

ADMINISTRATIVE PROCESS MODELING: AN INTRODUCTION TO ADMINISTRATIVE SERVICES AND PROCEDURES

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: The state administration is a part of every government and it is responsible for the implementation of certain administrative, legal and regulatory functions. An effective functioning of the state administration eases the functioning of the citizens and the business and therefore the processing in it is approached as a business process. There are certain similarities and respective differences between a business and an administrative process. In this paper an introduction into the problem is made.

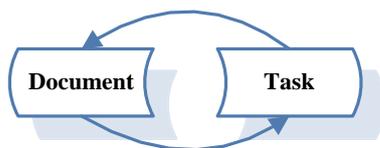
Keywords: OPTIMIZATION MODELING, ADMINISTRATIVE PROCESSES OPTIMIZATION

1. Introduction in administrative processing

An administrative process is a set of successive activities of documents (incoming, outgoing and also internal origin) processing and tasks and generating a final result. This is a process of data processing, processing in accordance with a certain predefined technological sequence to aggregate and / or make a management decision to achieve a defined management quality. It is also considered that an inform decision guarantees an efficient administrative processing and management.



An administrative process is a sequence of stages. Three main stages of the administrative process can be differentiated: the initial stage of initializing documents, tasks and data processing, the internal administrative procedure and the finalization of the process. The main *elements* in the structural decomposition of the administrative process are the "task" and the "document". Data in documents leads to tasks posing and fulfillment, those tasks can lead to other tasks and/or documents origination. Documents can also originate from tasks that do not derive from other documents but from the work of a collective management body.



The initial processing of documents and tasks involves the activities of the definition and the parameterization with specific values of a number of descriptive and significant requisites. Such requisites are the correspondent (addressee), the type of document (a letter, an invoice, a statement, a request, etc.), the subject and the type of the requested process / service. Administrative proceedings are initiated if the incoming data corresponds to the statutory forms and volume, including a legal basis, a correct and correctly filled out form, a full set of accompanying documents stated in an act, etc. The internal administrative processing is the process of taking management decisions, the assignment of tasks for execution, time and quality control on the fulfillment of the assigned tasks and the preparation of a document that finalizes the process. The finalization of the process is the final processing of the documents and data in the file, the closing of the tasks (marking them as fulfilled), the archiving of the documents and the response to the client.

From the point of view of the client initializing the administrative processing, two main types of administrative management processes can be distinguished:

- Administrative services offered from an administrative body to citizens and legal entities
- Administrative procedures initiated from the administration itself or from another external administrative authority

From the point of view of the number of administrations involved in a single administrative processing services are considered simple and complex.

The basic principles of an effective administrative management are:

- Formulating and posing a task
- Control of the execution of assigned tasks
- Information and reference activities, working processes and strategies optimization
- Archive and storage

Optimal administrative processes management is based on the following principles:

- Decomposition of the processes of managerial components
- Differentiating and describing the different directions of activity and defining the pathways specific to the directions
- Formulating conditions in which a minimum realization is achieved for each of the directions

or:

- structural decomposition into sub-processes - defining the sub-processes, the inter-connections and the specific functions for each of its elements and detailisation, a sufficiency analysis; the structural decomposition must be formulated in such a way as to allow the ease in the addition of other cases and elements that do not overlap with other elements
- multimodal management - identification of the different working cases and their description with the means and the elements of the structural decomposition
- synthesis of optimal management strategies - including the additional cases, thus not compromising the effectiveness of the strategies that have been organized so far

Optimization goals:

- Improve the management quality and the efficiency
- Make possible further addition of new procedures in the development of new functions

In general the objectives of an optimal administrative management also include improving efficiency, quality of service and management, speeding up performance, introducing innovation, implementing specific regulations and, above all, limiting reverse movements.

