Further development of automated methods for predicting risks and expert searching of weakly structured processes

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Structured Abstract

Purpose – Companies are adopting new methods of analysis of business processes to maintain an adequate level of control and transparency. If the process is subject to constant changes and becomes too complicated, there is a need to move from a linear to its non-linear processing. Lack of process structure is a source of increasing entropy. The statistical methods of technological processes based on delayed performance management are not as useful, considering key performance indicators (KPIs) vary from one process instance to another, and their target values cannot be clearly defined. This means that the 'thumbs-up' cannot be applied to weakly-structured process, and requires a new approach to execute dynamic models considering non-linear factors.

Design/methodology/approach – The implementation of the tasks was achieved by conducting field research, literature analysis and creating automated decisions based on the findings.

Originality/value – The proposed solution for the management and improve the efficiency of knowledge intensive processes. To implement pre-hold processing texts presented algorithm, namely the description of the problem and all attached text document. This will extract the tacit knowledge (unstructured), hidden in the daily correspondence, informal communication. The email can be taken as the source.
To do this consistently performed a morphological analysis and syntactic analysis of the text to bring the terms to the normal form. Based on this, we analyse the potential operational risks and the search for experts for the creation of the expert community. Thus, the process can be controlled by some internal/external experts of virtual teams (whose location is not important), that are essentially a community of practice. Coordination responsibility lies with the owner of the process.

Practical implications – The paper described in detail the results of field research, as well as show the system architecture that supports semi-structured process management. The following tasks have been solved:
1) researched features of poorly structured process management in various companies and technological challenges faced by the company;
2) examined the hypothesis that the process risks can be identified and addressed through changes in the information field indicators process (unstructured information on the process);
3) implemented expert search service and prediction of potential operational risks.
Using the developed system allows increasing the efficiency and transparency of processes and expert community.

Keywords – semi-structured business processes, intellectual services, expert search, operational risks

Paper type - Academic research

1 Introduction

Nowadays the process approach to management is a standard efficiency of an organization which needs to align and organize business processes, to adapt to changing economic realities and to survive in a competitive environment, the environment complexity and the emergence of new challenges such as globalization, rapid response to the demands and expectations of customers, the new information technologies. BPM - Business Process Management as a concept of process management of the organization allows the business owner to manage the processes of the organization itself and not the individual functions and organizational structure (as in the functional approach), increases the transparency of its activities. With the advent of the quaternary sector, involved in the production and the provision of intellectual services, process approach concept evolves, the reason for this are the following factors:

- use of intellectual capital. The main difference of sharp-witted employees that their duties are not in the strict implementation of existing regulations, not in the task of the pre-known algorithm. The work of the above-mentioned employee,

on the other hand, usually involves an independent search of new algorithms, methods and ways to address those or other problems. Moreover, his work is not only to find solutions for specific problems, but also to determine exactly which problems should be solved and why.

- the paradigm shift of organization build - from the mechanistic model to the socio-cultural, in which a single centre of decision-making will be absent, and there will be a few centres, which allows the participants to make decisions directly processes.

All this contributes to the transition from the highly-structured systems based on the mechanistic paradigm of communication, to the freer and more flexible system, in the framework of a multi-agent based socialized model taking into account the common values, interpersonal communication, flexibility and knowledge sharing. Such a process is characterized by high intensity of "feedback" to the customer since the product or service is created for a specific customer's requirements profile. Process for the production activities and the provision of intellectual services should be understood not as a series of interrelated tasks, but as a system, continuously generating new knowledge, and the impact this purpose all elements of the intellectual capital of the organization. Such a process can be represented as a network, where the nodes are the participants.

2 Objectives of the study

1. Interviewing representatives of companies in sectors such as professional education, science, and high technology, information and communication markets, production innovation, intellectual services, including consulting, analytics, information brokerage, marketing and banking services, etc. for information on the management of semi-processes;
2. To establish methods used to identify non-random deviations (bottlenecks, errors) in the semi-processes;
3. To analyse the effectiveness of the use of traditional methods (checklists, key performance indicators, strategic maps) for monitoring the flow of semi-structured processes and to identify non-random deviations;
4. To confirm or contradict the hypothesis that the timely analysis of changes in the semi-structured information about the process is the measure, warning about non-random deviations in the semi-structured processes and process quality can be measured by leading indicators of the information field.

