A Decision-Making Support Model for Business Process Configuration

George Valença

1 Federal University of Pernambuco
georgevalenca@gmail.com

Abstract. Business processes have improved management activities, approximating the strategic guidance and those who execute their work to achieve organization goals. This alignment can be maintained through a business process monitoring approach, which commonly introduces changes on business processes. Besides this, the impact of business’ changing environment is the variance of business processes. Independently of the level at which change occurs, a general challenge for the competitiveness of organizations is their ability to quickly react to business process changes. Decision making is an element that pervades this competence and guides the analysis of individual choices. Despite the relevance of decision support, existing business process models management approaches do not conduct the user as to what might be an appropriate configuration given the user’s environment. The objective of this research is thereby to elaborate a decision support model for guiding business process owners in the assessment of configuration possibilities, as a means to answer to a change context.

Keywords: change drivers, business process variability, business process configuration, decision-making support.

1 Introduction

Business processes have facilitated and enhanced management activities, being considered an instrument capable of approximating the strategic guidance and the people who execute their work to achieve organization goals. Through the operational point of view, the products the organization provides to the market are the outcome of a number of activities performed and business processes are the main instruments to organize these activities and improve the understanding of their interrelationships [13]. For organizations that have already incorporated Business Process Management (BPM) philosophy, the alignment between the strategy and the implementation can be maintained through a disciplined approach for measuring, monitoring, controlling and improving business processes, reaching the results desired by the corporation [1].

Once identified and formally executed in the first steps of the BPM life cycle, business processes should be continuously evaluated in order to obtain key performance information, which will be measured against business metrics and value. This optimization method commonly introduces a set of changes on business
processes, reviewing aspects such as sequence of activities, quality of inputs and outcomes, goals and/or actors involved.

Compliance with government regulations and industry standards, evolutions on the business domain, stakeholders’ needs, new technologies or economic factors related to globalization pressure are examples of external aspects that can either foster changes on processes [2][3][5][6][7]. The impact of this changing environment is the variance of business processes, which can be of different magnitudes: from the introduction of some automation until a complete reconsideration of the process [4].

Independently of the level at which change occurs, a general challenge for the competitiveness of any organization is its ability to quickly react to business process changes and to adequately deal with them [2]. Decision making is an element that pervades this competence and completely guides the evaluation of individual choices and the subsequent trade-off analysis. Notwithstanding the relevance of decision support, according to [8], existing process models management approaches do not conduct the user as to what might be an appropriate process configuration given the user’s environment. Therefore, it is not straightforward to address issues like: decision making parameters, impact of decisions on processes, relation between process objectives and change decisions, circumstances under which the decision is meaningful, decision constraints, etc.

The main objective of this research is thereby to elaborate a decision support model for guiding business process owners in the assessment of configuration possibilities, as a means to answer to a change context, which can be derived from an external environment and/or from internal requirements. Aiming at developing the decision support model, the following research question will be examined: how to analyze process configuration alternatives considering a set of process change drivers?

The remainder of this work is organized as follows: Section 2 introduces concepts directly connected to the problem domain, needed for the understanding of the work. In Section 3, an overview of the related work of this research is presented. The paper concludes with a discussion about the research problem in Section 4.

NB: in this work, the terms “process” and “business process” shall be used alternatively to refer to the term “business process”, according to [26].

2 Background

The famous slogan “what cannot be measured cannot be managed” translates the proposal of continuous process improvement approach. The practices that compose this phase of the BPM life cycle evaluates a set of metrics and measurements associated with the processes being executed [1]. The following are usual dimensions from which metrics are elicited: time, cost, capacity and quality – failure rate, flexibility, customer satisfaction, variation rate and cycle duration are examples of possible metrics. The monitoring of metrics allows the organization to estimate the impact of deviations in the market-share or to control business process performance in order to match quality requirements. A usual consequence of this analysis is the
insertion of changes on business processes, seeking to improve its performance and align business processes with the intended corporate goals.

In addition to process improvement perspective, there are also two other levels at which processes can change. As discussed in [4], differently from the tactical view of process improvement, process re-engineering is placed on the strategical level, acting as a response to threats and/or opportunities in the business’s external environment, which promotes a fundamental re-think of the business processes critical to the operation of the value chain. In an intermediary level, process redesign efforts are carried out on medium-sized processes, when the business has a low degree of process maturity, demanding the definition of the initial process capabilities. This method frequently modifies job descriptions and introduces some automation [4].

Besides the classification of process changes under business levels, [9] explores different notions of change, presenting a taxonomy based on three orthogonal dimensions: the abstraction level of the change, the subject of change and the properties of the change. The first dimension defines if the change concerns the type level or the instance level. Another branch of the model comprises five classes for change subject: functional, organizational, behavioral, informational and operational. The final perspective proposes four types of change properties (extent, duration, swiftness and anticipation) and their respective ramifications (incremental/revolutionary, temporary/permanent, immediate/deferred and ad-hoc/planned).