2. Basic principles:

The main feature in the implementation of a given administrative-management function is the assignment of tasks and functions to a specific structural unit or an official, specialized in the respective area. This principle possess two aspects: one is the unambiguous determination of the unit, and the other is the correct formulation of the task. The two aspects of the principle are difficult to consider separately from each other, since on the one hand the properly formulated task can define the structure and on the other hand the structure affects the formulation of the task, taking into account the particular organizational structure. Besides these two basic aspects, the formulation of the task has several more parameters:

Employee(s) / Participant(s) - The person(s) that will execute the work on the task. When there are more than one participants in the task's development an additional definition should be added: whether one of them is the leader in performing the task, whether all performers work independently from each other or whether the work of part of the performers depends on the work of other performers on the same task.

Defining deadlines (two main types: final deadline and control/intermediate term) for performing the task - if the task involves multiple employees, the respective terms may be different for each employee or a group of functionaries.

Defining an official or a unit controlling the work on the task - there are multiple approaches and generally they depend on the accepted work technology. Normally, the lead performer on the assigned task is also the one monitoring the task's work of all the employees. In cases with a single employee, it is possible to designate his or her supervisor or another official at the same level of the organizational hierarchy as the participant, that has to monitor the performance. In some organizational and administrative structures, the supervisor of a given task is treated as a participant in the same task. In others, the supervisor is in fact a participant of a task that follows the implementation of the factual task. In this case the first (actual) task is the basis for formulating a second task to monitor the implementation of the first task. It is important to mention that the implementation of the monitor task *does not* imply a result, but a positive assessment that ends successfully the fulfillment of both tasks. The first task is considered to be poorly executed until it is positively evaluated by its supervisor, but performance evaluation can not be obtained until a result is produced. A detailed description of the task structures will follow further.

Another important aspect in the formulation of tasks is the clear definition of the requirements to the final result as the participants of a given task should be aware of the specific requirements for the reports and materials they produce. These clear requirements should be strictly observed in order to assure for a positive evaluation immediately after preparation of reports and materials thus effective work.

In performing of administrative functions, a great attention is paid to the control over the execution of the tasks in terms of timelines and quality, with the term (deadline) being considered as a qualitative indicator. The processes generally might include two iterations - collecting (statistics) data and then processing and analyzing them. An analogue of the information and reference activities is the periodic accreditation, where on the basis of statistical information about the deadlines submission of all performances of the tasks and the number of the negatively evaluated materials an evaluation of the efficiency of a procedure and / or unit is made. If the assessment is low, a further analysis of

the reasons why such results are achieved has to follow and several principles are followed to reduce the delays and negative evaluations of the results. This in fact serves to provide sufficient information for making management decisions to correct imperfections or deviations of parameters.

In the next few paragraphs, we compare the semi-heuristic measures that are being taken to improve efficiency and quality of management.

On the basis of unsatisfactory results from the statistics (big processing time for documents, errors, negative attestations, difficulty in incorporating new management functions and reflecting new normative documents, etc.) there is a need to analyze problems in the management of administrative processes. It should be noted here that the unsatisfactory assessments of the administrative capacity of our state administration lead to the allocation of funds for its improvement, the assessment criterion being the improvement of the services for the citizens and the business. Not well-functioning administration leads to major time and financial losses even to juridical precedents, which also cost time and money. Until now, the administration has been working on vaguely labeled technology, lacking the tools to comply with, or there are no prescriptive procedures and allocation of functions and responsibilities at all. Very prominent in support of these statements is that the Bulgarian government has started the process of *e-government* implementation, one of the main elements of which is the service of individuals and legal entities by electronic means. In this respect, a number of activities have already been carried out in terms of formulating, on the one hand, the criteria for the management of the procedures and, on the other hand, the administrations themselves in terms of description of processes and their formalization. By law, public administration bodies are required to be ISO certified, and this is precisely a description of the procedures in a form similar to the one in this thesis. The goal is minimization of processing time and easy insertion of new management functions.

Normally, when new management functions arise in an administrative structure, it has to be optimized. In general the optimization process ended with one of the following two results - the assignment of the new functions of an existing structural unit that is not specialized and qualified for their implementation or the formation of a new unit to exercise the new functions. In the first case, there are new, accumulated negative outcomes - work increases, and resources and qualifications - not logically followed by longer time delays and negative assessments. In the latter case, the newly formed unit can burden the work of the existing elements of the structure, including the technical and software support. The greater risk, however, in this case is that in the quest for the formation of a unit with specialized functions there are added ones whose implementation is imputed to another existing unit, and this inevitably leads to collisions and dilution of responsibilities, already - duplication of work. A detailed description of the classic method of decomposition used in the structural decomposition of the working administrative processes will follow.

