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Governance: Decision-making Model and Cycle

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Abstract

The uncontrollable dynamics within organizations are a challenge for their agents. Currently, one encounters the non-stop optimization of business processes which translates into an undeniable competitive edge between organizations. To guarantee a correct and efficient application of resources, methods and models, able to align decisions with managerial objectives, must exist. However, the complexity involved in decision-making on a strategic level requires effective deliberation. The current paper contextualizes the decision-making process of the Portuguese Air Force Headquarters using the Harrison Cycle, categorising it in programmed and non-programmed situations, and suggests the introduction of a new method, based on the individual analysis. This method is a form of multi-criteria analysis called Analytic Hierarchy Process (AHP), which allows for a more cohesive course of action in the elaboration of a Headquarters Study.

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1. Introduction

The evolution of organizations is based on the agents that compose them but the diversity of points of view related to a certain objective creates a wide field in what concerns the liberty of the decider. To confine the decision to the organizational objectives without compromising the free-will, one must study all the process required to make a decision. In other words, the Decision Cycle.

It is an error to consider that every situation has perfect approach to be dealt with. There are always some aspects that are unpredictable and will cause a deviation to what is considered to be the perfect decision. Therefore, instead of sticking to current techniques, one should try to perfect a good rigorous and convenient practice. It is in this continuous search for innovation that the resistance to change is born. This obstacle must be solved efficiently so that no problems are created in a more advanced phase of the project. There are several mechanisms to make this process easier but, overall, one must take into account two important factors: the gain that will come from the change for the organization and the degree in which the affected individuals are involved in the process.

This change has its origin in a decision. A decision can be necessary whether because there's a problem or because there's an opportunity to perfect a certain aspect of the organization. Either way, there's an 'objective' behind the situation. Trying to reach this goal, there will be hardly just one path to follow unless the investigation was poor since if it were an investigation with depth several 'alternatives' would come through. It is, therefore, necessary to 'compare' these alternatives to discover which one is best suited to the organizational objectives. Taking the overall alternatives into account the decider must 'take action'. From this moment on, one must focus on the 'implementation' of the alternative chosen and the 'follow-up and control' of the decision is essential to evaluate if the action fulfills what's demanded.

This decision cycle happens in every organization and the Portuguese Air Force (PRT AF) is not an exception. It was in the military organizations and in great part in the World War II that one started to study the problems around the theory of decision and even today there are military methods that are being used in civil organizations. Once the Portuguese Air Force is a nonprofit military organization, the correct distribution of resources is a commitment towards our country and, according to this principle, one tries to continuously optimize the processes inside the organization.

One way to show perspicuity in the PRT AF's activity is to decide the high level Managerial and Operational Objectives, the and, in a lower level, build the Annual Activity Plan. However, the verticality of a military organization offers power of decision between the different branches and levels of the hierarchy. The main question is to understand if it's productive to limit the decision of two different agents in similar situations.

There will hardly be a completely correct answer for the previous question because if the human personality weren't important machines would already control the process of decision. It is this dichotomy that is the base for this article. All in all, one tries to establish a balance between the two points mentioned, in order to empower the organization to better achieve its goals.

The decision support systems have a great value to balance the decisions taken and the managerial objectives. In the Air Force Headquarters (EMFA) the problem is the ambiguity due to the dispersion of the mechanisms that support the decision. In other words, it is necessary to structure the decision cycle as well as the methods to use in each phase of this cycle.

The article outline is as follows: paragraph 1 presents the importance of alignment between the decision-making process and the organizations, its problems and some general concepts associated. Paragraph 2 presents the relevant literature for the paper and the theoretical foundations that were considered essential to develop this research. In paragraph 3, the decision cycle in the EMFA is demonstrated, using the theoretical concepts of paragraph 2. Paragraph 4 concludes.

2. Concepts and Applications

2.1. Enterprise Engineering

It takes only a quick look to nature to understand that it rearranges itself almost intuitively to any adversity. It is in this intrinsic adaptability that organizations nowadays try to mold their behavior to achieve their goals. "But the

scale and speed at which innovative business models are transforming industry landscapes today is unprecedented. For entrepreneurs, executives, consultants, and academics, it is high time to understand the impact of this extraordinary evolution"⁷.

