

Method for Automated Analysis of Users' Requests to Service Centre of Information Networks in OIS

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Abstract: Monitoring and operational support for the functioning of the information systems (IS) of large, distributed organizations is of great importance and requires careful study. A method for automated analysis of user requests arriving at the service centre of a large-scale distributed information network is considered. The method is based on identifying the problematics of incoming requests and proposals related to the functioning of the organization's information systems (OIS). To identify the problematic of appeals, the content analysis is used together with thematic reference book (thesaurus) in the areas of information support and the functioning of the network. The content analysis is well known for its high flexibility to study recorded information. Involving of problem-oriented thesaurus allows to avoid some disadvantages of content analysis, namely subjective interpretation of the results. Prompt processing of such documents and making decisions on their execution ensure effective maintenance of the organization's information network.

Keywords: *OIS, monitoring, information flow, documents, content analysis, thesaurus.*

1. Introduction

The efficiency of social and economic systems in the society depends on the rate of using information technologies. The recent trend is to support and improve their exploiting, increase the transparency of management activities. In organizational structures, this trend initiated a whole complex of informatization processes such as: the transition to electronic document flow, the introduction of electronic interaction methods with higher and subordinate organizations, interdepartmental electronic interaction, interaction with the portal “citizens’ appeals”.

The ongoing processes of informatization in organizational management required the creation of distributed databases and specialized software systems for the accumulation of significant information resources on various aspects of the

organization's activities, stimulated the development of new applied areas and services to support management activities provided by information networks [1, 2]. In this regard, the problem of monitoring and operational support for the functioning of information systems of large, distributed organizations is of great importance and requires careful research.

Various approaches to monitoring the functioning of information systems can be considered, both from the point of view of information and technical support, and from the point of view of servicing requests, wishes and comments of network users [3]. The flow of such requests, sent by users to the network operation support service, contains documents related to the quality of the network or application system functioning. Additionally, these requests can be concerned to demands for connection to corporate or external software systems, wishes for changing access modes and much more. The flow of these documents testifies to the active work of network users, their information needs, as well as shortcomings in the processes of network functioning.

Operational analysis of user requests and appeals will speed up the processing of incoming requests, investigate problems arising in the process of functioning of information systems (IS) to eliminate shortcomings and increase the efficiency of monitoring the functioning of a large-scale information network.

2. Problem Statement

The operational analysis of user requests and appeals in large-scale organization leads to the need to develop an automated method for their processing. The basis for the development of one of the approaches to the implementation of an automated method for analysing of user requests was a large number of documents (appeals) received by the network support service to promptly resolve issues related to information services for the organization's employees and the operation of the network.

When considering the implementation of this approach, the following provisions were taken into account.

1. The configuration of applied subsystems of information systems to support management activities for large organizational structures varies in accordance with the objectives of the organization. Each subsystem provides the necessary information and technological support for management activities. In addition, each subsystem accumulates all information about the processes together with work results and establish information archives. The traditional composition of computing landscape for supporting organizational management includes the following subsystems (Fig. 1):

- documentation support of management or document flow,
- support of financial activities,
- management of personnel services,
- material and technical support,
- planning tasks for various target areas, etc.

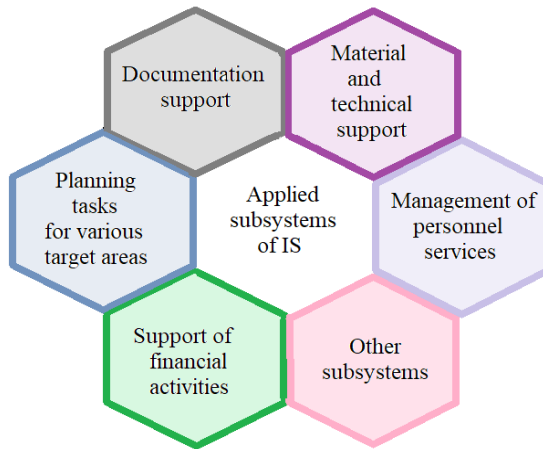


Fig. 1. Composition of applied subsystems of information systems

2. All the main processes and results of management activities (decrees, instructions, protocols, orders) in organizational structures are drawn up in the form of documents that comply with the standards for management documentation (e.g., ISO). Automated documentation support systems provide maintenance for approved schemes for the passage of business documents in accordance with the structural management principles implemented in the organization. The normative regulations of the documentation support systems of the organization prescribe that all applications, wishes and comments of network users must enter the workflow system in the form of service notes and applications (documents).

3. For each document entering the documentation support system, a structured document card is generated, most of the details of which are filled in on the basis of standard data sets.