After the building of a verbal description of the problem and the definition of the objectives follows the analysis of the environment and the boundaries of the problem. The environment can be considered "*semi-determined*", because part of it is formulated by regulatory documentation, and part of it depends on the social factors - i.e. of the volume of work itself, from which the sufficiency of resources for its implementation is assessed. Factors influencing the quality of the process include, on the one hand, staff turnover (including holidays, business trips, sickness absences) and delays arising from the use of postal and courier services when additional external information is required (that element is obligatory in complex services). In addition, it is worth noting and assessing the impact of the so-called administrative capacity, financing and energy intensity.

Apparently, the "*straight*" approach to the problem does not give satisfactory results, taking a direction from the start of the process to the end result. That is why it is approached by the "*other*" end starting from the purpose, through the methods and limitations (constraints) for its achievement, resource evaluation, to the input effects, which again reverts to the principle of building the structural decomposition.

Once the structural decomposition of:

1. *the administrative process* - it already became clear that the *task* and the *document* are the main elements of the structural decomposition; the main "*subprocesses*" (activities, operations) that are carried out as part of an administrative procedure (registration, allocation, assignment to a functionary, including formulation and assignment, task execution, evaluation of performance, coordination procedure, finalization)
2. *the functions and tasks* of the individual administrative units

one can proceed to an analysis and decomposition of the different working processes in the different activities - i.e. classifying and describing different workflows and their modeling through a multitude of core activities / operations. Here the management basis is a multi-model adaptive management[1] (separation of manageable units) approach. Uncertainty stems above all from ineffective management procedures and uncertainty within terms that depend on external factors, so there is a structural uncertainty and another uncertainty of a purely random nature. In this way, by separating two different types of uncertainty some degree of determination of the task under consideration can be achieved adding respective filters and applying appropriate adaptive techniques to uncertainty. Of course, the uncertainties arising from external factors should be subsequently taken into account, but for each administrative management process they will represent an ultimate and minimal set and also their origin is considered to be fully known - who they are and how many they are.

Subsequent analysis and synthesis of models and management strategies need to be carried out again in two stages. First, go back at the initial set-up of the problem before its "*shredding*" - to examine and analyze the critical and shortest path. Based on these considerations, the need to determine processes and to illustrate optimized processes can be demonstrated. In general, administrative processes are undetermined and stochastic but discrete.

The implementation presented in the following pages is minimal: it combines the principles of multi-model adaptive management because there is a striving for an absolute determination of the possible working variants (types of processes, grouping of the types of processes based on general principles and characteristics). This, in turn, makes the approach as optimal as it aims to minimize resource spending and maximize efficiency and speed.

The meaning behind the above concepts is as follows: if at the input of the system we have a request that is not identifiable, i.e. does not belong to any of the models already built, its development will follow "*full-stage*" order - on the critical path. For this path, however, after all of the following research and analysis, we'll have enough information about what we can expect as a result, and even more - we have statistical information about future or more accurately the possible realizations of the process. When creating a qualitative and complete description of all administrative activity (ie, maximizing all possible cases) such "*incidental*" requests are expected to be minimized while the elements in the set increases.

The aim is to build a model for each of the processes - a principle that is the basis of multi-model adaptive management. In order to build a model for each process, a generalized model that reflects to the maximum extent all sub-processes needs to be evaluated and developed. By reducing this aggregate model, the specific patterns for each administrative process should be obtained and management can be synthesized for each of our known operating modes. For these regimes, which there is not enough data

for an unambiguous identification, a "*back-up*" action plan has to be provided, which is considered to be in the best position to meet the quality indicators and requirements, i.e. - the generalized model. Each of the models in use has to be optimized in accordance of quality indicators and cost sizes.

