

## SITUATIONAL SCRIPT MANAGEMENT OF BUSINESS PROCESSES WITH CHANGEABLE STRUCTURE

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**Abstract:** *In the presented work the problem of management business-processes with changeable structure is considered and situational based approach to its decision is offered. The approach is based on situational model of management business-process according to which process is represented as a set of situations. The script defining necessary actions is connected with each situation. Management of process is carried out by means of the rules formalizing functional requirements to processes.*

**Keywords:** *business-process, situational management, rules, procedures, roles*

**ACM Classification Keywords:** *H.1.0 General*

**Conference:** *The paper is selected from Sixth International Conference on Information Research and Applications – i.Tech 2008, Varna, Bulgaria, June-July 2008*

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### Introduction

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The present stage of business process operation is characterized by necessity of flexible business-processes management, focused on the user and changing on the basis of awareness the functions of the enterprise. It assumes carrying out of reorganization of such processes during their functioning. At the same time most often used to methodology of structural and object-oriented designing are directed on construction of preliminary specified models business-processes which updating during functioning processes is connected with a number of difficulties. Thus, the problem of management flexible business-processes with changeable structure (BPCS) to provide their reorganization according to external influences and evolution of the purposes of the enterprise is actual. The decision of the specified problem demands construction of corresponding models and methods of management business-processes with changeable structure. The given work is devoted to construction situational script models of management such business-processes.

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### Features of business-processes with changeable structure

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Business-processes with changeable structure are characterized by change of time parameters and sequences of a part process of procedures during its functioning, distribution of processes between divisions of the enterprise, a significant degree of parallelism, presence of time, financial, material restrictions. At functioning BPCS under influence of uncontrollable external indignations the condition of data of process changes. Change a condition of BPCS data leads to change of process structure as realization of the last is defined both on the basis of the traditional process approach, and on the basis of current data [Chaliy, 2006].

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### Problem statement

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Initial data for realization situational script management of BPCS are: the business-corrected, defining the order and restrictions of functioning of processes at the enterprise; the multi-component representation business-process including levels of rule [Gottesdiener, 2002], procedures, the objects given; logic representation of sequence of realization of procedures business-process. According to the offered approach, at automated management BPCS it is required to provide a finding of a rational route of realization business-process which at occurrence of external indignations allows to reach the set parameters of productivity proceeding from a current condition of process. Thus under productivity, according to ISO series 9000, we shall understand a degree of achievement of the planned results.

Productivity  $Rz(BP_i)$  of business-process  $BP_i$  is defined on the basis of productivity criteria convolution:

$$Rz(BP_i) = \sum_{m=1}^M \lambda_m Kr_{im}, \quad \sum_{m=1}^M \lambda_m = 1,$$

where  $Kr_{im}$  –  $m$  - productivity criteria  $BP_i$ ,  $m = \overline{1, M}$ .

The productivity criteria, according to requirements ISO of a series 9000 is defined as follows:

$$Kr_{im} = \frac{pk_{im}^{fact}}{pk_{im}^{plan}},$$

where  $pk_{im}^{fact}$ ,  $pk_{im}^{plan}$  –  $m$  - actual and scheduled parameters.

Let's note, that parameters business-process, according to features of the process approach to management, are subdivided into three groups: parameters actually process, parameters of production, a degree satisfaction of the consumer.

On the basis of considered above characteristics BPCS we shall formulate requirements to situational script representation of business-processes:

- representation business-process in the form of a set of situations;
- use of the contextual information for operative decision-making;
- decision-making on the basis of the knowledge expressed in the form of rules;
- division of duties and powers of executors.

According to the given requirements a route of realization business-process consists of sequence of situations  $St_l$ , each of which is characterized by a subset of the data reflecting a current condition business-process, and also the script of actions in the given condition. The script reflects sequence of performance business-procedures  $Br$ . Realization of procedures is carried out by executors on the basis of roles  $Rl$ . Thus for each process exists initial and final situations  $St_{begin}$ ,  $St_{end}$ .

Formally general statement of a problem consists in a finding during each moment of time  $t$  display  $\Psi_t$ , connecting current  $St_l$  and final  $St_{end}$  BPCS situations in conditions of unforeseen external influences  $\Phi_t$  on the basis of business-rules  $Bpr$ :

$$\Psi_t^{BPS} : St_l \xrightarrow[Bpr, \Phi_t, t]{} St_{end}$$

with limits  $BPS_i$ ,  $Rz(BPS_i) - 1 \leq \Delta$ ,

$$kf_i \geq kf_i^{plan}, kf_i \in Kf,$$

where  $BPS_i$  - description  $i$  - business-process, represented a set of admissible situation  $St_l$ ,  $l = \overline{1, L}$ ,  $St_{begin}, St_{end} \in BPS$ ;  $Rz(BPS)$  - BPCS productivity;  $\Delta$  - maximum deviation of productivity from the scheduled value equal 1;  $Kf$  - set of critical factors of the success defining areas of steady BPCS functioning.