There's a massive volume of data that in a daily basis needs to be correctly processed in every organizational sectors. Enterprise Engineering is a tool that establishes a path according to which all individuals, departments and stakeholders are aligned so that their objectives are fulfilled. In other words, Enterprise Engineering can be defined as *"the body of knowledge, principles and practices related to analysis, design, implementation and operation of an enterprise"*⁵. As of so, there's a series of concepts that aid organizations to think in a sustained manner.

2.2. Governance

The perspective of the design and architecture of an organization is Enterprise Engineering. Governance is when it's necessary to bring the appropriate action into the organizational context in question⁴.

Overall, the concept of Governance refers to *"all processes of governing, whether undertaken by a government, market, or network, whether through laws, norms, power, or language. Governance differs from government in that it focuses less on the state and its institutions and more on social practices and activities"*¹.

Given the wide range of this theme it was necessary to divide it into three topics: Corporate Governance, IT Governance and Enterprise Governance. Among all these there's a special attention on Corporate Governance due to amount of publications on the matter.

Corporate Governance is centered in the way enterprises are managed and controlled⁸, taking into account *"the interests of shareholders, the responsibility of the board of directors, the rights of other stakeholders, and appropriate ethical standards, notably of disclosure and transparency"*¹.

On another perspective, there's a necessity to manage the explosion of IT that is revolutionizing organizations since 1980. This tendency must be controlled so that the means provided by it are beneficial in all their capacity. IT Governance is the area that assumes that responsibility.

At last, there's a more recent concept, Enterprise Governance that *"is considered as the set of responsibilities and practices exercised by the board and executive management with the goal of providing strategic direction, ensuring that objectives are achieved, ascertaining that risks are managed appropriately and verifying that the organization's resources are used responsibly"*⁴.

2.3. Decision-Making

The study of decision-making or theory of decision is relatively new. It was in the World War II that several areas like operational investigation, statistical analysis and programming as a support decision arose. However, the contribute of psychology and sociology only emerged twenty to twenty five years later making the decision making process much clearer³.

The decision is the moment, in a continuous process of evaluating the alternatives to reach a given goal, which the expectations on a course of action guide the decider towards this line of thought in order to reach the main goal³.

Páscoa (2012) and Páscoa et al. (2012) proposed four organizational actor types: the monitor, the manager, the analyst and the decisor^{11,12}.

2.3.1. Decision Types

There are two types of decisions: programed and non-programed. Nonetheless, the fact that a decision is programed doesn't necessarily mean that it can't have some non-programed content⁹.

The decisions are programed if they are repetitive and a routine, one doesn't need to create a new method to deal with the problem since what's new in the situation is not significant. All in all, this is seen in the routine of the organizations since there are several situations in which the course of action is always the same⁹.

The decisions are non-programed when there's something new, they don't have a structure and are unusual. This contemplates a series of problems like something that the decider didn't know beforehand, the complexity of the nature and structure of the problem or there's crucial problem that given its importance requires a closer look⁹.

2.3.2. Decision Cycle

The decision cycle is divided in functions that can be interrelated via some process and it is dynamic³.

Starting with the functions that remit to a group of actions that are related and that contribute to an end, it's possible to identify six as presented in figure 1 and are as follows:

