Organizational and economic efficiency of the polyhierarchic model of construction

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Abstract. This study has been done over the years in the field of growing the effectiveness of management in construction companies from the point of view of applied linguistics. The purpose of this work is to share with the scientific community some practical results of the application technology of company process management, in particular linguistic methods of the effectiveness subject to control in natural language. The study deals with the description of the linguistic and management models, views, practical results of their application in the application area to assess the sustainability of production and minimize losses. The authors used the developed technology for practical use, and the article presents the results of this application.

1 Introduction

The need of information in the subject's structure reflects the operational demand for the information support of virtually any activity, thus suggesting inclusion of the subject in the present social information systems.

This statement is methodologically meaningful both for distinguishing the stages of independence and the level of formalization of information activity as the conscious process of business administration, which is especially vital for construction industry.

Uncertainty in construction processes causes delays, higher costs, accidents, losses of material, technical, and financial nature, losses of life. It is quite essential that the administrative, regulatory, procedural, technical work flow correspond to the principles of the triple unity:

1. Unity of purpose.
2. Unity of objectivity.
3. Unity of the plane of expression.

Any violation of this principle, i.e. uncertainty and redundancy, over administration of the processes may lead to the problems of now objective, not virtual, reality of the documented procedures.

The overall craze caused by a free access to printing a text has caused an abundance of documents, never confirmed by reality, dubbing of processes, confusing reporting, loading executive staff with formalized and destructive functionality - all of this not only lowers declared quality but threatens the functioning of production itself in objective reality[1].

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2 Goal, tasks, methods of study

Let us view a popular example of how bureaucracy functions: a sausage factory has a pack of authorizing documents, which gives the sausage they produce high quality salami, so any inspection will yield positive results. In fact, here the essence of the event to be evaluated is substituted with a bunch of properly prepared supporting documents, which never confirms the quality of the production in objective reality as the task of an inspection committee is to make sure that the results of the factory administration activity objectively match the quality of their produce and services and not the formal indices of documented procedures[2-6].

In construction, the formalization and destructuring of administration activity may result in tragedies with multiple losses of life.

Therefore, the administration should be properly and relevantly structured, while the functionality should be closely tied up with objective reality thus matching the urgent needs of the administration and never allow any multiplication of texts irrelevant to the company's functionality.

The polyhierarchic model of administering the building contractor facilitates most effective structuring and management. Evidently, real-time administration is performed in the natural language. Therefore, it is linguistic (communicative) techniques that allow for a more accurate and complete exposure of the essence and potential of an efficient administration[7,8].

The area of the terms of the natural-language polyhierarchic model covers facts, actions, rules and the way the facts interact, details of regulations and actions they trigger, etc.

The relationship between facts and actions as well as the rules of realizing processes should be of high priority, accessible and objective. Meanwhile, one of the most actual issues of the present life is a difficulty in realizing administration activity, particularly due to delays and contradictions in the natural language.

The language area is the cluster where mutual conversions between the concepts from the area of concepts and the natural language are performed, thus requiring two functions: the function of conversion between concepts and the semantics of the natural language and the function of either the synthesis of sentences composed of simple words in accordance with the natural language grammar or sentence analysis [9-11]. Being at the top level of the language, the world of grammar never includes the knowledge of grammar which is required for the synthesis and analysis of sentences and the knowledge of words that are used everywhere, e.g. prepositions, the majority of function words, auxiliary verbs and adjectives, and other grammar forms. The worlds of the language that lie below the world of grammar are clusters of conversion of words and concepts, i.e. the world of vocabularies. Dividing the vocabulary in accordance with the world of objects has the following advantages:

1. We may reduce the number of vocabulary objects to the number of objects in a particular area of concepts thus enabling efficient processing.

2. In the area of objects, the semantic range of polysemous words is limited, therefore their meaning is easy to indentify. For instance, "frame" in the world of knowledge means the "model of Minsky frame", in the world of computer-supported education the "model of education with a sequential display of frames on the monitor", in the world of building mechanics it is "building frame".

3. Parameters and arguments may be determined in pairs to avoid misunderstanding.

When controlling the information flow, sentences in the natural language may be converted to information multitude that , beside concepts shaped as predicates, contains information about time (present, past, future), aspect characteristics (continuous, perfect, imperfect), modality (permissive, prohibitive, potential, subjunctive, obligatory, misleading

etc), sentence types (interrogative, narrative, exclamatory), independent members (time, place, cause, effect, degree, purpose, compromise etc.). Such information multitude may assist in specifying the differences among sentences that seem indistinct when using predicates alone. In practice, we can see uncertainty of the administrative document.