The main purpose is maximum quality at a minimum price

The quality of an administrative process is, above all, a function of the efficiency of the human resource employed in it. i.e. the higher the qualification of the employees of an administration, the higher the quality of the administrative processes in the respective state administrative authority is expected to have. The main qualitative indicator is the timing of the tasks to be performed: not only must they be implemented on time but also meet specific, specific requirements for each individual administrative activity, including document layout, factual content and so on. What determines the cost of technology is the spending (exhaust) of human resources, including all wage costs, overheads, etc. costs associated with the work process. But the main resource available is the *employee* and his *time*. Therefore, when building a network model, in the considered arc weights also quantify the amount of spent working hours for the performance of an administrative activity. It might be assumed that each arc spends time on one employee, denoted by the weight of the rainbow. The fictitious links in the models, where the process automation can be appropriately carried out, expressly indicate whether human time is spent or not. At the same time, an analysis of the optimization options is made in the general case.

At first glance, the subject under consideration is continuous - or rather a continuous sequence of information transmission and its aggregation from one employee to another. On a thorough analysis, it can be easily noticed that this process can be very conveniently and easily referred to in the terms of *discrete event systems* - a sequence of a discrete set of states, each of which is reached after the execution of one or a set of specific administrative activities. To construct such a discrete description an appropriate approach is needed, namely a work breakdown structure of the process and the interpretation of the activities and conditions. The requirement for the elements of the process classification structure is to contain such elements as to provide and guarantee a qualitative description even if the system parameters are changed. In this case, the parameters of the system are changes in the regulatory and legislative framework regulating the activity of an administrative structure, new requirements for the quality of the processes, change in the structure of the organization, personnel changes, etc. In short, what could be changed in such a system is:

- a manifestation of a new statutory document stating the framework for a new procedure;
- a repeal or a modification of an existing normative act which regulates the administrative activity in a certain administrative process;
- a change the amount of resource available to perform the processes;
- a change the statutory deadline for the execution of a procedure;

All elements of the breakdown structure must allow for such a "*fluctuations*" in the parameters of the constructed models. Elements must be selected in such a way as to allow the modified models to be modified in order to reflect newly emerging situations. When a detailed description of all work processes is available, it is realistic and possible to make a realistic analysis of the sufficiency of the available resources: number of employees, qualification, etc.

3. Network models techniques

As stated above, the administrative process might be considered as a discrete event procedure. So a network model is an appropriate abstract description tool [2,3]. The initial network model contains actual weights of the arcs for the duration of the current activities in

the development of one single realization of an administrative process. In addition, fictitious links include operations that can be machine / algorithmically implemented. These operations are not exactly fictitious in the true sense, but in any case the whole approach to the task is highly specific as such, and the trivially valid concepts for each approach differ semantically from the ones specific to the task. The *dummy* operation in a model means that no human resource is spent, but it does take time that is minimal and negligible compared to the overall duration of the process. The execution of the dummy operation implies the existence of specific and pre-defined initial conditions, and it must generate specific results. In such a treatment of the task, the Critical Path Method (CPM) gives the minimum time to complete this process. The critical path gives the set of activities that determine the minimum duration of the process, and something else - their sequence in the sense of which *critical* operations should be completed before the next one starts. It is clear that any delay in carrying out any of the critical operations will lead to a complete delay in completing the procedure. Changes in critical operation parameters inevitably affect the duration of the overall process. This is a logical conclusion of project management. Let's look at the advantages of the Critical Path Method from another point of view. After its implementation, an ordered set of operations is obtained, i.e. if an operation is treated as an information processing, it must have the initial conditions required to execute it, run an operation specific to the operation, and generate a new set of data that is already the starting point for the next operation.

The Program Evaluation and Review Technique (PERT) provides an even larger set of data to analyze. By its very nature, PERT is a modification of the CPM as the main difference in the input of the network, not its structure and, above all, the results obtained. PERT works with statistical assessments of the duration of the activities on the critical path. This results in a statistical assessment of the minimum duration of the process under consideration, and it can be ascertained with what probability the process can be executed within specific deadlines, or, more importantly, the likelihood of delaying the completion of the process. PERT introduces uncertainty into the model parameters with respect to the expectation of the duration of each operation. After two methods of estimating the determinations - deterministic and stochastic - have been applied, it is necessary to examine and within what limits the duration of the execution of such a process - i.e. the CPM is modified into a task with interval estimates of the duration of the operations. As a result of applying the three algorithms, a solid information will be available about the minimum duration of a process, its variance, the order of operations in the course of its execution, and the timeframe in which a result can be expected.