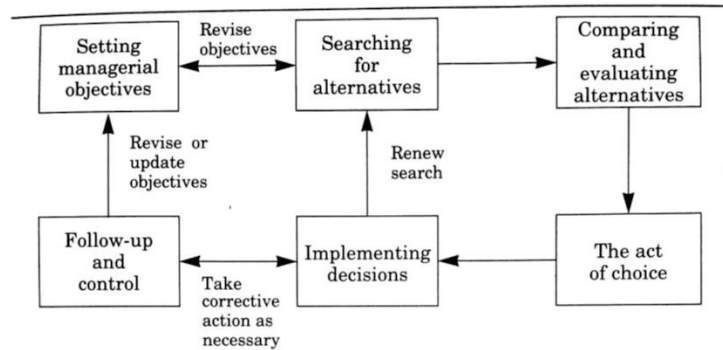


Fig. 1 Decision Cycle³

- Setting managerial objectives – The first function in the decision cycle is to set managerial objectives. Taking into account that objectives are the main part of decision-making, the search to materialize them is what makes the decider choose one path and not another.
- Searching for alternatives – Once the goals are set, the next step is to search information in order to discover alternatives. The alternatives are not all considered because the human decider will abolish the ones that his perception and experience indicate are not suited to fulfill the setting managerial objectives
- Comparing and evaluating alternatives – This phase is relatively complex because each alternative will produce a different degree of attainment of a given goal and also a different degree of efficiency.
- The act of choice – The act of choice is what defines the decision and is from this moment on that things happen and the consequences begin to be clear.
- Implementing Decisions – It is not worthwhile to make a decision if it's not implemented according to the standards chosen and this is basically the function of implementing a decision.
- Follow-up and control – Once the decision is implemented the manager can't simply assume that the results are the perfect materialization of the objectives defined. The decisions are made by human and one cannot expect that there're no mistakes happening.

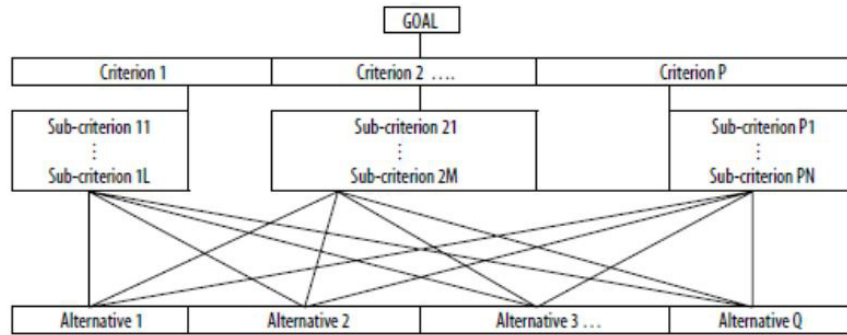
2.4. Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a method of multicriteria analysis. It was developed by Thomas Saaty based on the experience acquired on investigation projects in US Arms Control and Disarmament Agency. This process appears as an answer to the lack of methodology when complex decision needed to be made².

“The AHP provides a means of decomposing the problem into a hierarchy structure (see figure 2) of sub problems which can more easily be comprehended and subjectively evaluated. The subjective evaluations are converted into numerical values and processed to rank each alternative on a numerical scale”².

AHP has three phases⁶:

1. Construction of hierarchies: the problem is decomposed into a hierarchy that establishes as first level a goal, as second the criteria and sub criteria, and as third the alternatives;

Fig. 2 AHP Structure²

2. Definition of priorities – It's based on the ability of the human being to understand the relation between objects and observed situations, comparing pairs according to a given focus, criteria and judgment⁶;
 Logic consistency – The relations that the decider or expert establish between pairs has a level of consistency, in other words, if all the objects are compared, the degree attributed to each of them in the comparison will have a level of consistency based on the ability of the human being.

3. Development of the Decision Cycle in EMFA

3.1. The Decision Cycle

The process of identification of a Decision Cycle in a complex organization that has deeply rooted practices and costumes can be challenging in some phases.

As in any organization, PRT AF decisions are related to two different situations: programed situations that results on a timely plan; and non-programed situations that may result from internal or external necessities.

However, it's of great importance to acknowledge that a decision cycle in programed situations does not imply that it doesn't exist non-programed content⁹. In other words, there's a moment after which a situation becomes programed even if for other means it requires high preparation and evaluation.

Table 1 bellow shows the comparison between Harrison Cycle phases and PRT AF procedures for programed situations.

