ADMINISTRATIVE PROCESS MODELING: BASIC STRUCTURES AND MODELING

M.Sc. Trashlieva V. [1], M.Sc. Radeva T. PhD.[1]

Department of Electrical Power Engineering – Technical University of Sofia, Bulgaria

vesselina.trashlieva@gmail.com

Abstract: In this paper a general structure of an administrative process development is proposed. A block diagram showing the logical dependencies in the development is also given and analyzed as well as the basic structures for the variants to implement the core element "task" in a an administrative processing. A concept for generalization in some of the administrative process stages is given as well as an approach to the most commonly executed internal procedure that is the approval one.

Keywords: OPTIMIZATION MODELING, ADMINISTRATIVE PROCESSES OPTIMIZATION

1. Introduction

An administrative process can be approached as a sequence of events forming a finite set of discrete elements. In an environment of full information, that is a complete certainty onto activities duration and any other events considered otherwise as uncertainty being ignored or considered fully known a linear programming model can be evaluated. In specifics, a network model of an administrative process brings enough clarity onto the process' development, required steps to fulfill the final result as well as evaluate the overall duration. Unfortunately, as any other real-life process, no matter if it's a business or an administrative one, uncertainty of a different origin exists and it should be properly approached and modeled so the risks and the costs in the final result are evaluated. Here we make a review onto two approaches of dealing with uncertainty in the durations for each operation designating an activity in the process development.

In administrative proceedings, inefficient use (or management) of human resources is often observed as well as delays in the administrative implementation/performance of and management functions and tasks. This requires the search for methods and approaches to solve optimization problems in order to meet deadlines and improve efficiency and quality of management. While an administrative process is considered event-oriented, PERT (Project Evaluation and Review Technique) and CPM (Critical Path Method) methods are key tools for project management [1, 2] and case studies on feasibility and effectiveness are emerging in the research and work process. The demand for PERT structures, reflecting both the uncertainty of the duration and the complexity of the process, is not a novelty [3]. On the other hand, PERT network models, which contain a minimal number of fictitious operations [4], whose presence is noted as the main drawback of PERT, are also sought. The approaches to shortening the process' overall duration and the consequences of its implementation are a key point in the research, especially in conditions of uncertainty [5].

2. Process structure and logical modeling

Administrative process stages

In documents management systems that are designed to deal with the correct structuring and data collection, documents concerning a similar problem (called "*subject*") are grouped in a *file*. So a file is the set of documents, there included the first one (*initiating document*) and all the other documents (*intermediary documents*) following it no matter of their origin. An intermediary document is also all of the correspondence between an administration and a client or another administration in the administrative process and final result of an administrative service.

The process starts with incoming documents and/or data.

1. The initial processing is called "*Registration*" and includes the following operations:

• verification if the data for the addressee (correspondent, the client) is available and correct,

• check if there are any other registered documents and procedures initiated with this client
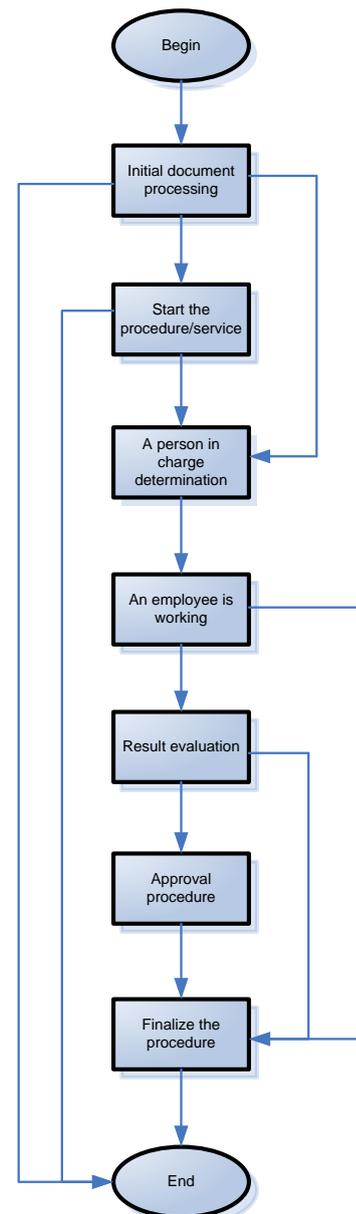

Fig. 1 Administrative process development stages

• check whether the incoming document is somehow connected with any available files with this client,

• check if there is enough data to start the procedure directly - in order to reduce the unnecessary actions it is very common requests of a certain predefined type to be directly transferred to a predefined official. This idea is common for queue management systems where

servers are specialized in the processing of requests of a certain type and there is "a request redirecting/sorting server" before the queue member enters into the processing system.