"Crossbar calculations should be made using the LIRA software." - "Crossbar calculations can be performed by means of the LIRA software." - "Crossbar calculations are performed by means of the LIRA software." - "Crossbar calculations are only possible by means of the LIRA software."

All of the about are converted into a single concept "calculation of a crossbar by means of software", while the variety of meanings may only be realized by means of the information multitude which was described above. Consequently, this multitude determines the formal meaning of the statement; however the communicative purpose and efficiency of the documents depend on how this multitude gets formalized.

The meaning of a sentence in the natural language gets identified due to the knowledge obtained from the area of concepts, the relevant language area into which the initial sentence is converted, to the knowledge from the world of links by means of which the area of concepts inherits properties, to the knowledge from the world of the prehistory of the choice. All of them are technically limited but help words to inherit properties from the area of concepts[12-15].

The definitive relations of independent members may be classified in a few ways. The format of these predicates is the format of the complex sentence. The knowledge of these formats plays a key part in identifying questions, answers, mistakes in an intermediate dialogue, one of which is administrative work flow.

It is possible to define which of the concepts of regulatory activity is right by using the knowledge from the area of concepts; if there's no other knowledge, there's no other way except training coming from the outside world shaped as dialogue.

It is also possible to define the concept from the context of the dialogue as well as by means of the knowledge from the world of concepts, Since, as it will be mentioned later, a model of the user gets created in the polyhierarchic model during a dialogue, the content of the dialogue in question beings the knowledge from the model, may be treated as the object for making conclusions in the area of concepts.

Thus, the efficiency of administrative communication is linked to the process of mutual education of the user through the dialogue of documented procedures or by direct realization in the objective reality of the ideal algorithm fixed in the natural language document. It is evident that simplification of the procedures is directly related to the second method of concept decoding, but the complexity and variability of the objective world suggest the possibility and necessity of an educational dialogue when administering a manufacturing complex [14].

3 Results and discussion

A dialogue in natural language may be divided into three stages: grammar analysis, understanding (concluding), and subsequent synthesis with an exit to the objective reality in the form of specific professional actions or a setup of feedback to build up some additional knowledge. Grammar analysis and synthesis are performed using the knowledge from the world of the language, while understanding and making conclusions are supported by the knowledge from the area of professional concepts.

Processwise, such a dialogue is similar to an initial statement made in order to set up a sequential, orderly and hierarchic relation, a meaningful message, some information about the feedback channel [15-18].

In the documentary context, this system is formally converted due to the predicate that identifies the language of communication by means of the knowledge from the area of the language, and is identified as the meaning of variables, formal meaning, and a concept. The formal meaning serves as an input parameter for the predicate - concept identifier that follows. Here, by using knowledge from the area of concepts, a conclusion is made to be identified as the meaning of the variable of the message. The message gets converted into a document or a series of documents in the natural language by using a predicate that follows.

This dialogue may never end. However, it gets completed due to the identification of the user's input sentences in the area of concepts that leads either to practical realization or to the loss of the potential of continuing identification of the semantic aspect of the message.

For a more successful completion of the dialogue it is necessary to structure the knowledge of the operational area, where the interaction takes place, as well as the knowledge used to identify the concepts and their relations with the objective reality.

We have already mentioned that polysemantic words normally express a number of concepts, hence they often belong to different worlds of the language. The worlds of the polyhierarchic model that serve as subjects of a dialogue inherit relevant knowledge from the upper-level world and, due to unification, they determine the meanings of words, thus playing a major part in the process of identification [19,20].

The hierarchic organization of worlds is also effective for processing obscure sentences where it is important to structure the semantic content of the document and correlate it with the concrete executive algorithm.

4 The method of analyzing a few variants

When identifying the formal meaning of a linguistically obscure sentence it is possible to put forward a few versions (hypotheses), the number of which may be reduced by making a conclusion in the area of concepts. For example, setting up a temporary or objective dependence in an administrative document will allow narrowing a possible choice of the algorithms of actions and relating them to the reality. It should be understood that an administrative document that requires a few hypotheses specifying the realism of the algorithms or concept content would at least interfere with the executive functionality and administration on the whole by depriving the document of its meaning.

5 The method of identifying variables

This widespread approach of management analysis, at which the operator compares administrative documents to the existing base and personal experience for the purpose of restoring the missing algorithm of actions or to conceptualize and remove contradictions. This method is applied as a localized extreme measure to establish functioning where administration is an issue because of multilingual concepts in the documents (bad translation), low performance of communicators or intended distortion of the meanings. The method of identifying variables is applicable for solving the system's problems of company administration or when facing direct losses.