3 Field survey results

The survey conducted interviews with representatives of 50 Russian companies at the various conferences about process management experience; it is widely described in

(Gromoff et al., 2017). The results revealed that 89.5% of respondents face weakly structured processes in their daily work and that there are different problems that they cause to their working routine. (Fig. 1)

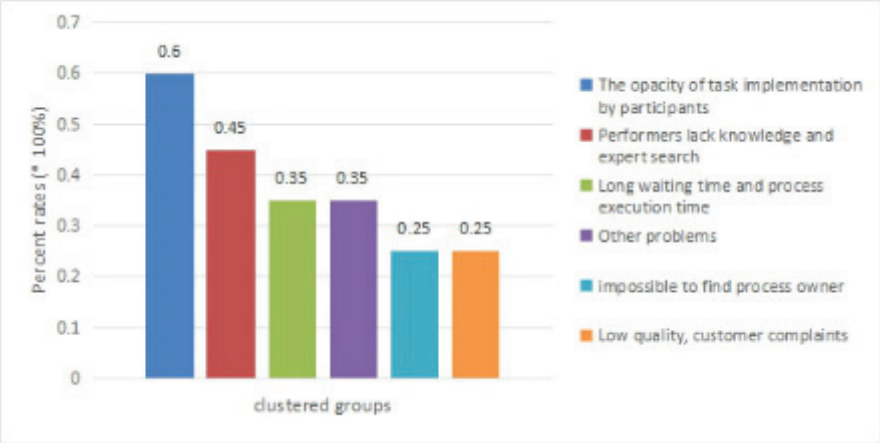

Fig. 1. Which problems relate to your weakly-structured process?

One of the most common problems is the opacity of the tasks of implementing tasks by the stakeholders of the process. Among other problems, respondents indicated:

- the uncertainty of the steps, the uncertainty of composition of the initial information, the uncertainty of the task sequence;
- the uncertainty in the interest of customers, their opacity, frequent changes of mood and vectors;
- duplication of tasks, the uncertainty in the distribution of responsibilities;
- actors do not perform its function;
- lack of methodologies and tools.

The most common way to automate is Microsoft Office, ie the exchange of information in text form. As other methods of automation of respondents

- ACM (adaptive case management), a specialized tool as part of document automation (also known as document assembly)
- CRM, industry-specific solutions
- Mindjet MindManager
- E-Mail
- ERP, WMS, TMS
- Lack of automation
- iBPMS

The question how to measure the effectiveness of semi-structured process, the following responses were received: results, the duration of operation of the process in comparison with the ideal output quality.

Based on the responses received, the following conclusions can be drawn:

- the lack of transparency semi structured processes: often there are problems with visibility of all elements involved in the process;
- lack of control: without an accurate measurement and analysis of the terms of work, schedules are damaged and exceeded budget;
- lack of trace: the lack of communication between events of the individual processes leading to its own failure, when the solution of a problem increases the problem in another area or leads to a failure in the attempt to solve a similar problem somewhere else;
- lack of monitoring: without a trace and the "transparency" it is difficult to implement process monitoring. Management is unable to take informed decisions, so the schedules continue to be damaged and broken, and their costs continue to exceed the budget;
- uncontrolled change: the participants (stakeholders) of the process constantly have new ideas regarding the process. The impact of these changes may just be enormous;
- lack of support: managers often forget that new processes require the support and adjustments in other areas of the organization, for example: in training, motivational schemes, the distribution of role responsibilities;
- The absence of approach to process management, which is able to provide effective support to the above features of the process.

Thus, comes the understanding that the business model of the company has to provide a new organizational space in which can be implemented fundamentally different business processes, organizational structure, business strategy and its relationship with other economic agents. This is due to the specifics of manufactured products - highly specialized knowledge in various forms, as well as the use of intellectual capital. However, almost always unsuccessful projects are related to the lack of organizational discipline and a limited ability to build an integrated and complex approach in the management of processes for the production and the provision of intellectual services. To ensure successful planning and management, it requires an effective management structure, clearly and unambiguously defined processes (organization of work processes), which are accompanied by relevant programs and performed by qualified and motivated employees.