• check whether the submitted document (i.e. the request) is in the statutory form

• check if the form is filled out correctly

• check the availability and the completeness of a set of attachments to the request legally required to start the process

• Targeting for follow-up action - to allocate, to start a procedure, to place a task for execution

2. Start the administrative service / procedure

3. Direct the data to a relevant official for further action

4. Cascade (successively) redirecting and assignment until the document reaches the actual expert according the procedure's specifics

5. The appropriate and competent expert on the problem described in the document and its attachments (also the other data available in the file) works. This stage ends up with a result that has two components - a report on the implementation of the assigned task and a *material* on its implementation. The material might be a document that will be sent outside of the administration, a report, an internal posture. The task implementation report is a statement that the job is done and it might contain few other

6. The result is redirected for a performance evaluation. In the case of a negative evaluation the result is returned to the employee for improvements until the evaluation is positive. An optimization aims also at a positive evaluation on the first iteration so that no returns for improvement are carried out. A clear and detailed description on the requirements of each task is a prerequisite for a positive evaluation.

7. After a positive evaluation, a conformity and reconcilement procedure might be carried out; this step figurativelly is the process of the collection of a set of signatures (named also *approval* signatures) of officials that have to grant their approval and / or any subsequent generalization of the results obtained;

8. The process finishes with signing and registering the *outgoing result* (*internal document* in some cases of administrative procedures) of the administrative processing; the final step includes several options in the work technology, primarily concerning the order of the two sub-activities that is *sign* and *register*.

Logical dependencies between the different development stages

After the stages in the development (Fig. 1) are clearly defined the building of a block diagram of an administrative process follows. The block diagram shows the logical dependencies in the events. Fig. 2 illustrates the conditions that are checked in a general realization of the process described in the previous section with Fig.1. The existence of a certain condition in a process' development may serve as a basis into the *structural* classification of the different types of administrative services/processes for example whether a group of services contains an explicit approval procedure or not. On the other hand, the block diagram on Fig. 2 marks the conditions under which a certain stage in a process development can be curtailed (that is namely - "*skipped*").

3. Tasks structure types

The main goal in the implementation of a certain managerial administrative function is to assign tasks and functions to a specific, exactly specialized in its competence administrative unit or an official. One side of this effectiveness goal principle is the unambiguous determination of the unit (or official) itself, and the other component is the correct formulation of the task. The two aspects of the principle are difficult to consider separately since the

properly formulated task can determine the structure on the one hand, and on the other the structure affects the formulation of the task, taking into account the particular organizational structure. Because of the fact that a certain task might be posed to a set of officials, whose work might be dependent of each other or not, and also that someone controls the work of the others it should be noted here that a "*task*" can also represent a set of tasks (named *sub-tasks*) connected in different ways and then this set of sub-tasks is designated as a *composite/complex* task.
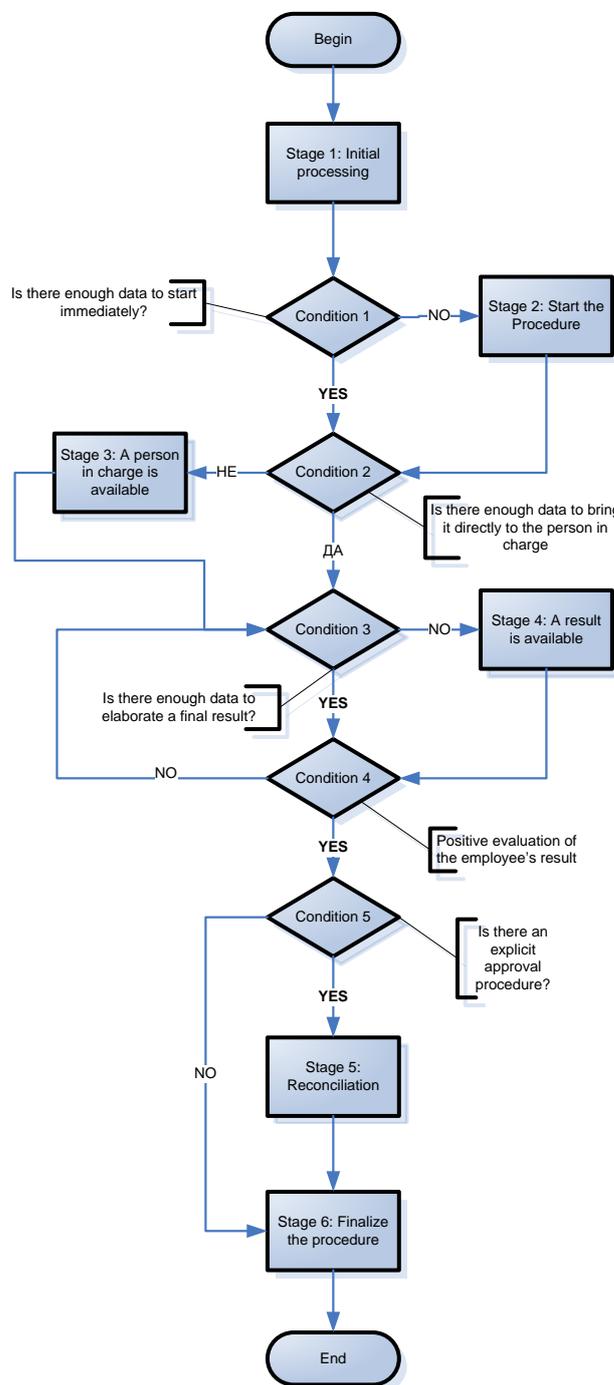