Each of situations  $BPS_i$  corresponds traditional business-process and is described on the basis of multi-component model of process. Management of situations at a level of process as a whole is carried out by means of rules. Operating influences within the limits of a situation are implemented by means of the business-corrected, used for updating the script of performance of procedures. Thus, the offered approach provides management business-process with changeable structure at two levels - a level of process as a whole and a level of a situation. Management at level BPCS is directed on achievement of an end result and carried out by means of the rules reflecting expert experience, and also functional requirements to processes. Management at a level of situations is directed on minimization of expenses at achievement of the set parameter of productivity.

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### Situational script model of management business-process

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In conformity with the formulated requirements, combines advantages of the approaches which are based data and approaches, based processes and it is focused on construction of models business-processes with changeable structure on the basis of knowledge of a subject domain. According to the considered statement of a problem of automated management business-processes and according to the approach offered situational script problem of automated management BPCS in conditions of uncontrollable external indignations consists in a finding of the rational route consisting of sequence of situations business-process which at occurrence of external indignations allows to reach the set parameters of productivity proceeding from current condition BPCS. Thus the choice of a route is carried out by means of corresponding business-rules on the basis of the data reflecting influence of external uncontrollable influences [Levykin, Chaliy, 2004]. Unlike traditional approaches to construction of models business-processes, situational script model operates not simply with sequence of procedures of process, and the situations arising during its realization. Examples of such situations are: results of acceptance of an experimental batch of the goods the customer, change of the constructive sizes of a product on demand of the customer during manufacture, necessity of replacement of materials or accessories because of absence of the necessary party at suppliers, etc. For processing a concrete situation should be executed business-procedure  $Br_j$ , which represent logic units of work which are distinguished by executors as a unit (for example, filling of the electronic form).

Let's note, that  $Br_j$  is considered as a uniform indivisible part of work which can be either executed completely, or not executed. Business-procedure is implemented by one worker.

Management of a situation business-process at the considered approach consists in the following. External influences during the moment of time  $t$ , and also realization of procedures  $Br_j$  change a condition of data of a situation. The changed condition of data leads to performance of business-rules  $Bpr_i$ , according to a principle of dynamic reengineering changing the script of performance of procedures  $Br_j$  to receive preset values of parameters business-process.

We shall more detailed consider offered situational script model. In a basis of the given model the concept of a situation lays.

**Definition 1.** The situation  $St$  represents the object, described the data sets, describing condition BPCS, conditions of occurrence of a situation, a set connected with a situation business-procedures, the script of performance specified business-procedures, and also set of roles of executors business-procedures. Elements of structure of data of a situation are the logic variables describing presence of those or other given results, necessary for performance connected with this situation business-procedures in conformity with the script of a situation. Formally the situation is characterized by a following cortège:

$$St = \langle C, Br, Bpr, R, Sc, D, E, Rl \rangle ,$$

where  $C = \{c_i\}$  – set of initial conditions of occurrence of a situation;  $Br = \{Br_i\}$ ,  $i = \overline{1, I}$  – set of business procedures;

$Bpr$  – business rules set;  $R$  – set of communications between elements of a situation;  $Sc$  – situation script;  $D$  – set of situation data;  $Bpr$  – business rules set;  $E$  – set of the interface elements reflecting a condition of elements of data in model at BPCS realization;  $Rl$  – set of executors roles.

Realization of all necessary actions business-process at occurrence of a situation is carried out by means of business-procedures  $Br_i$ . The script of performance  $Sc$  connected with a situation is based on set of the attitudes  $R$ , reflecting connections between procedures  $R_{Br}$ , procedures and data  $R_{IN}, R_{OUT}$ , procedures and roles  $R_{Rl}$ , и executors and divisions of the enterprise  $R_{OS}, R_{PD}$ :

$$R = (R_{Br}, R_{IN}, R_{OUT}, R_{ADD}, R_{RI}, R_{OS}, R_{PD}).$$

Definition 2. The script of a situation represents a set of the ordered sequences of procedures, relationships of cause and effect between which are set on the basis of patterns of interaction of elements business-process, and also business - rules:

$$Sc = \{(Br_i \text{ before } Br_j) \vee (Br_i \text{ next } Br_j)\},$$

$$Br_i = \{Br_i\}, Br_j = \{Br_j\}, i, j = \overline{1, N},$$

where  $Pt$  – typical patterns of BPCS fragments;  $Br_i \text{ before } Br_j$ ,  $Br_i \text{ next } Br_j$  – accordingly attitudes preceding and followings between procedures  $Br_i$ ,  $Br_j$ .

