The Usage of The Technology of Constructing "AS-IS" Models of Initial Maturity Levels of Process Management

Serhii Chalyi[1],

Ievgen Bogatov[2]

[1]*Kharkiv National University of Radio Electronics, 14 Nauky Ave, Kharkiv UA-61166, Ukraine, serhii.chalyi@nure.ua*

[2]*Kharkiv National University of Radio Electronics, 14 Nauky Ave, Kharkiv UA-61166, Ukraine, bogatovevgeniy@gmail.com*

Abstract. *Research of enterprise maturity levels has shown that enterprises above the second maturity level have well-structured and documented processes. At the same time, systems of maturity level below the second don't operate processes at all. Instead, such systems have workflows as an analogy of processes. Building of "as-is" model with Process Mining technology is complicated for such kind of systems due to the inconsistency of log structures of the management systems to requirements defined by the mining technology. To resolve the constraints the technology of construction of graph models of business processes of zero and first maturity levels of process management on the basis of the analysis of event logs is offered. The technology involves structuring the event log, building graph models of workflows of the system, forming business process logs by combining routes, and building graph models of workflows "as is" by means of intellectual analysis of processes.*

Keywords:, AS-IS; TO-BE; workflow; maturity; process mining; log; event.

I. Introduction and Problem statement

Modern approaches to enterprise management differ in the way of organizing many works performed within the enterprise in order to create the final product. Today there are two alternative approaches to the description, implementation, and management of the list of works within the enterprise: the process-oriented and the functionally-oriented.

The process-oriented approach is based on the concept of the business process. The latter is presented in the form of a sequence of works, the results of which meet the requirements of consumers. Changing requirements requires adjustment of business processes.

The functional approach involves the definition and implementation of individual functional tasks, taking into account the organizational structure of the enterprise. Evaluation of the results of such tasks is carried out at the highest levels of organizational management. Therefore, the results may not fully meet the requirements of the consumer. This discrepancy determines the importance of the transition from functional to process management or a combination of both approaches.

The analysis of approaches to the implementation of process management of the enterprise showed that the implementation of process management in the enterprise requires solving the problem of automated formation of business process models. Existing approaches to the automated construction of such models "as is" use Process Mining technology. According to this technology, graph models of business processes are constructed based on the analysis of event logs. The technology requires input logs that contain time-ordered records of each process [1]. This approach is successfully developed in the case of at least partially implemented process management in the enterprise but faces difficulties in the transition from functional to process management [2].

The maturity levels analysis of process management according to the CMM has shown that functionally-oriented information control systems belong to the zero-level of maturity of enterprise process management systems. For zero-level maturity systems, it is typical to register in the event log all tasks that have been performed at the enterprise, without prior filtering. That is, work in such systems is fixed on an "ad-hoc" basis [3].

At the first-level maturity systems, a mixed, process-functional approach is used. The works at such enterprises are only partially separated into certain sequences of works, for which the criteria for assessing the performed work quality are formed, the roles of employees are defined and responsible persons are appointed. So, zero-level and first-level maturity systems features, as well as nuances of event logs, significantly complicate the automated construction of business process models by Process mining methods. The construction of process models requires the formation of process-oriented event logs, which indicates the relevance of the topic of this study.

II. Problem solution and Results

To solve the problem of business processes graph models automated construction for enterprises, that have zero-level or first-level process management maturity, the structure of event logs and their features were determined. This allows building a process model by means of process mining. Events in such journals are not grouped by belonging to a particular group of works. However, the attributes of events allow you to take into account the resources used, the performers involved, the current state of work in the construction of a process-oriented log. The affiliation of the event to the business process can be determined by analysing the mutual use of the same resources of the enterprise. In addition, when identifying the affiliation of the event to the same process the knowledge about the order of work at the enterprise can be used, but the presence of such an order is inherent management systems with the maturity level above the first one [4].

The general technology for building business process models at the zero and first process maturity levels includes the following stages.

Step 1. Build business process logs "AS-IS" based on the frequency of workflow objects usage.

Step 1.1 Calculate the coincidence of events by analysing the objects used in the workflow.

Step 1.2. Formation of business process execution traces basing on events coincidence degree.

Step 1.3. Formation of structured logs from the formed single routes of events.

Stage 2. Construction of "AS-IS " graph model

Step 2.1 Parameters clarification of a generated log to build a business-process workflow model by means of the process mining.

Step 2.2. Process mining algorithm for the "AS-IS" model selection and construction;

Stage 3. Formation of business process logs by combining traces, based on the analysis of AS-IS" models.

Stage 4. Construction of business-process workflows refined "AS-IS" graph models by means of process mining.

Thus, for the first algorithm stage, it is proposed to use one of the structuring log methods. The selection of an appropriate method depends onto depending on the current maturity level of the enterprise.

The second to fourth technology steps suppose usage of process mining technology. There are many software solutions that support process mining methods, the most used of them ProM. This software uses plugin-based architecture and has a free license. This allows extending the solution with self-written plugins.

For enterprises of zero maturity level, it is proposed to use the method of forming an even sequence (traces) of business processes [5]. The method is based on attributive similarity analysis of log events. The analysis is performed by comparing the significant attributes, considering the weight of each attribute. The calculation of similarity indicators is performed for each current event and for all the last events of business-process traces that have been already identified. The current event is included in the trace, the last event of which one has the maximum value of the similarity index. The complexity of the proposed method is linear, amount of required data about enterprise workflow is minimal. Therefore, the method is focused on the rapid correction of the event sequence while transitioning from zero maturity level of process control to the first one. However, it is possible to utilize the method for systems of first maturity level as well. The method can also be utilized in the process monitoring subsystems for the sake of support of business-process graphical model prototyping. Then the formed models can be used in the comparison of the current business-process models "AS-IS" and the planned, ideal business-process "TO-BE".

The quality of the final result of the method is significantly influenced by the event pairs indicators calculation correctness, which depends on the correctness of incoming data about the event's attributes weight. Attribute weights can be determined by experts or calculated.

In order to automate the process of calculating the weights of the attributes of events, a method of calculating the weights of the attributes of the procedures of the current business-process model "AS-IS" was proposed [6]. As a result of using this method, events attributes weights table is created. Further, the calculated weights can be additionally adjusted by a group of experts.

For enterprises of the first level of maturity, it is proposed to use the method of forming traces, which uses existing knowledge and rules of the business-process execution, namely [5]:
- rules of procedures priority within a business process;
- rules of business-process objects processing;
- rules of performers interaction.

The obtained knowledge is represented as pairs:
- "procedure - next procedure";
- "action - attribute";
- "performer - next performer".

Formed pairs are further used in the formulation of the event trace, by means of further event occurrence possibility analysis, where for each trace the allowed event attribute values are predefined.

The complexity of the proposed method is nonlinear and depends on the number and different types of invariants. The main advantage of the method allows you to use this method for the system of the first -second levels of maturity. This is achieved through the use of existing knowledge about enterprise business processes. The disadvantage of this method is the time it spends on pre-processing an event log.

III. CONCLUSIONS

The technology of construction of graph models of business processes of zero and first maturity levels of process management on the basis of the analysis of event logs is offered. The technology involves structuring the event log, building graph models of workflows of the system, forming business process logs by combining routes, and building graph models of workflows "as is" by means of intellectual analysis of processes.

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