Table 1. The Decision Cycle in Programed Situations

Air Force Headquarters' Decision Cycle		
Programmed Situations		
Phases of the Harrison Cycle	Identified phases	
Objectives configuration	Order N°87/CEMFA/12 Order N°04/CEMFA/13	3 Managerial Objectives 10 Operational Objectives
Search for Alternatives	2014' PAA of to the organs subordinated to Vice Chief of Staff	Activities related to PRT AF objectives
Comparison and evaluation of Alternatives		
Act of choice		
Decision implementation	RFA 300-1 (A) (1997)	<i>A command decision, made by the commander or by the EMFA, must be widespread in a way that's adequate and opportune. To be effective, this widespread can be made through directives, operation orders, administrative orders, manuals, regulations, notifications and messages</i>
Follow-up and control	DIVPLAN	One report per trimester

Table 2 shows the Harrison Cycle for non-programed situations.

Table 2. The Decision Cycle in Non-programed Situations

Air Force Headquarters' Decision Cycle		
Non-programmed Situations		
Phases of the Harrison Cycle	Identified Situations	
Objectives configuration	Information/ Problem; Factors that affect the problem	A study is requested about a given situation, a problem is defined and all the information about it is gathered, goals that materialize into the resolution of the problem are settled.
Search for Alternatives	Information/ Discussion	The possible solutions are identified
Comparison and evaluation of Alternatives	Information/ Discussion	The identified solutions are compared in order to see if the requirements are met.
Act of choice	Information/ Conclusion; Recommended Action	According to the analysis made a solution is pointed out by the Air Force Headquarters, it is the command responsibility to confirm by dispatch the recommended action.
Decision implementation		The technical departments affected by the problem implement the orders.
Follow-up and control		It is the Air Force Headquarter function to do the follow-up and to control the consequences of the decision implementation.

3.2. The application of AHP in an academic example

The AHP is a tool that supports decision, giving method to the process of decision through a hierarchy that is divided in goal, criteria and alternatives.

In the present assignment the insertion of AHP is proposed as a way to define a coefficient of value to the criteria of a Headquarters Study. These criteria are divided into two groups.

- Essential Criteria (EC) – these criteria are inflexible and it is mandatory that the solution respect them.
- Desirable Criteria (DC) – these are the criteria that allow for some flexibility. It is convenient that the solution respects the criteria but it is not mandatory.

Considering the criteria mentioned we propose the application of AHP mainly to the Desirable Criteria since the Essential Criteria must be contemplated by the alternatives.

There are two major factors from the moment that the criteria are decided:

- The Primarily Responsible Entity (EPR) must establish, or coordinate by naming experts, the elaboration of the coefficient of value of the criteria.
- From the moment that the valorization of criteria is defined, all the interveners on the elaboration of the HS must follow and recommend an action based on the previous valorization.

As an example we have agent A and agent B as a part of the work group responsible for the problem. Table 3 illustrates the current state (AS IS, without application of AHP) and the state that we propose (TO BE, with application of AHP). One must pay attention to the percentages identified in the AS IS as they are a hypothetical transposition of the understanding about the importance of the valorization of criteria in form of percentage.

Analyzing this table, is possible to assess that the 'as is' has on average 20% dispersion between Agent A and Agent B and this will materialize into the recommendation of two aircrafts, Aircraft A and C. With AHP one define a criteria valorization that implies that every agent follow the same values. The AHP will lead to a 'to be' where the recommendation is reduced to one aircraft, Aircraft B.

Table 3. AS IS vs. TO BE

AS IS				TO BE		There's no dispersion because every agent follows the criteria valorization made by the EPR or by its experts.
Criteria	Agent A	Agent B	Dispersion	Criteria	CIC	
DC1	40%	5%	35%	DC1	7,69%	
DC2	10%	40%	30%	DC2	43,01%	
DC3	20%	5%	15%	DC3	37,8%	
DC4	20%	25%	5%	DC4	3,39%	
DC5	10%	25%	15%	DC5	8,1%	
Solution	Aircraft C	Aircraft A	Average=20%	Solution	Aircraft B	

3.3. Validation

EMFA has the mission to support the Air Force Chief of Staff (CEMFA) decision process. Studies that optimize decision quality are essential.

The interviews made prove several factors:

- There's no decision cycle clearly identified;
- The mechanisms of decision are dispersed according to the degree in which the situation is programmed;
- The optimization of the applications interface is suggested;
- The AHP is an advantageous method on a strategic level.

