse, both horizontally (at the tactical level between base units and air units) as well as vertically, enhancing communication between PRT AF’s various levels. Existing direct access to the dashboard, and other needed information, to types of stakeholders existing at the operational, tactical and strategic levels. The visualization of information will be instantly available, depending only on the operator responsible for data entry, making this way the organization closer to real time. All these benefits, for the reason that information is easily and rapidly available, result in an increase of adaptability, flexibility and agility of the organization. Decision making will be faster, being the impact of that decision more easily visible.

3.3. Model Validation

There are several and different dashboards that are currently available throughout the base units of PRT AF. To identical stakeholders, access to different types of information is provided resulting in types of views with different information, depending from the base unit to base unit. The CRUD matrix is formed with the relation between the stakeholders and the informational attributes that are already available in some locations. All attributes visible by stakeholders, contained in a matrix, were grouped, being possible to define categories of stakeholder, and the respective associated IE. This Category now operates as a single stakeholder, regardless of location and base unit associated to it. With this, all identical stakeholders are connected with the Air Force’s IS, with standardized views and access to identical and beneficial informational attributes. It is from the final CRUD matrix that the information for the creation of a uniform view for certain category of stakeholder will be taken. It is thus possible to have a specific and detailed view, only containing the information which is really necessary and relevant to a category of stakeholders. With the success achieved with this proof of concept, we can then do the extrapolation of a single example, presented here, and as a result perform the same procedure for all other categories of stakeholders, and for all levels of the organization, or even create new stakeholders. For a proof of concept we created a view representative of a category of stakeholders: The Base Operations Category at the Tactical level. Data fields were assigned to the “Base Operations” Stakeholder as an initial setup. Users can personalize the stakeholder view according to specific needs by adding new fields. However they have to always maintain the initial setup fields.

4. Conclusion

The goal of this research was to create a system of views of the operational organization for all PRT AF entities to have access to the information architecture. Therefore, all of the operational IE areas can achieve a better operation of the available resources and faster and more efficient decision making. A system of views applied to SIAGFA contributes to improving the verification of the organization’s goals and objectives.
accomplishment. It also creates and monitors decision indicators. The creation of a system of operational dimension views, for the PRT AF organizational levels, should follow the principles of organizational engineering, while changing the organization. The individualization and detailed views of specific PRT AF individuals produces an increase of the PRT AF’s OSA, thus making the PRT AF an organization with higher levels of OSA. Thus, an organization more likely to predict changes in the middle and get overcome the difficulties to achieve their goals and objectives.

The views that should be created are called missionboard at the tactical level, dashboard at the operational level (intermediate level) and a performance dashboard at the strategic level. The presentation of views in SIAGFA will just be a new presentation layout of data and information already available in the PRT AF’s IS. A new view of specific information, previously filled, is created. From the moment that all interested individuals have access to a view with specific information of a particular function, they will spend less time searching for the data in IS, being therefore able to access faster to the information and to react and take actions to optimize and correct potential problems. All IE necessary for creating views are already available in IS, so it is only necessary an adjustment in IS in order to make a variety of views available for all stakeholders. The creation of individualized views for each individual the organization had provided a considerable increase in its OSA and also an improvement in the information available for the decision making process. The PRT AF becomes more aware of the state of air activity, thus becoming more adaptable, more flexible and more agile. Credible and updated operational information is now available and easily accessible to the organization’s employees, supported by an economy of effort, a centralization of information and standardizing procedures. Flexible and specialized views of all individuals are required for organizational development and to increase the OSA. PRT AF becomes increasingly adaptable, flexible and agile, therefore more able to survive the environmental changes.

Implementing scientific theories and concepts in a military organization is not an easy task. Bearing in mind that applying known concepts is not always a trivial job because each organization has a different way of working, it was possible to congregate wills among the interested parts at all levels of the organization. The work done is the result of congregating efforts with different entities, with different interests, that took significant communication channels and broad common sense.

References