Each situation generally can be simple or compound. The simple situation, as it has been shown above, is characterized by the script which can be executed in the given situation, and a corresponding data set. The compound situation  $St^{compl}$  contains references to the description of other situations entering into it (both simple, and compound) and, thus, characterizes hierarchy of situations and procedures.

The offered hierarchy of situations is able to solve a problem of discrepancy between vertically-focused functional structure and the horizontal description of the enterprise in the form of set of cooperating processes. Really, the hierarchy of situations allows displaying functional hierarchy at the enterprise. At the same time, each situation, both simple, and compound, is BPCS element. The interrelation between BP situations and divisions of the enterprise is implemented through the mechanism of roles. Realization of the script of a situation in the developed model is carried out by means of the mechanism of plural roles. We shall note, that the mechanism of roles in the given model allows considering occurrence of supernumerary conditions of process to similarly normal BPCS functioning. Accordingly, the description and processing of supernumerary conditions is carried out by regular means. Roles  $RI$  in model are connected to procedures according to relation  $R_{RI}$  and allows to group executors, implementing  $Br_j$ :

$$R_{RI} \subseteq RI \times Br, R_{RI} = \{R_{RI_j}\} = \{(RI_j^i, Br_j)\}, Br_j \in Br, j = \overline{1, J},$$

where  $RI_j^i$  –  $i$ -role for business procedure  $Br_j$ .

Thus, the same  $i$ -role can mean various executors. For example, a role "the head of a department" can mean various heads depending on process and business-procedure. It is obvious, that one executor can play various roles and one role can be implemented by various executors. The offered concept of roles enables to implement the communication presented to models between business-processes and organizational structure of the enterprise on the basis of the attitude  $R_{OS}$  connecting business-procedure and executors:

$$R_{OS} \subseteq Br \times RI \times Isp, R_{OS} = \{R_{OS_j}\} = \{(Br_j, RI_j^i, Isp_i)\},$$

$$Br_j \in Br, RI_j^i \in RI, Isp_i \in Isp, i = \overline{1, I}, j = \overline{1, J}.$$

where  $Isp$  - set of executors business-processes in the organization.

In turn, business-procedure can be a part of the situation, a situation a part of BPCS structure, and executors can be grouped on divisions  $Pd_n$  according with the list of staff.

Start of every business-procedure of the script  $Br_j$  n model is implemented on the basis of the typical rules developed by the author  $Run(Br_j)$  at performance of following conditions:

- all procedures  $Br_i$ , connected with current attitude  $before(Br_j)$  are completed;
- all input data  $D_{IN_j}$ , for procedure  $Br_j$  launch are received;

According to the stated representation of a situation, situational script model  $BPS$  of management business-processes with changeable structure is represented in the form of a set of the simple  $St$  and compound  $St^{compl}$  situations arising at its performance in this or that sequence, and also a rule of start of situations  $Run(St)$ :

$$BPS = (\{St^{compl}\}, \{St\}, Run(St))$$

BPCS implementation within the limits of the presented model corresponds to the considered statement of a problem and it is represented in the form of sequence of the situations reflecting a rational route on the column business-process:

$$(St_1^{compl}, \dots, St_i^{compl}, St_j^{compl}, St_1, \dots, St_l, \dots, St_L)$$

Thus, the situation at the offered approach to management business-process reflects a condition of process to similarly traditional models. At the same time the description of a situation differs from existing BP models as the condition of the structure describing a situation, does not depend from executed at realization of process of sequence of actions, and is defined only by presence or absence of corresponding data. Differently, the sequence of BPCS procedures is defined on the basis of the received data unlike existing models business-processes in which the sequence of procedures is primary. In view of the considered features of the description business-process we shall generalize definition of BPCS class.

**Definition 3.** BPCS represents expansion traditional the business-process, specified in the form of rigidly set sequence of procedures and. It is characterized by purposeful management of structure of process during its performance by means of the rules expressing functional requirements and on the basis of data, describing a condition of process. These data change as a result of functioning process, and also external revolting influences.

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## Conclusion

The offered approach to management business-processes is based on situational script model in which BPCS it is presented by set of situations. Each of situations characterizes a typical condition of process and contains the script of carried out actions in the given condition, and also the list of corresponding executors. Management at BPCS level is directed on achievement of the set purposes of process and carried out by means of the rules reflecting corresponding functional requirements. The presented model provides an opportunity of dynamic reorganization business-process by means of the mechanism of roles of executors according to situations which arise at realization of process.

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