Managing Interactive Business Processes During Software Development

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Abstract[1]

Software development, implementation and maintenance are the set of complex interactive business processes, which are characterized by a high degree of dynamics and frequent occurrence of problem situations.

Most problem situations are related with the distribution of different resources and customer satisfaction. Problem situation elimination is achieved through consistent decision-making[3].

In order to improve the quality of software development projects, management scenario is proposed for interactive decision-makers, which is based on ontological methods, models and algorithms analysing and knowledge processing. Interaction scenario supposes that there is a developed and agreed reference subject area model, which includes structural, ontological, dynamic and simulation models. Besides, it is necessary to have the Knowledge Base which contains information about the problem situations in implementation of the business processes, the order of their elimination and final decision-making results.

Managing interactive business processes will help with organizing online process-monitoring, eliminating redundantly-obtained information, increasing economic efficiency of decision making using, reference domain model and Knowledge Base. Methodology of complex interactive processes allow developing information systems based on knowledge about the features of the actors involved in the designated subject area.

1. Introduction

The operation and progress of any organization is largely due to effective implementation of the complex interactive business-processes. The value of interoperability problems for companies and organizations is still increasing[1, 2].

A well-organized interactive business-processes management leads to organization of business-processes online-monitoring, improves the accuracy and time rate of the received information and eliminates redundancy.

The main idea of interactive business-processes management is necessary resource consumption optimization for the implementation of business-processes. To achieve this goal, it is necessary to make optimal managerial decisions, taking into account all aspects of interactive organizational elements, including the emergence of problematic situations related to resource allocation.

The decision is often made on a collective basis, which implies the need for use negotiation.

2. Software Development Process Characteristics

Management of complex interactive processes is necessary for solving problems related to improving the efficiency of some enterprises and organizations, including those organizations whose primary activity is the software development, implementation and maintenance.

Software development management is a complex process with many participants and a high degree of uncertainty [4,5].

According to Software development life cycle standard ISO/IEC 12207 [7], it has identified the following processes groups, the implementation of which requires the software design and implementation (see Table 1).

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Table1: Software Development Life Cycle Processes

Primary processes	Supporting processes	Organizational processes
• Acquisition • Supply • Development • Operation • Maintenance • Destruction	• Documentation • Configuration Management • Quality Assurance • Verification • Validation • Joint Review • Audit • Problem Resolution	• Management • Project Management • Quality Management • Risk Management • Organizational alignment • Improvement • Infrastructure • Human Resource Management • Measurement • Reuse

These processes overlap in time and require the concerted action of its members. Therefore, control of the software development process can be attributed to the complex interactive process (Figure 1).

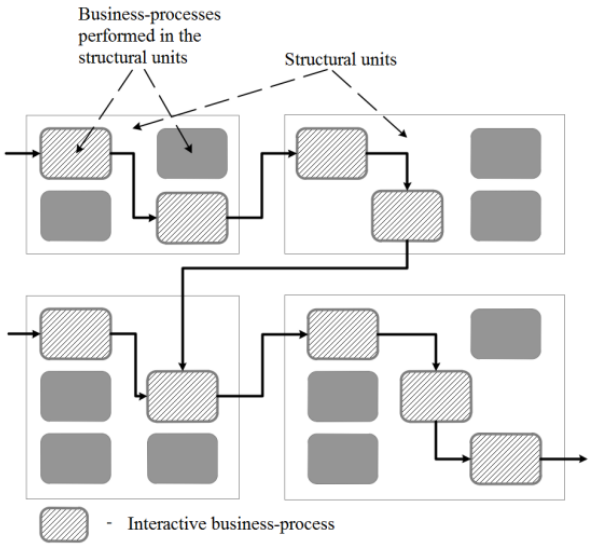

Fig.1. Complex interactive business process

Complex interactive business-processes are business-processes which are necessary to carry out the resources of the various structural units. In such processes, each task can be a separate business process performed within a single structural unit [8, 10].

According to the definition of interactive business-processes, we can conclude that the problem of allocating resources among competition for access to its objectives in managing of interacting business-processes will inevitably arise [10].

3. Brief Overview of Contemporary Software Development Methodologies

Information systems developing methodology based on the process approach imply a shift in focus from managing individual departments through process management, binding activities of all organizational elements.