Fig. 2 *Administrative process block diagram*

Consecutive structure - successive realization

A successive realization of a complex task is the consecutive assignment and execution of different (sub-)tasks, as a positive result from any previous one gives rise to the start of the next one in the chain as shown in Fig. 3. In such configuration, it is the positive evaluation of the *last* sub-task that marks the whole task as done.
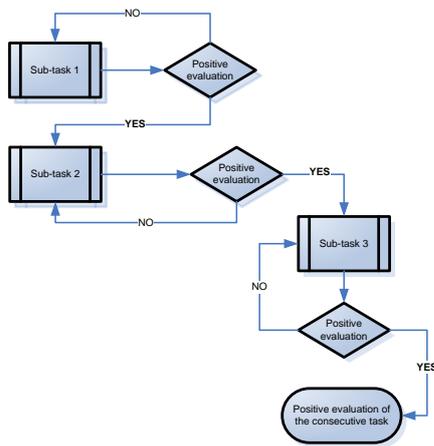
Fig. 3 Consecutive structure of a task

Parallel structure - realization in series

The parallel structure is the realization when the assignment and execution of different and / or similar sub-tasks is done in series. The sub-tasks are placed at the same time and their execution runs regardless of the of work on the other sub-tasks. The whole task is considered done when a positive assessment for each of the sub-tasks in its composition is available. If even one of the sub-tasks is not well-executed, all other sub-tasks are considered not done. This is one of the main problems in the performance reporting on complex tasks. Often in timing controls officials who have in fact received positive ratings (that have done all their work) "*receive also*" a certain number of tasks not-done because other officials have received negative evaluations.
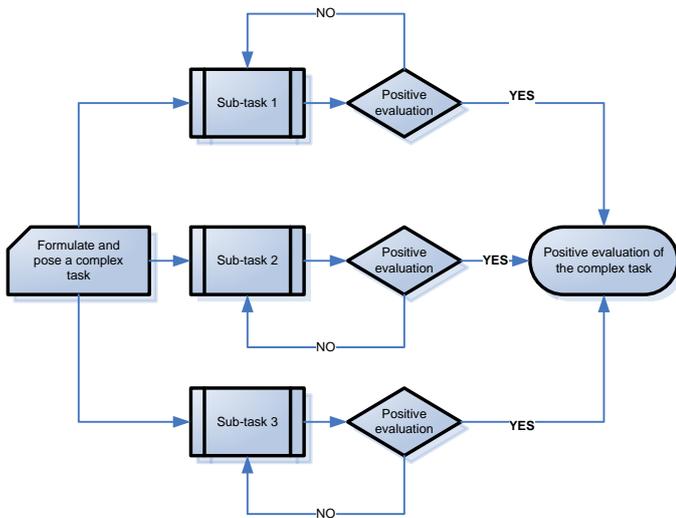

Fig. 4 Parallel structure of a task

Mixed structure - parallel and successive realization

The most common architecture is the mixed one. Usually there are several parallel tasks whose performance is evaluated in a single finalizing task. The finalizing unit has also the performance coordination and monitoring function for the implementation of the preceding parallel processes. It is responsible for the right-moment measures in order to avoid delays. It is also responsible for the overall performance quality and sometimes for summarizing the results from the preceding tasks. In the latter case, a task for the assessment of the summarizing sub-task may also follow but this is very rare in practice.