4 Methods to improve the efficiency of semi-structured processes

Less than 20 years ago, there was a theory of business processes, the interest of which was significantly activated by the massive introduction of quality management ideas and use of the systematic approach. At the same time, new approaches to the business organization and management control: the concept of Kaizen (continuous improvement process), quality management system concept (TQM), the concept of lean production (Lean), the concept of re-engineering processes, Balanced Scorecard (BSC).

Total Quality Management (TQM) - an organization-wide method for continuous quality improvement of all organizational processes. The main idea of TQM is that the company should work not only on product quality but also on the quality of work including the work of the staff. Continual improvement in parallel of three components: the quality of products, the quality of the organization's processes, and the level of staff qualification allows for faster and more efficient business development. Quality is determined by the achievement of the objectives of the process.

BSC concept was developed in the early 90-ies of the 20th century, a team of researchers at Harvard Business School running Professor Robert Kaplan. During his studies Norton and Kaplan, along with the improvement of traditional indicators, such as indicators of business activity, created completely new - the timeliness of delivery of goods or services to the customer, product quality and cycle times of manufacturing processes, performance indicators of new product development, performance improvement, teamwork, leadership effectiveness, etc. The main advantage of the BSC - an opportunity to create a strategy map, which, on the one hand, covers the main directions of development of the organization (enterprise), and on the other hand, allows you to see the cause-and-effect relationship between them.

The objectives of the above methodologies are often in conflict with the goals of the traditional managerial control based on financial performance. With the selection of key performance indicators (KPI, which are essentially gauged reachable goals, the organization receives a well-balanced picture of the short- and medium-term performance targets. Strategic goals are communicated to employees by means of cascading objectives, and thus determining the KPI for each employee.

For the traditional structured process, measurable KPI is easily determined based on their process objectives and functions, most often it is time indicators: cycle time, processing time, wait time, run-time, title, etc. TQM (Total Quality Management) postulates that a product or poor service - is the result of unpredictable variability of the process: or the input parameter in the beginning of the process, or in the process of execution. According to the TQM process is statistically controlled, when the only source of variation is natural causes - this variability, originating from many sources and inherent in the process. Natural change behaves as a system of random factors with constant parameters. While all instances of the process differ from each other, as a group

they form a certain pattern, which can be described as a distribution. The reduction of this variation requires management solutions and investment capital (for example, the purchase of new fixed assets). If the distribution is normal, it is characterized by two parameters: the medium and standard deviation. In practice, it is impossible to measure the average and standard deviation, as this would require all possible measurement process instances. Instead, several measurements taken over time by measuring the sample mean and sample variance, respectively. As long as the distribution of these parameters remains within predetermined limits, the process is statistically controlled and natural variations allowable. If they go out of the set parameters, then this is due to non-random changes that are not inherited by the process.

The objective of the quality control system is the supply of statistical signal of the presence of non-random causes. Such a signal can accelerate the adoption of measures aimed at eliminating the causes of non-random. The particular variation can be caused by:

- specific events in the process: the actions of individuals, change settings, etc.
- Process grouping factors, shifts, operators, etc.
- external factors categories: suppliers, environmental conditions, etc.

Recently, however, there is an increasingly visible gap between the approaches based on the generally accepted standard of maturity models created for standardized processes predictable and relatively stable internal and external environment, and the new challenges facing organizations a competitive advantage which is achieved due to exchange. The traditional model in mass production implies that business processes in the organization will be improved in the direction of complexity and standardization from entry-level (chaos) to complete predictability and controllability, i.e. to the level of a well-structured business process, which can be regulated in detail for multiple repetitive actions. The structure of such processes in nature rather rigid and does not support sudden changes dictated by the business environment, such as a change in the laws or market requirements, technologies, business opportunities, etc.

