Organizational Change Measurement via Change Metrics

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Abstract – Business Process Reengineering (BPR) has been popularized in recent years as the most important technique for restructuring business operations to achieve dramatic improvements in profitability and sustainable competitive advantage [3]. The Re-engineering activity is a transformational change, moving the business outside its current «rules and games » [5]. Change management is then necessary to manage people trough the emotional ups and downs lead to the massive change and then prevent resistance. Several process evaluation approaches exist to analyze the impact of business processes structural complexity on their performance. To achieve this objective structural and operational metrics are defined upon processes. These metrics are mostly adaptations of software Process or product Metrics. However, these approaches do not target performance problems lead to organizational and business change, that inevitably occur in projects like BPR. This paper defines change metrics that measure the change operated on business process models. Our metrics are also inspired by change metrics defined in Software engineering [6]-[7]-[8]. This work is a first step towards a quantitative and predictive change management methodology to prevent risk related to organizational change in Reengineering projects.

I. INTRODUCTION

In relevant literature of risk management in software engineering, we can find predictive risk management methods based on decision tree modeling [7]. These methods allow fault detection in software modules earlier in the software development process. However, the literature on the risk management in BPR project does not give substantial and reliable quantitative methodologies to manage risk related to organizational change. BPR projects, or other projects that require a BPR like ERP implementation, suffer from low rate of success. BPR projects are characterized by the occurrences of problems, which may lead to major restructuring of the business processes. BPR requires changes to organization structure, roles, job design, and material/information flow [5]. Looking at the research done from the perspective of business people, we can find a variety of proposals for the evaluation of processes. There are mostly from the point of view of the results obtained in the execution of these processes [1], with the use of operational metrics. This evaluation of performance and results of business processes include aspects such as time and cost of the process [2]. There is also a literature related to the evaluation of structural complexity of business processes using structural metrics. Its objective is to establish relation between operation and structural metrics and then proof the influence of the process structural complexity on its performance. These approaches address performance problems lead to process complexity but do not address those lead to organizational and business change, that inevitably occur in projects like BPR. This paper defines structural and operational change metrics that measure the change operated on business process and working environment models. Our metrics are also inspired by change metrics defined in Software engineering [6]-[7]-[8]. This work is a first step towards a quantitative and predictive methodology, like in software engineering, to prevent risk related to organizational change earlier in Reengineering projects.

II. EVALUATION MEASURES FOR BUSINESS PROCESS MODEL

In Elvira's work [2] business process metrics fall into two major categories: operational and structural [2]-[3]. Operational metrics are those that measure how the process is performing through time [3]. While operational metrics deal directly with the dynamic properties of business processes, structural metrics deal directly with static properties [3]. Structural metrics [1]-[2] has been grouped into two main categories: Base measures and derived measures. Base measures are calculated by counting the different kind of elements that a business process model is composed of represented in BPMN (Business Process Modeling Notation) [1]. These static, or structural, properties strongly influence the performance of the process. A benchmark is also realized upon business processes by collecting measurements against both operation and structural metrics. The collected measurements can help to analyze the impact of deficiencies in the process structure on its performance problems. The structural metrics represent a quantification of business process structural complexity. They are composed of 43 Base measures and 14 derived measures.

T. Sobh (ed.), Innovations and Advanced Techniques in Computer and Information Sciences and Engineering, 315–319.

A. Bases measures

Base measures are simple metrics calculated using the Business process model with BPMN. These base measures consist principally of counting the business process model's significant elements. Bases measures are distributed according four categories of elements [2]:

- 37 in Flow Objects category
- 2 in Connecting Object category
- 2 in swimlane category
- 2 in Artifacts category

In the Flow Objects category, base measures are also grouped according to the common elements to which they correspond [2]

- 23 for Event element
- 9 for Activity element
- 5 for Gateway element.

Somme of the bases measures [1] are shown in TABLE I.

B. Derived measures

Derived measures are more complex metrics resulting of aggregation of bases measures. Derived measures allow seeing proportions that exist between the different elements of the model. TABLE II show some derived measures defined by Elvira [1]. The formulas that require base measures that are not presented in TABLE I are omitted. The complete tables corresponding to base and derived measures are available in [1].

TABLE I
BASE MEASURES BASED ON BPMN

category	element	Core element	Metric Name	Base measure
Flow Objects	Event	Start Event	NSNE	Number of Start None Events
			NSTE	Number of Start Timer Events
		Intermediate Event	NIMsE	Number of Intermediate Message Events
			NIEE	Number of Intermediate Error Events
		End Event	NECaE	Number of End Cancel Event
			NELE	Number of End Link Event
	Activity	Task	NT	Number of Task
			NTC	Number of Task Compensation
		Collapsed Sub-process	NCS	Number of Collapsed Sub-process
			NCSA	Number of Collapsed Sub-process Ad-Hoc
	Gateway	Inclusive (OR)	NID	Number of Inclusive Decision/Merge
		Parallel (AND)	NPF	Number of Parallel Fork/Join
Connecting object		Sequence Flow	NSFA	Number of Sequence Flow between Activities
			NSFE	Number of Sequence Flow Incoming from Events
		Message Flow	NMF	Number Of Message Flow Between participants
Swimlanes		Pool	NP	Number of Pools
		Lanes	NL	Number of Lanes
Artifacts		Data Objects (Input)	NDOIn	Number of Data Objects-In
		Data Objects (Output)	NDOOut	Number of Data Objects-Out