4. Processing of the flow of requests (user requirements) includes analysis of requests, distribution of work on the execution of requests, preparation of response records and documents (Fig. 2) to the organization responsible for the supply of equipment.

At the same time, the standards for processing requests in workflow systems allow to track: the stages of the passage of the requests, repeated requests and, ultimately, the quality of work.

Thus, it is assumed that all incoming requests:

- are entered into the organization's workflow system,
- are registered in accordance with general rules based on normative sets of workflows,

In such a way the preconditions for the development of automated analysis methods are created.

3. Development of a method for analysing user requests

The developed method is based on the following stages:

- analysis of details and text of documents received by the support service for the operation of the network to identify basic metadata as type of document, addressees, urgency, and scopes of the document,
- analysis of the text of the user requests (appeals), which includes the structuring and sorting of the extracted data according to certain thematic areas,
- presentation of the results in a form that is convenient for prompt decision-making on received requests.

The implementation of the method is based on the analysis of the details of documents using a multi-criteria assessment of problem situations [1], as well as on the use of directed search in the text of the document for compliance with the terms of the problem-oriented thesaurus.

The use of the thesaurus in the developed method allows to correlate the selected terms of the document with the concepts of the thesaurus and their groups, due to which a structured model of an incoming appeal or document can be obtained. Involving of problem-oriented thesaurus allows to avoid some disadvantages of the content analysis, namely subjective interpretation of the results.

The development of search functions for the text of a document is based on the adaptation of the content analysis method for algorithmic processing of text documents sent to the support service for the functioning of a large-scale distributed information network.

The method of content analysis has positively proven itself in almost all fields of science, one way or another practicing the analysis of text sources – in the theory of mass communication, in sociology, political science, history and others [4-7]. Content analysis has a long history in research. It was used primarily as a “quantitative research method, with text data coded into explicit categories and then described using statistics” [8].

Content analysis is defined as “the systematic reading of a body of texts, images, and symbolic matter, not necessarily from an author's or user's perspective” [9]. The method is used for a qualitative and quantitative analysis of the content of documents in order to identify or measure various facts and dependencies reflected in them. Content analysis is also useful for examining trends and patterns in documents [10]. The qualitative content analysis provides a systematic approach to find value in textual data [11, 12].

In this case, the possibility of using the method is associated with the ability to automatically identify text units that vary depending on the goals, the type of information array, as well as several additional reasons. The inclusion of content analysis in the considered development is intended for a formalized study of the content of text documents to find and quantify the occurrence of thesaurus terms in

the document to determine the problematics of the document and make decisions on the distribution of work on the execution of the received appeal.

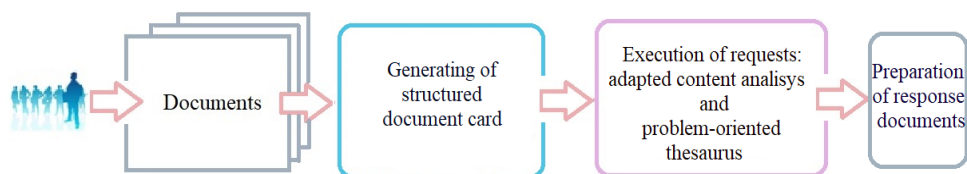


Fig. 2. Path of documents through the IS

Thus, the combination of the two approaches to working with textual information makes it possible to create a new method of automated processing of textual references and documents received by the unit responsible for servicing the distributed information system.

As part of the developed method, an integration with the module for automated drafting of instructions for solving problems related to the maintenance of the information system is provided.

4. Method for automated drafting of instructions

The idea of the method for the automated preparation of draft instructions related to solving problems in the maintenance of an information system is based on the use of a specialized reference book, also prepared in the form of a problem-oriented thesaurus.

Users can contact the operations support service with requests for:

- connecting or disconnecting to corporate network systems,
- expanding the required functionality of work,
- the development and inclusion of new functional tasks in the system,
- connecting to external information sources.

The level of “functioning error” is the most operational and requires immediate consultation with a specialist. In this case, it is important to identify the problem and form an order for a specialist.

To solve this problem, conceptual and thematic units of the reference book for the distribution of activities and job responsibilities of the employees of the support service for the functioning of the system were selected as units of analysis. Fig. 3 shows fragment of the reference book for the distribution of activities. Two levels of the reference book are shown to identifying the problematic of the document, including directions and types of work. The figure shows the first level of the “information network resources” section of an organization. In general case, such resources can be databases by thematic areas of the organization, applied information systems that support management activities and technological processes of the organization, help systems, etc.