Process approach requires a comprehensive research of various life aspects in the organization, i.e. the legal operation rules, organizational structure, functions and performance indicators of their performance, interfaces, resource support and organizational culture. During the analysis of business-processes, the responsibilities of departments are thoroughly investigated. This allows you to set the addresses of owners of business processes, thereby creating conditions for the development and implementation of incentives and accountability for outcomes, defined moments and procedures for the transfer of responsibility. In addition, the analysis of this model shows, when performing any functions within the business processes required to support decision making.

During the business processes analysis responsibilities of departments, their managers and employees are thoroughly investigated[6].

This allows us to set the business processes owners' addresses, thereby creating conditions for the development and implementation of incentives and accountability for outcomes, defined moments and procedures for the transfer of responsibility. In addition, the analysis of this model shows necessity of using decision-making support when performing any functions within the business processes.

4. The Necessity of Using Decision-Making Models and Methods in the Management of Software Development

Decision support involves, at least, the presence of the Knowledge Base about the domain on which the inference engine works with problem situations.

Knowledge Base should include information on performed business-processes, including:

1. information on the terms of their implementation, indicating the level of consumption of all kinds of resources;
2. information on the possible outcome of their implementation, indicating how planned is the result;
3. information on the technical and economic parameters of business processes, indicating the allowable range of values;
4. information about the decision maker involved in the implementation of business processes with an

indication of their qualifications, experience and place in the organizational structure of management;

5. information on the time required to achieve the planned results of the business process;
6. information on the business processes formalization degree showing the type, name and place of storage of documents regulating the performance of the business process;
7. information about possible critical situations encountered in the implementation of business processes and the reasons and conditions of their occurrence and measures to eliminate deviations from the normal course of the process.

To fill the Knowledge Base, the above-mentioned information is required to analyse carefully the subject area and to process the information, to achieve its consistency and completeness.

As a basic frame, which brings together and organizes all knowledge of the subject area, the reference model can be used. Reference model is a generalization of the best descriptions (documents, diagrams, decisions, and practices) for a particular object management based on its specificity.

Control object can be of an enterprise as a whole, the activities of organizational element, a single business process or a set of interacting business processes. Reference model of the control object are a complex structural, informational, functional, ontological, dynamic models.

In this paper object control for building the reference model is the process of software development project management in the enterprise, to provide consulting services for maintenance of information systems.

Figures 2 and 3 show examples of the reference model describing software development for consulting industry. The model shown in figure 3 is a typical work schedule for software development project implementation (Gantt chart). Figure 3 shows a fragment of the ontological subject area model constructed from the perspective of the documents accompanying the project management software development process.

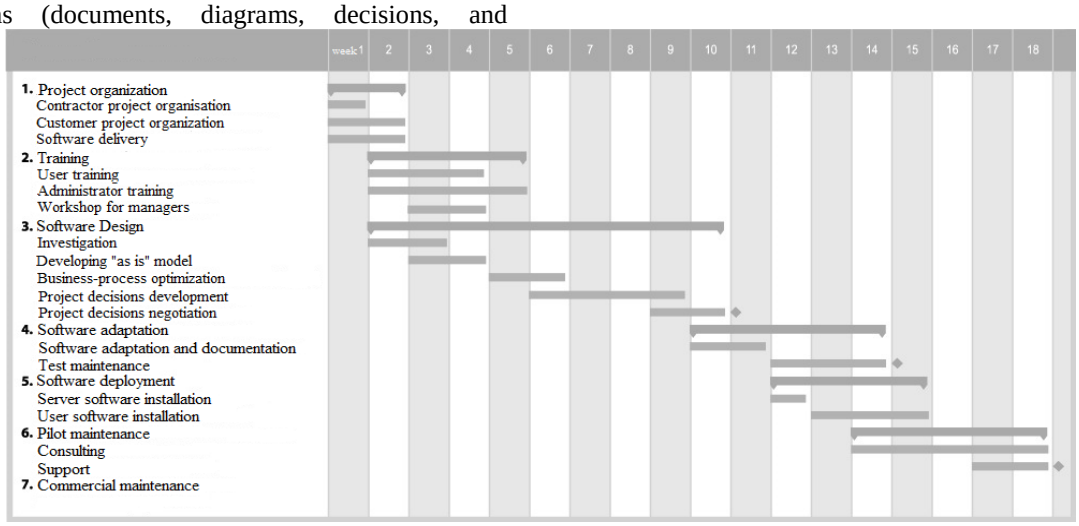

Fig. 2. Fragment of reference model describing software development for consulting industry