So the interpretation of the results is slightly more controversial than in the trivial case of applying these methods. On the one hand, the results are described with "*this is what we expect*" to happen, but in fact it is more correct to say "*that is why it is happening at the moment*" when the probability of meeting deadlines is very small and the requirements are very high.

The project managers and the theory provide three ways to shorten the critical path:

- *fast tracking* – parallel execution of operations on critical paths that run sequentially;
- *adding* additional resources to critical activities in order to reduce their duration;
- *shortening* the duration of operations along the critical path, including breaking it down the critical path by eliminating critical operations.

Another important thing that teaches not only the theory but also the practical application of the three approaches is that every iteration of shortening the critical path must be re-analyzed because it is possible that the critical path itself may change, change its elements, i.e. the operations that build it.

4. Conclusion

Taking into account the above risk, the options for applying each of the above three approaches should be considered. Parallel execution of sequential operations in the problem under consideration is impossible due to its specificity and the flow of information due to the mentioned logical factors behind the abstract representation of the arcs and nodes. Adding additional resources to a certain stage of development is perhaps the most intuitive and widely used way to shorten the execution time of an operation. But it does not imply absolute results. Yes, it is true that quantitative accumulations inevitably lead to qualitative changes, but in this case not only the absolute value of the change but its sign is important. Another thing that is a serious underwater in such an approach is that every extra resource has its own *cost*. In support of the above considerations, a classic example can also be given with the trivial: one canal is dug by 10 people in 10 days; will the canal be dug for 1 day out of 100 people? The conclusion is that this approach to shortening the duration of critical activities is applicable to the task under consideration, but with a particular caution - not to get a surplus, not to overly increase the price, which instead of producing positive results to reflect in a bigger delay. Consider also the fact that the coordination of the activity of 5 people is one problem, and the coordination of 10 people - it is quite another. The third approach seems to be the best option and deserves the most comprehensive analysis as it has a number of obvious limitations, but it also provides several options if it is approached in the right way. Clearly shortening the time for sending and receiving information to an external administration can be achieved by using modern (and not yet new) technologies that are widely available - *e-mail*, Internet, etc., automated generation of requests for information to certain databases, templates of sample documents, etc. With regard to the elimination of elements from the critical path, a modern approach is needed - under what conditions can activities be eliminated, can the states through which they pass be emulated (presented) appropriately. The answer to all these questions is *yes* - if sufficiently accurate and correct models for each process are built when doing such a detailed analysis of the activity, as a result of which it is possible to say unequivocally at what event an operation is started, which document which official is being processed. What is the set of information that a workplace handles - what information it receives, how it processes, what information it generates, whether it uses information that is stored in another / separate information system or array (database), and what its structure is. In this way, a shorter path than expected is expected, and a set of variants of possible conversions appears. Two methods are combined: the critical path and the problem of finding the shortest path in a network, such as the critical path being the initial condition, and the result of the shortest path is the best option that can be achieved as a result of the network optimization.

In the models that are constructed, the arcs entering a node are of two-sided significance - on the one hand the activities that must be completed before the start of the next on the path and the generated results, which are the initial conditions for the next operations. All the time it's about information - its one-time introduction and multiple use, its aggregation and updating.

5. Bibliography

- [1] Astrom K. J., Murray R. M., Feedback Systems: An Introduction for Scientists and Engineers, 2007, http://www.cds.caltech.edu/~murray/books/AM08/pdf/am07-complete_17Jul07.pdf
- [2] Hillier S. F., Lieberman G. J., Introduction to Operations Research, 7th ed., McGraw-Hill, 2001, ISBN 0-07-232169-5, 1 214 pages
- [3] Guide to the Project Management Body of Knowledge (PMBOK® Guide) 5th edition, Project Management Institute, Jan 1, 2013, 589 pages