The thesaurus combines a reference book for identifying the problematic of a document with a reference book for the distribution of functional responsibilities of the support service for the operation of the information system.

Thus, it can be said that the developed method for monitoring the functioning of a distributed information system includes the integration of content analysis and directed search based on a specialized thesaurus.

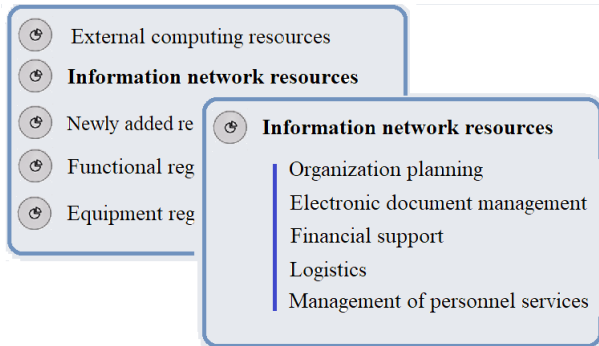


Fig. 3. Fragment of the reference book for the distribution of activities

The *first stage* of proposed method for analysing document texts includes:

- development of the presentation of the reference book of official powers in the form of a problem-oriented thesaurus,
- fundamental development of a method for analysing texts entering the information system.

At the *second stage* of the work, the development of algorithms for supporting decision-making in the preparation of draft instructions is carried out on the adapted content analysis. It is based on the reference book for the distribution of official powers. Thus, difficulties to automate the implementation of content analysis is reduced.

At the *third stage*, a software model is developed that ensures the implementation of the method and its integration into a distributed information system, as well as the interfaces that provide convenient modes of operation when preparing draft instructions.

Fig. 4 shows a diagram of the technological chain of processing applications entering the system.

As a result of the implementation of the technological chain for processing documents entering the system, which are applications or requests from users of the distributed network, it is provided:

- identifying the problematic of the document,
- analysis of the received text arrays on the basis of a problem-oriented thesaurus,

- sorting of requests, visualization of requests, as well as automated preparation of draft instructions and rules for solving problems related to the maintenance of the information system.

5. Conclusion

Analysis of the possibilities of using the accumulated information is recognized as an important area of support for management activities [13].

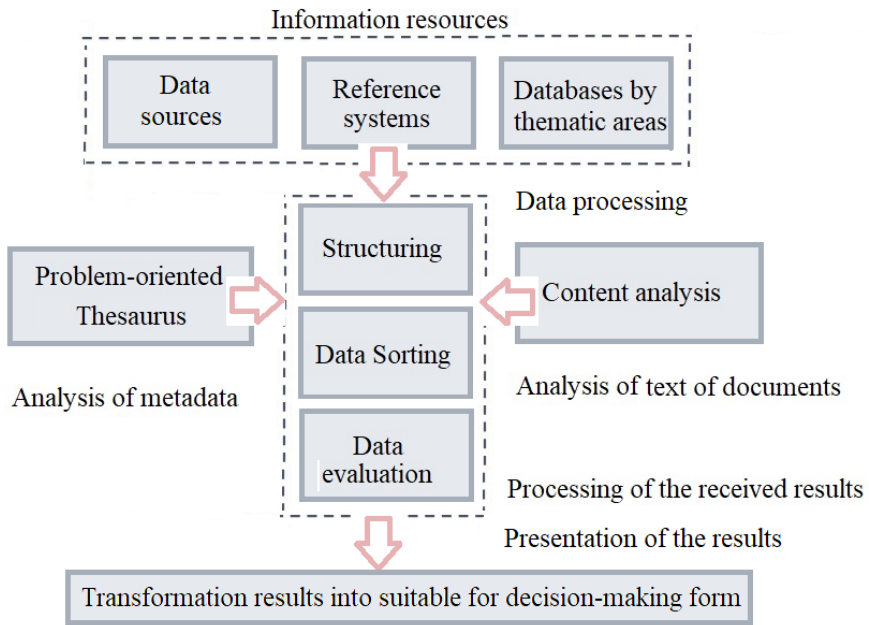


Fig. 4. The technological chain of processing the requests entering the system

The article discusses the development of a method for the automated preparation of draft instructions for the execution of orders related to solving problems of maintaining a large-scale distributed information network. The method is based on the analysis of the texts of addresses of network users. The idea of the method is based on identifying the problematics of documents, appeals and proposals received by the support service for the functioning of the information network.

Thus, the on-line analysis of applications and user requests will allow investigating the problems arising in the process of information systems functioning, speed up the processing of incoming requests, and also increase the efficiency of monitoring the functioning of a large-scale information network.

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