6 Identification of the meaning by means of questioning

In case of misunderstanding of obscure statements, as it has been mentioned above/ one may ask the administrator to speak more clearly, thus obtaining some new knowledge. It is evident that the identification of a meaning suggests an increased communicative impact and time of processing information, instead of production activity.

The method of polyhierarchic model means fixation of information and communicative issues and the realistic management of the company's quality, planning, and production management.

Verification of economic meanings and avoidance of misunderstandings in construction management is possible by means of constructing a clear-cut multilevel interaction among company services.

The method of administration offered by the authors means creation of the basic system of monitoring of the company's work flow and execution of resolutions that should be built on an intellectual model of computerized control.

A single database is formed to stratify work flow and also to introduce monitoring systems and calendaring based on the authors' UNIX2016 software. The information here is structures using role and status markers along the following diagrams:

Fig. 1. Hierarchic model of company administration knowledge.

By "regulations" we mean a sum of legal, normative, and instructional base of knowledge for the company's management to use in the time of their principal activity. According to the model, we construct a priority in constructing and executing documents in the current work flow that suggests concrete and controlled deadlines, control over the priorities of the administrative document and execution; the control here is based on the means of automatic fixation of the process of reading and reporting.

The calendaring and the temporal monitoring of the workflow in the contractor's divisions is fixed automatically according the following enlarged diagram (Fig. 2)

The relevance of the document and its ability to be processed automatically in the natural language enable efficient fixation and execution of documented procedures. As shown in the diagram, the document is processed by an operator after being received from an external source depending on the address, temporary dependence (main dates of fixation and execution), importance, and executive force. Further on, the processed document is automatically sent to the 1st level administrator (manager), while the receipt (real time of its opening in the UNIX2016 system) and processing times of the document get fixed irrespective of the user.

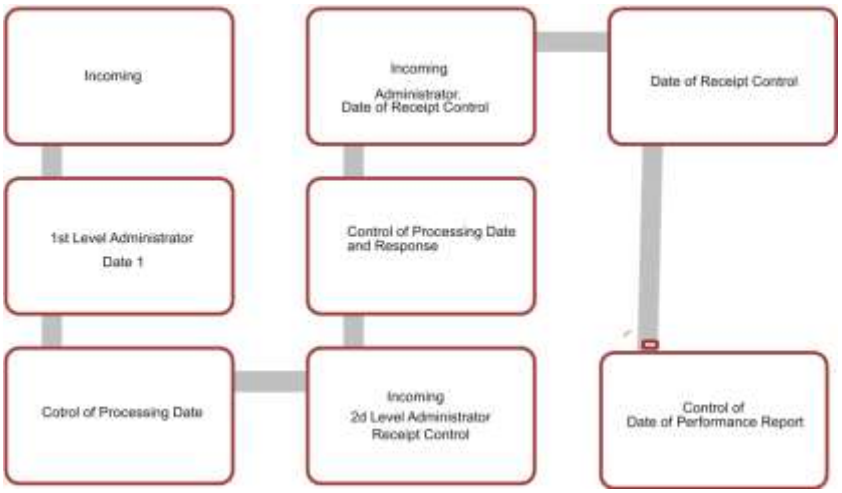

Fig. 2. Calendaring of the automatic monitoring of document processing.

In case of a delay or discrepancies in control dates there comes a reminder of the urgency of fixation and reading it. The same system is used when the document gets through all of the level of administration, while at the final stage a report control is provided. The system provides top managers with an opportunity of gradating documents by importance, need of reporting, including the form and volume as well as the quality control of the documents proper. In case of uncertainty or unexecutable instruction, or a long clarifying dialogue, they are also immediately fixed by the system as soon as the user's message arrives (dialog is independent from the users) and gets analyzed to be corrected.

Removing obstacles in the process of efficient administration means a higher rate in operations and decision making, planning and administration, clearing out stoppages. All of this will lead to an actual decrease in production costs due to unpredictable losses, accidents, errors in planning, and sanctions from administrative bodies and customers. The objectivity and executability of decisions is based on efficient administration in the natural language.

7 Summary

Practical application of computerized managerial systems based on the polyhierarchic models of production management in the natural language suggests an increase in the total efficiency of production, a lower level of uncertainty in the management of the investment-construction complex. Applying the scientifically optimized interdisciplinary approach to the optimization of the company's managerial operations facilitates its efficiency and lower costs. Care must be taken not only in improving organizational diagrams but also about the content and layout of the text, which is the key information carrier of the contemporary system of management.

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