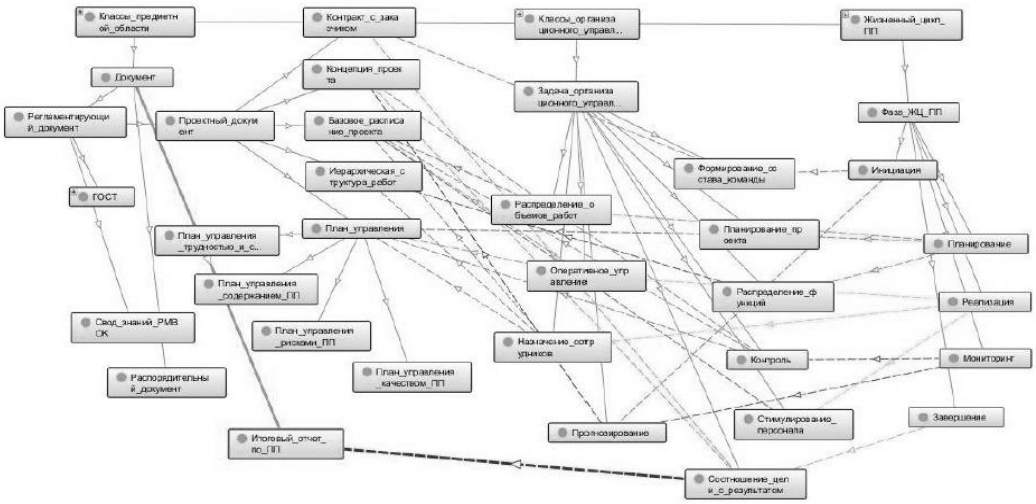

Fig. 2. Ontological subject area model

5. Scenario Decision-Makers Interact in the Software Development Process Using Dynamic Models

In case of problem or emergency situations during the priority tasks, the structural units of the company are acting according to the following scenario (Figure 3)

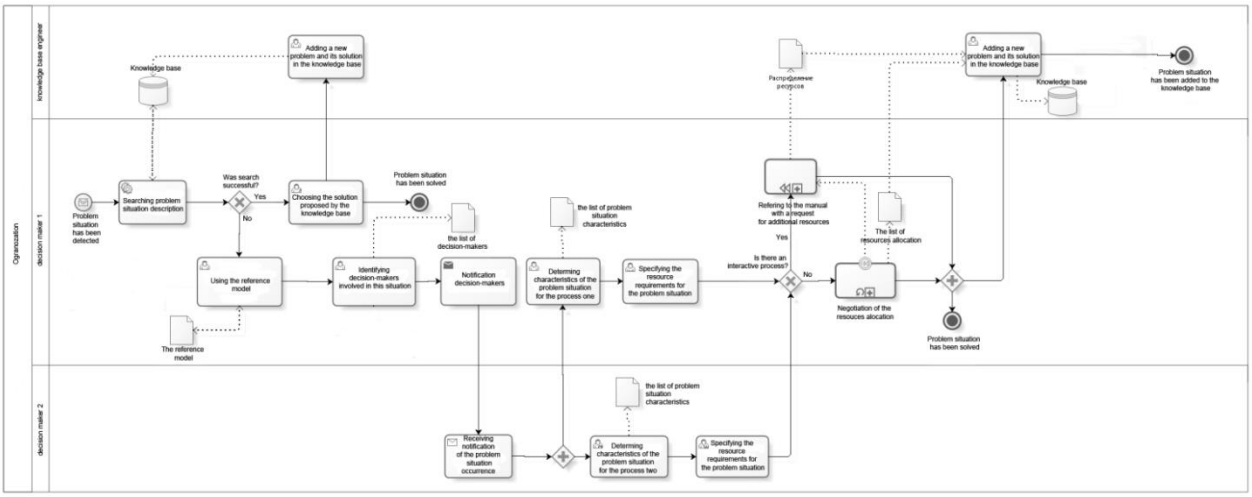

Fig. 3. A dynamic model of decision-makers interaction scenario in the case of a problem situation

.Decision-maker defines the main features of the problem situation to find it in the Knowledge Base. If the Knowledge Base contains the relevant records of a similar resolution of the problem situation, the decision-maker chooses from a list of proposed options so that the problematic situation is resolved. If the Knowledge Base has no problem situation, the decision-maker should see the reference model for determining the presence of interacting business processes.

