

Change Management and Quality of Service through Business Process Modeling: the N-VIS, a Public Sector Project

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Abstract—Outsourcing in the Public sector has become common practice in the United States and is spreading rapidly in the European Union. When Information & Communication Technologies (ICT) are involved, outsourcing becomes rather complex. In such cases, a clear definition of the processes to be implemented and a quality assurance monitoring system are crucial factors for success.

In addition, globalization, world level financial instability and the need to adjust to evolving standards and requirements, compel Governments and Public Organizations to become more adaptable and to handle changes efficiently. This last constraint has a direct impact on the design of ICT systems; Business Process Modeling becomes mandatory as the most appropriate change management mechanism.

In this paper, a new methodology is presented based on Business Process Modeling. Once the model is completed, the relative program code of the final system is produced. In addition to this system, an end-to-end monitoring platform is developed to continuously search, identify and assess technical and human deficiencies. This goal is achieved by following-up the quantitative and qualitative characteristics of the processes, through the creation and management of adequate Key Performance Indicators (KPIs).

Once the technical problems are suitably addressed, the focus moves to human skills and competency. In this case, clearly defined training needs can be covered adequately and the system can be used optimally.

This new methodology has already been tested successfully on a simple Bank application, a short description of which is included in this paper.

The next step is to apply the methodology on N-VIS, the Greek National Visa Information System that is responsible for the exchange of visa application data between the Greek Authorities and the Schengen Member States.

Keywords- BPEL, BPMN, KPI, Visa.

I. INTRODUCTION

Nowadays, more and more public organizations invest considerable sums in new technologies and complex information systems in order to improve their processes, to manage knowledge, to enhance citizen services and, in general, to become more efficient and competitive.

Undoubtedly, technology leads to significant changes, as far as the operation of Public organizations is concerned, the management of information, the perception of organizational changes, and even the development and management of information systems, through which the strategies of the organization are implemented and supported. However, surveys show that approximately 80% of the implemented projects that are relative in various degrees to Information and Communication Technology (ICT) fail to achieve their initial goals.

The reasons for this failure are usually inadequate requirement analysis, inappropriate design, erroneous estimations, incorrect encountering of the information needs of the organization and faulty or inappropriate change management.

Despite numerous attempts to deal with business processes and change management, research on the bibliography shows that there are only few specific mechanisms for supporting change management and helping government organizations to improve their processes.

Through the case study of the N-VIS (Greek - National Visa Information System) project, a new methodology, based on business processes modelling, is proposed in this work. This novel methodology can lead to significant improvements in the efficiency of public sector organizations, as well as offer assistance in change management and result in successful completion of ICT related projects.

II. METHODOLOGY

A. State of the Art

The majority of advanced organizations opt for approaches that enable them to implement the selected standard(s) and then measure the effectiveness of the new processes. The most fundamental approach is the Plan–Do–Check–Act (PDCA) cycle. In the PDCA cycle, the existing process is compared to the selected (or required) standard or model. Based on the needs or insufficiencies detected, the organization develops a plan for process improvement, then updates or changes the existing processes, measures the improvement, standardizes the new processes, and finally implements these across the organization. The cycle is repeated until all objectives are achieved. Thus, the application of standards assists the users' understanding of the concepts, practices, and values associated with effectively managing, developing, and delivering products and services [1].

B. BPMN&BPEL

In practice, few platforms offer the tools necessary for Business Process Modeling Notation and only one guarantees application code creation through Business Process Execution Language (BPEL) [2]. But, even in this case, there is no end-to-end monitoring system available to facilitate the Public Organization in assuring the quality of the services obtained.

Recognizing these deficiencies, an innovative methodology is proposed aiming at following-up the quantitative and qualitative characteristics of the processes, through the creation and management of adequate Key Performance Indicators (KPIs). In order to successfully improve the processes, it is necessary to accurately define the business goals and objectives of the organization.

Towards this purpose, an all-inclusive platform is suggested, which presents organizations with the following capabilities:

Recording of developmental procedures.

- Select a framework that will enable the realization of the goals and objectives.
- Select a process improvement approach.
- Develop and document a process improvement plan.

Modeling of existing and new functions in the form of business processes, using BPMN

- Analysis of existing processes
- Changing existing processes
- Developing new processes
- Deploying new and modified processes throughout the organization

Application of functions using BPEL

Evaluation of processes using KPIs from beginning to end.

Cost effectiveness and quality control.