As a result of an optimization approach a semantically modified version of the mixed structure might be used. At the beginning there are one or more tasks in parallel to one or more officials. The implementation of each one finishes with *materials* and/or *reports*

that are directed to the next official. The last official that receives a material must draw up a summary of all other materials received by him and this summary is the result of the composite task. This summary should pass the procedure up to a positive evaluation.
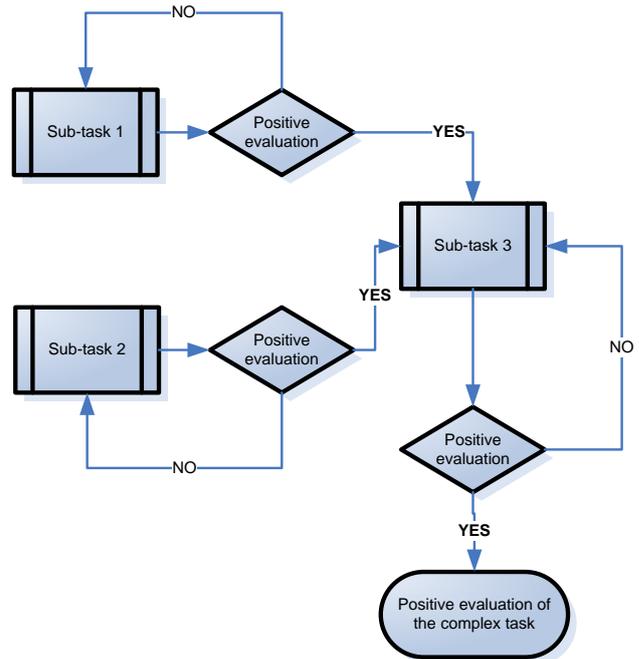

Fig. 5 Mixed structure of a task

Very often in practice, however, the summarizing official is the same one who assesses the precedent materials. This minimizes the time for which the outcome of the process should be directed towards an approval procedure and / or signature.
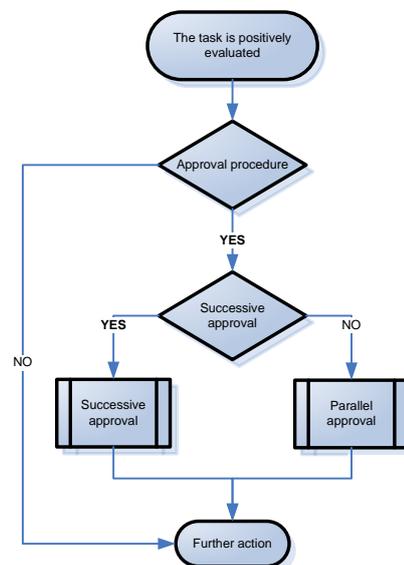

Fig. 6 Block diagram of a general approval procedure (a mixed realization)

4. Approval procedure

The approval procedures are the most common *distinct* procedures in an administrative processing that appear in almost all services and procedures. This is a sub-process where certain officials approve or not the job done previously by other employees that mainly are their subordinates. As an example, a chief accountant should always approve a contract before it is finally signed, no matter of the fact that an accountant is not responsible for the legal value in the contract. There are also three configurations (successive, parallel and mixed) for the approval procedures as with the "*task*" according to the number of officials

that have to grant their approval on the final result before it gets official. In many cases, a non-approval in this stage will lead back to the task's implementation and evaluation stage. So in such work technologies an event of a non-approval fires a preceding task status "*un-done*" and a starting point for the preceding stage.

Successive structure of an approval procedure

In the case of a successive structure, an approval signature shall be applied only in the presence of a preceding approval. If any of the participants is the approval procedure is prevented from explicitly stating this action, the completion of the whole stage is delayed.
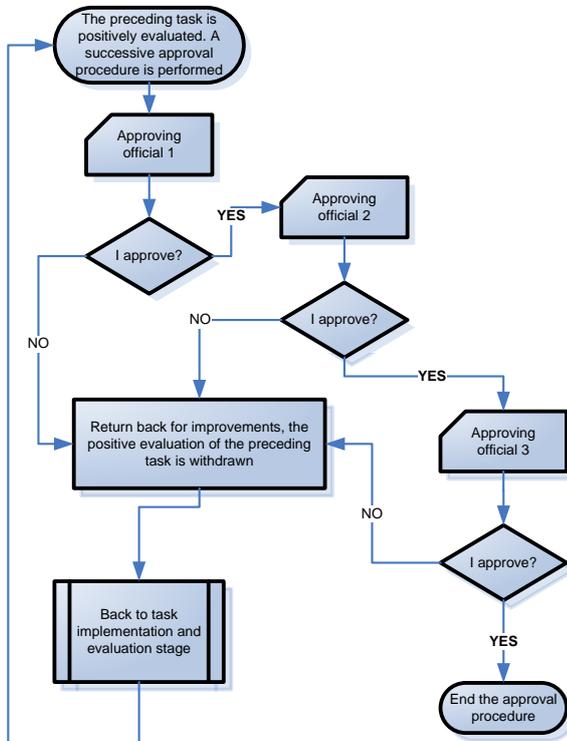