Two different agents have some liberty to propose different decisions.

Some of the points mentioned address very specific themes so not all of them translate the opinion of all the interviewed. This specificity is present in the methods that support decision and in the internal knowledge of certain areas of the organization.

The validation of the proposal presented in this paper is proved by the points pointed out by the interviewed, by the identification of a phase that needs optimization in the decision cycle identified and by the mathematic demonstration presented (not presented in this paper due to lack of space).

4. Conclusion

Enterprise Engineering sees the organization as a continuous process of optimization. This investigation highlighted two components: the identification and organization of the decision cycle in the EMFA and the insertion of the AHP as a complement to HS.

In relation to the first component, through research and the interviews, we tried to find tools that organize the PRT AF decision process. Since this process is not transversal to the organization, we've narrowed the study to the strategic plan, more concretely to the EMFA that is the organ that supports CEMFA decisions.

The decision cycle is viewed as a tool that clarifies and organizes the process of decision. The demonstration of its value was clear on the interviews in which the answers diverged into two paths: one that presented the decision cycle in the EMFA as a group of programmed situations that converge in an annual planning cycle and the other that stated the decision cycle was characterized by the development of a study. This differentiation allowed us to conclude that the degree in which the situation was programmed would imply a combination of certain phases in the decision cycle.

The organization of the decision cycle in the EMFA was proven to be effective so it was the starting point for the construction of the second part of this project. In other words, the analysis of the process of decision in phases allowed us to identify an optimization point. We found a conclusion that the elaboration of an Air Force Headquarter study had no specification about the value of each desirable criterion. As so, we considered that the EPR responsible for the study should use AHP so that it would be possible to attribute an importance coefficient to the criteria that all the individuals interested should follow. This fact prevents that the deviations to the action wanted is so significant that the managerial objectives are not fulfilled.

It is important to emphasize that this paper suggestions can be a complement to the current procedures and not a structural change. The only way to assess the quality of the new procedures is to make it gradually and analyzing its results.

References

1. BEVIR, Mark - *Governance: A Very Short Introduction*. Hampshire: Oxford, 2012.
2. BHUSHAN, Navneet; RAI, Kanwal - *Strategic Decision Making – Applying the Analytic Hierarchy Process*. Springer: Bedford, 2004.
3. HARRISON, Frank - *The Managerial Decision-Making Process*. 4ª edição, San Francisco State University, Houghton Mifflin Company, 1995.
4. HOOGERVORST, Jan – *Enterprise Governance and Enterprise Engineering*. Springer, Netherlands, 2009.
5. LILES, Donald; PRESLEY, Adrien – *Enterprise Modeling within an Enterprise Engineering Framework*. 1996.
6. MARINS, Cristiano; SOUZA, Daniela; BARROS, Magno - *O uso do método de análise hierárquica (AHP) na tomada de decisões gerenciais – um estudo de caso*. XLI SBPO, 2009.
7. OSTERWALDER, Alexander; PIGNEUR, Yves - *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley & Sons, Inc, 2010.
8. SOLOMON, J.; SOLOMON, A. - *Corporate Governance and Accountability*. Chichester: Wiley, 2004.
9. SIMON, A. Herbert - *The new science of management decision*. Prentice-Hall, Inc: New Jersey, 1977.
10. TAVARES, J. (2015), Unpublished Master Thesis, Department of Education, Portuguese Air Force Academy, Sintra, Portugal.
11. Páscoa, C. (2012): *Organizational and Design Engineering of the Operational and Support Dimensions of an Organization: The Portuguese Air Force Case Study*, Doctoral Dissertation, Instituto Superior Técnico, Lisboa, Portugal
12. Páscoa, C.; Aveiro, D.; Tribolet, J., *Organizational Configuration Actor Role Modeling Using DEMO*, Practice-driven Research on Enterprise Transformation, 4th Working Conference, PRET 2012, Gdańsk, Poland, June 27, 2012. Proceedings, Volume 120 pp. 18-47, doi: 10.1007/978-3-642-31134-5_2, 2012.