In this paper, the methodology proposed is tested on a Bank application. The following five axes are considered focal points:

- Reduction in the duration of the analysis and design. Consistency of enterprising processes
- Decreasing the implementation time
- Reducing the cost
- Improving the quality
- Rendering effective the transition to new standards-change management

C. KPIs analysis based on Data Mining techniques and Factor Analysis

All KPIs, related techniques and reports are included in a Performance Measurement Systems (PMS) to create an effective Management and Business Process tool, based on BPMN. In order to model and assess the N-VIS processes effectively and to analyze simulation results, specific Key Performance Indicators are derived. These KPIs are divided into three distinct sections:

Section A comprises Time-relevant KPIs to measure the time delays between several phases in the overall BPMN model.

Section B comprises Volume-related KPIs to measure the volume delays between several phases in the overall BPMN model.

Section C is a combination of the above two to create some Quality KPIs.

The estimations are based on the BPMN model generated and simulated on the BPMN workflow engine, using the BPEL language and a back-end database system.

D. Quality KPIs Clustering and Decision Making

KPIs measurement results can be used in a graphical representation format to create visual representations of statistical trends and critical indicators, which provide an analytical picture of the process status. A more concise view of the process status can be achieved using clustering algorithms. Clustering is an important tool in data mining and knowledge discovery, and there are many algorithms available for applying a clustering approach to a set of data. Grouping similar items together automatically enables the discovery of hidden similarities and key concepts [5], [10], as well as the summarizing of a large amount of data into a smaller number of groups.

III. APPLICATION OF THE METHODOLOGY

The suggested methodology has already been successfully applied to a case regarding a Greek Bank aiming at optimizing the loan application process. The procedure followed is analytically described in this section. The BPMN diagram illustrated in Figure 1 consists of three separate pools. Each pool represents a participant in the process. A participant can be a specific business entity (e.g., a company) or it can have a more general business role (e.g., a buyer, seller, or manufacturer). In the graphic display, a pool is a container to distinguish a process from other pools when modeling business-to-business situations, although a pool

does not need to have any internal details (i.e., it can be a "black box").

In the first pool, the model of the client and the process of various loan applications are formatted.

In the second pool, the Bank System pool, the loan application processing and approval procedure are designed. The orchestration pool acts as a central management unit for all other pools and includes the ones responsible for the overall organization and communication.

In the third pool, the employee pool, the bank employee responsible for the approval phase is modeled. The client, from the client pool, completes an application form on the internet, initiating, in this way, a request for a loan product.

The bank system pool, after receiving the application request, communicates through xforms with the employee pool in order to have the client's application checked. The "check" subprocess examines the credibility status of each client and automatically designates the status of each application. In this stage, the application of the particular client is either approved or rejected.

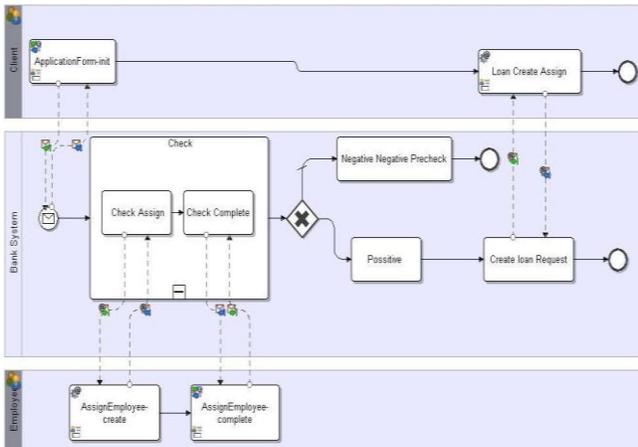


Figure 1. BPMN model for bank loan initiation.

The modeling of all activities is actualized using Intalio designer. Intalio|Designer is built on top of the popular Eclipse platform. It is a collection of Eclipse plug-ins and it runs on any of the numerous operating systems supported by the Eclipse workbench, including Linux, Mac OS X, and Microsoft Windows.

Intalio Designer [8] has a modular architecture, with core modules being part of Intalio BPP Community Edition. It was found to be particularly useful for the purpose of our work because its environment offers easy access to the processes deployed. Once a BPMN process has been modeled, bound to external systems and linked to workflow tasks (all activities are performed through intuitive graphic metaphors and simple wizards) a single click validates the process, generates the code, checks for all dependencies and deploys all artifacts onto Intalio|Server [9]. Intalio|Server is a native BPEL 2.0 process server based on the J2EE architecture and certified for a wide range of hardware

platforms, operating systems, application servers, and database servers.

The proposed system supports the synchronized selection and effective correlation of all information, and as a result a centralized knowledge base is created, through the dynamic depiction of important KPI networks.