Fig. 7 Successive structure of an approval procedure

Parallel structure of an approval procedure

In this realization all approval signatures are independent one to another (see Fig. 8). The approval procedure will finish only if all approvals are available, meaning that if only one of the officials does not approve the whole stage is revoked while one non-approval leads to the previous task implementation and evaluation stage.

5. Conclusion

Generally in the administrative process modeling approach as an discrete-event process the aim is to achieve a complete determination of the administrative processes. If the correct answers are given to a few simple questions, a network model for each administrative process can be built while the general structure is carried out. The main issues a consultant has to face are:

• What kind of processes take place in an administrative structure? What is the legal basis regulating the progress of each process?

• What are the exact responsibilities of each official and how does its work influence the work of the other officials? That is simply for each employee to obtain full data about the documents and information he/she receives and from who.

• When performing specific tasks, what information is used and generated, where is it processed, stored and updated?

Subsequently, two important nomenclatures are created:

• List of procedures and related document types and / or tasks that trigger their execution;

• Nomenclature of the types of tasks to be performed, for each task of the nomenclature are described in detail the requirements for the final result, the deadlines and its performers.
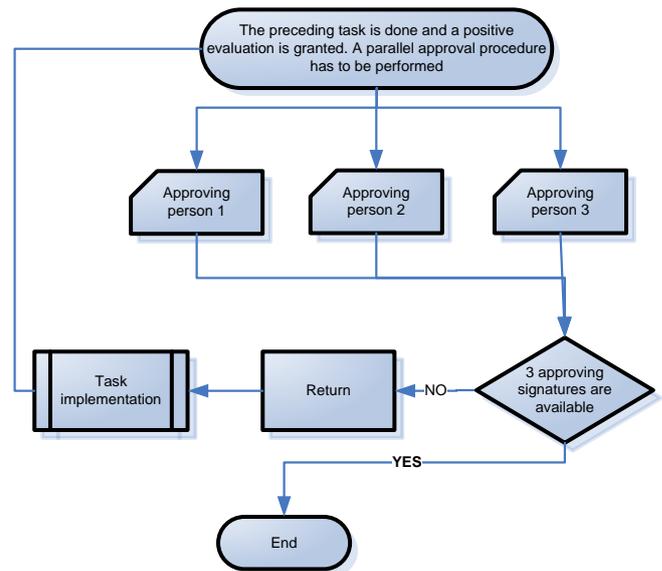

Fig. 8 Parallel structure of an approval procedure

On the basis of the research that lead to the explicit formulation of the structures proposed in this paper and also the accompanying comments a practical methodology for building such models is developed. Subsequently few analysis algorithms can be used for the evaluation of the efficiency of the administrative-management procedures themselves. The description of each process that takes place in an administrative structure has, on the one hand, a disciplinary function and on the other hand it is a prerequisite for an efficient management and relative independence of the processes of staff turnover. In the research, model parameters can always be updated and the effects of these updates on the overall management structure can be assessed. When such a model is available, even the optimization of the staff structure can take place. It should be clear that the basis for building an administrative structure lies primarily with the description of the functions assigned to it and when structural change is planned without taking account of the functions, change is almost always ineffective. Moreover, modeling and analyzes such as those presented in this paper should precede any structural change.

6. Bibliography

[1] Hillier F. S., Liebermann G. J., Introduction to Operations Research 8th ed., Mc Graw Hill, 2005, ISBN 978-0072527445, 1214 pages.

[2] Taha H. A., Operations Research: An Introduction" 8th ed., Prentice Hall, 2006, ISBN 978-8120330436, 840 pages.

[3] Pontrandolfo P., Project Duration in Stochastic Networks by the PERT-path Technique, International Journal of Project Management 18 (2000), pp. 215- 222

[4] Mouhoub N.E., Benhoucine A., Belouadah H., A New Method for Constructing a Minimal PERT Network, (APM) Applied Mathematical modelling, Elsevier ISSN: 0307904X, Vol. 35, Issue: 9, 4575-4588, March 2011.

[5] Haga W. A., O'Keefe T., Crashing PERT Networks: A Simulation Approach, 4-th International conference of the Academy of Business and Administrative Sciences, Quebec City, Canada, July 12-14, 2001.