Based on the traditional approach of many Russian companies claim that the level of process maturity in them is growing steadily, but on the other hand is the question of how developed structured models are suitable for processes on production and the provision of intellectual services. If the traditional business model focuses on the standardization of processes, then in the knowledge-dependent models of the main role is played by another function - implementation of a unique product or service through the management of the expert community, customers, suppliers, and utilities. This is achieved through constant effort, training, teamwork, involvement, and self-discipline, that is, the orientation process of formation of the new knowledge gained using organizational knowledge, of knowledge as a business service in distributed socio-technical structures communicates.

A structured approach is undesirable and impossible for the processes of provision of intellectual services, as the high degree of uncertainty leads to the complexity of the process of creating a model with the right level of detail; Moreover, structuring may lead

to stereotypical thinking, at the time when decisions and frequent changes require creativity and flexibility. Such processes are semi-structured in nature, they can be described only partially, because the functions are known only to the beginning of the actual processing, the sequence of processing steps is set regarding a specific situation, and the organizational units are determined depending on the specific requirements. There are 2 approaches to the definition of the business process:

1. A set of interrelated activities, which has inputs and outputs needed to achieve the goal (the value to the client) - supported the notion of a structured process;

2. Coordination between the people and the IP by selecting the optimum competences and technologies to achieve the goal (competitive advantage) - supports the concept of weakly structured process.

For the second approach, it is necessary to develop their own methods of quality management and automation to address the problems identified in the study above. For semi-processes of the production and the provision of intellectual services needed to develop and implement new approaches to process management, focused on the promotion of activities through close cooperation between stakeholders and rapid response to changing requirements.

5 Analysis and automation of weakly structured cooperation as the basis for the effective functioning of the production processes and the provision of intellectual services

In terms of approach, a weakly structured business process is a purposeful communication of participants to achieve a certain goal. This communication may be presented as an information field, which gives rise to the participants by exchanging messages. Information field - is a set of information that can be extracted from the e-mail employees, documents exchanged between them, log in information systems, etc., that is, in fact, it's all "tracks, which leaves the person during the process.". If your organization has implemented a system of Enterprise Content Management (ECM) to manage all types of unstructured information across the enterprise, the information can be obtained from it.

Thus, employees generate content, with proper evaluation of the process which can identify process purposes, its semantic environment, and operational risks. The information flow is a unifying element and can be used by a management structure for planning, monitoring, analysis and adjustment of the functioning of the whole system and conduct risk exploration in the business processes of the organization. Then there is a natural question - is it possible to analyse all of this information to build on its basis a system of leading indicators of the effectiveness of the process?

Interim indicators are lagging, meaning that the owner can find them only after the process is complete. To increase the reaction rate of the occurrence of operational risk

should have leading indicators - signs of future problems. To develop them fundamentally different approach to the description of the process.

For semi-processes, rather than to describe fully process model in a static form, more appropriate would be to provide a description of the objectives of the process, which can be implemented with the help of the tasks within the process instance. Subjects of tasks determined by employees - the carriers of tacit knowledge.

6 The architecture of the proposed solution

The proposed solution for the management and improve the efficiency of processes, semi-works according to the algorithm shown in the figure. To implement pre-hold processing texts presented algorithm, namely the description of the problem and all attached text document (Gromoff et al., 2011), (Gromoff et al., 2012). This will extract the tacit knowledge (unstructured), hidden in the daily correspondence, informal communication. The email can be taken as the source.

To do this consistently performed a morphological analysis and syntactic analysis of the text to bring the terms to the normal form. Based on this, we will analyse the potential operational risks and the search for experts for the creation of the expert community.

The examination must be carried out by persons having special knowledge and experience to understand the specifics of business processes. The study presents to support the automatic detection of the knowledge centres (experts) on the use of terms dynamic picture of each employee in the organization (Romanov et al., 2013). Having studied the recommendations and profiles of the candidates, the initiator sends an invitation to the potential investor of the knowledge (the expert). The expert accepts the invitation or rejects it. In the case of accepting the invitation - it is automatically added to the expert community for the current process instance.

The formal establishment and registration of the community are done by the system. The expert turns into a participant of the process. After accumulating intellectual investment of all members of the community begins solution.