Based on the knowledge gained, the decision-maker determines the group of participants of business processes, which affect the problem situation, using subject area ontology.

Further, the decision-maker organizes discussion of the problem situation, involving interacting business process decision-makers. In the case where the decision-maker cannot meet the efficient allocation of resources, he involves the company's management to make the final decision. All decisions pass the procedure negotiation, which in case of disagreement may be held by the company's management. Further actions are associated with the introduction of all the parameters, the circumstances of a problem situation, as well as entries in the Knowledge Base decision.

Thus, scenario decision-makers interaction requires a pre-designed and coherent reference domain model, including its structural, ontological and dynamic simulations.

In addition, we must have the Knowledge Base, which contains the decision rules identified during problem situations troubleshooting.

It is necessary to maintain up to date reference subject area model and knowledge base of decision support system, which is developed by the scenario decision-makers interaction, shown in Figure 4.

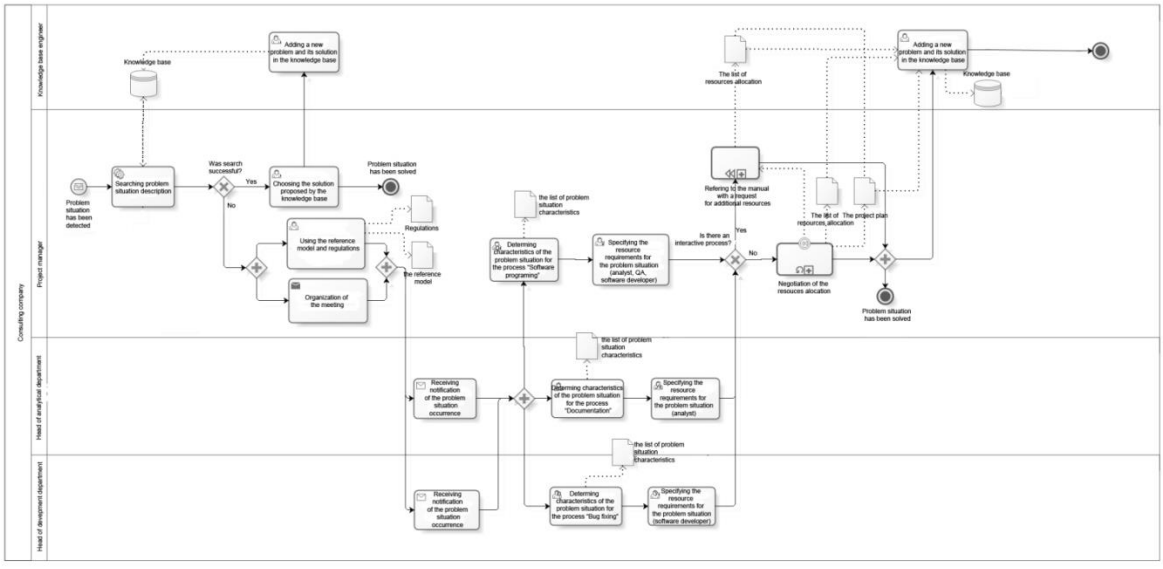

Fig. 4. A dynamic model of decision makers' interaction scenario in the case of a problem situation for example in consulting organization

6. Conclusion

The developed techniques of managing complex interactive processes require designing information systems based on knowledge bases on the features of the actors involved interaction in a particular subject area. In this regard, the design requires using of information systems models, methods and algorithms for ontological analysing and processing knowledge.

Thus, for effective management of the software development process, it is necessary to create the concept of intelligent decision support in the management of complex interactive business processes. It should be based on the principles of knowledge management, relying on ontological analysis of interactive business processes. Built-in ontology knowledge base will allow, in problem situations, accumulating and applying knowledge and experience of experts on business process management in the organization.

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