Successful system application for web-KPI monitoring, depends, to a great extent, on the choice of measurement indicators of record and their corresponding statistical significance, in order for these to reflect the strategy and the objectives of a bank, via the central loan methodology. The system provides information and knowledge not only to the time indicators of lending flows ("Timestamps KPIs") but also to quantitative indicators ("Volume KPIs") and qualitative indicators ("Quality KPIs").

The correlation of the three categories of indicators, which is achieved via the proposed system, results in a dynamic system of decision making where the user is able to make decisions based on the connected KPIs.

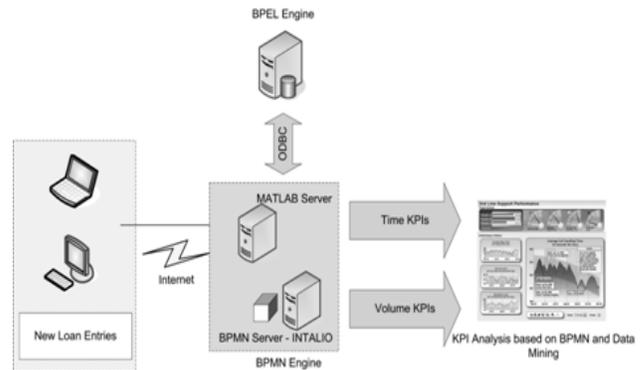


Figure 2. Bank Loan Business Flow Technical Topology.

Information and access to the sub-systems of the new banking web-KPI system is available through a specific web portal, which can be accessed via the bank's intranet by all users, according to the rights of use and access that the bank has designated. The range of information requested is so extensive that it cannot be derived from one system alone. Practically, data are collected from various external sources and relevant databases and merged adequately.

More specifically, according to the implemented architectural structure (Figure 2.) the information that is used for the needs of the currently-used system web-KPI is found mainly in external DB systems of the bank, from where a credibility status of the application is generated automatically, according to the bank's internal data warehouse system.

The core of the system is the central business logic server, based on Matlab with the BPMN Intalio Server Engine. As soon as a loan request is made, the BPMN model generates certain BPEL outputs that are analyzed by the business logic middleware (Matlab) according to specific rules. The KPI analysis creates a dashboard of results and the corresponding graphs in order to assess the KPI performance and produce

the correct decision, based on the k-means clustering algorithm.

IV. THE N-VIS CASE AND EXPECTED RESULTS

This section is devoted to the N-VIS project. This case study aims at demonstrating the possibilities of the proposed methodology and techniques for end-to-end system monitoring and quality of service assurance. Particular emphasis is placed on Human Resources Management and on feedback mechanisms with a view to improve productivity.

The N-VIS is the National Visa Information System, responsible for the exchange of visa application data between the Schengen Member States. The main function of the N-VIS is to connect Greek consulates (more than 130 worldwide), border-crossing points (airports, ports, land borders, more than 50 locations in total) and other proper authorities (ministries, police etc) to the Central System located in Brussels.

Thus, each Member State has to create its own National System (N-VIS) in order to communicate effectively and punctually with all the parties involved. Additionally, each member should be connected to the Central System in the method designated by the European Union (EU) Common Regulations and Decisions [3],[4],[11]. Moreover, the National Visa Information System has to be flexible to handle changes, especially when a new regulation is enacted, or certain changes are requested by the EU. As part of this important and innovative project, vast amounts of alphanumeric data, digitised photos and fingerprint images have to be collected, processed and transmitted all over the world.

The project concerns every citizen in need of a visa and aspires to change the visa “life cycle”, in other words, the way Member States create, store, forward, recall and check visa applications. The focus is especially on the way Member States check and approve visas. Latest technology is going to be employed, such as scanners that capture fingerprints and novel processes and transactions will replace the existing ones. Moreover, at visa crossing-points, new methods concerning the visa check will be investigated, for example verification or identification using the fingerprints of 1, 2, 4 or 10 fingers.

It is obvious that a project of this size, which combines innovative technologies, multitasking mechanisms and knowledge sharing with other parties, is not only very costly but also rather complicated since it requires the incorporation

of several complex processes. Issues like training and organisational impact (time spent to complete border control procedures, waiting lines, signs, and border points) should also be considered.

Therefore, a robust information system is needed in order to create, store and distribute knowledge within this organization. As stated in [12] “organizations are much larger, with higher turnover and require better tools for collaboration, communication, and knowledge sharing. Thus, they ought to develop strategies to sustain competitive advantage by leveraging their intellectual assets for optimum performance”.

Managing knowledge is now critical for almost every organization. Undoubtedly, in the case of the N-VIS, powerful models should be employed to manage the novel procedures and the rapid changes of the new business environment and to support knowledge sharing among individuals from different ministries and with different educational backgrounds.

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