Thus, the process can be controlled by an internal/external expert of virtual teams (whose location is not important), that are essentially a community of practice. coordination responsibility lies with the owner of the process.

For rapid identification of potential risks in the process, the taxonomy of risks based on expert judgements was compiled. After such a "manual" risk classification all messages related to a specific category of risk, mentioned and said by the experts were processed text parser to extract key terms that characterize the risk. If a new task contains the threshold of such terms risk, detection service sends a message to the originator for making operational decisions.

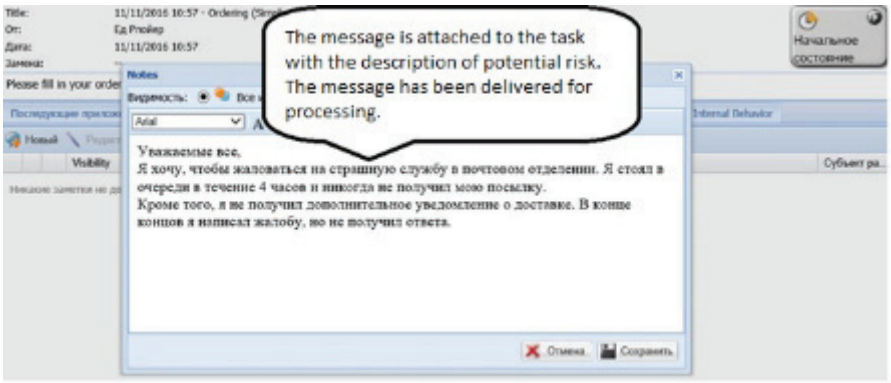

Fig.2. A new problem report

Thus, this communication serves as a leading indicator of potential future problems.

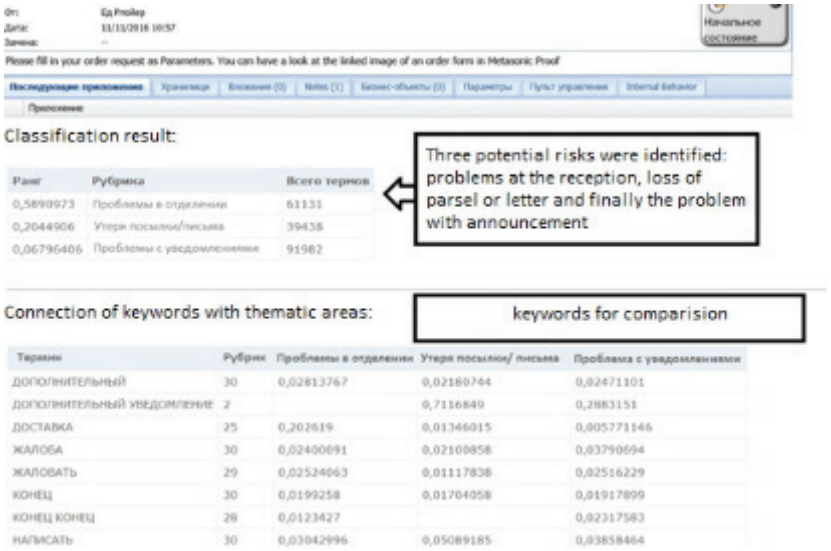

Fig.3. Classification of risks

7 Conclusion

A field study conducted in the work has shown that there is a fairly wide range of issues in all stages of the process for the production and delivery of intelligent services, which confirms the relevance of research, aimed at improving the management of semi-structured processes; maximize the use of intellectual capital.

The semi-structured process itself can be defined as a set of focused efforts of the interacting participants - carriers of information and knowledge (the initiator and expert). This is evident if we consider the activities of the company as a result of the functioning of the socio-techno-economic system. Thus, the activity of the process is a process-

oriented search for the required procedural decisions in a system of distributed information and knowledge. From the management efficiency of the search depends on the efficiency of the entire process.

More correct for these processes is to react quickly to emerging issues in the implementation process, based on the identification of potential risks from the information field of the process, which have forecast the character and allow the organization to quickly adjust their actions based on the involvement of experts.

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