The impact of a change in a process is the focus of [6]. The work introduces the concept of scope of a change, clarifying whether it affects pre-conditions for other activities, outputs to be generated or requires new inputs. The result is the possibility to identify the boundaries of the adjustment efforts – which, in the context of the paper, are concerned with the maintenance of the fitness between business processes and business process support system.

The sense of change in terms of process is complemented by the definition of flexibility. Business processes need to be flexible as well as capable of being configured and reconfigured appropriately in order to accommodate changing business priorities as well as business cases with varying characteristics [27]. According to [10], flexibility is the ability to change or alter the way things are handled (i.e. processes) without facing serious complexity issues. Another interpretation of flexibility can be found on [12] which states that business process flexibility is the capability to yield to externally triggered changes by modifying only those parts of a process that need to be changed and keeping other parts stable.

Classifying flexibility as the capability to react to uncertainty by adaptation, [11] offers a deeper understanding of the subject. The paper distinguishes two forms of process flexibility, namely short-term flexibility and long-term flexibility. The former is defined as the ability to deviate temporarily from a standard way of working, whereas the other type is described as the ability to easily change the standard way of working. In [14] is approached the need or stimulus for business process flexibility. The work suggests that the design of requisite business process flexibility demands an understanding of the stimuli (variations and perturbations), which requires a flexible response from the business process. Further, a taxonomy of stimuli to business process flexibility is provided. A more technical view is discussed in [15]: it investigates the nature of flexibility, a property that defines if the capacity of
considering environmental changes could be incorporated in the process model during compile time or not.

According to [14], process flexibility should be designed in such a way so as to meet the demands of variations. Consequently, the flexibility of the process is explained as its ability to adapt to the variations. Organizations need variations so they can deal with changes in the environment, states [16]. The concept of variability is defined in [17] as the property of an object of being changeable. The following description is presented by [10]: variability characterizes the versatility of tasks that is necessary to execute a certain business process. In [19] variability is defined along three dimensions: variety in the range of tasks performed (task variety), variety in the order that these tasks are performed in (sequential variety) and variety in the inputs and outputs of the process (content variety). An alternative classification can be found on [21], which suggests that variability can occur in the context of an intentional view of a process or at an operational/organizational level of flow of activities or state transitions. Going beyond, [19] identifies two main sources of process variability: within the application domain space and over time.

In [18] the variability concept is put into operation through the introduction of variation points in a process model – to which variants can be bound by means of variability mechanisms [17]. Including some process modeling notations were extended to support process variations. [18] increases the boundaries of the modeling language EPC (Event-Driven Process Chains) inserting variability capabilities. The notation allows part of the process model to be individualized by the selection of alternative options. These mechanisms capture a decision point (named variation point) together with the related possible choices, declares [18].

Decision-making is a fundamental aspect when dealing with process variability within process modeling. According to [8], the decision associated with a variation point is a design-time decision, being based on the requirements of the project or organization for which the model is to be used. The work highlights that many can be the drivers behind the configuration of a process: organizational culture, national or regional regulations, compliance requirements, cost, etc. Configuration can be seen as limiting choices by making choices and thereby implies decision making [23].

According to [25], the degree of turbulence of the environment influences the nature of decision making. Hence, turbulent environment and consequent unpredictable business process demand localized decision making, where all relevant decisions about work are made directly by people who actually do the work – having workers in full control of their work, claims [25].

The argument behind the decision is the issue discussed in [22]. The paper explores the rationale for why a given design is proposed. It states that the configuration of a given artifact is based on a sequence of decisions, which are functions of two sets: a design space, constituted by alternative options which might be appropriate, and an evaluation space, formed by explicit reasons such as consistency and criteria for choosing among the possible options.

In SPLE the decision perspective is one of the main concerns. In [24], it is stated that the variability dimension should be separated as much as possible. The decision thereby appears as an additional concept to map the variation points to the variability dimension and to describe influences and constraints of variabilities and variation
points. The literature of SPLE presents feature modeling as a decision model, which manages variabilities through software product lines.

According to [8], the majority of the proposals for managing variability in business process models suffer from a lack of decision support for the selection of configuration alternatives. Section 3 depicts current literature on process model configuration and complementary aspects (process change, process flexibility and decision modeling), reviewing their work and discussing available methods. This enables the treatment of the problem with an improved practical foundation.

3 Related Work

Recent concerns in Business Process Management field, variability modeling and the consequent configuration activity are widely investigated issues in SPLE. In addition to Product Line perspective, researches in Software Architecture, Value-based Software Engineering and also in social sciences such as Business Administration and Economics have deeply discussed the decision-making process and related questions – for the scope of this paper, with respect to areas other than Business Process Management, only works in SPLE field will be examined. Therefore, in order to obtain insights for the conception of the proposal of this research, this section starts exploring approaches in Product Line field, followed by initiatives which reflected on process models configuration. The main purpose here is to identify the level of decision support given; analyzing which aspects are considered by the approaches to be helpful and to enhance this process.

In [29] it is developed a systematic approach for decision making regarding product families’ variability in a context of uncertainty. The unpredictable future, which will demand the family architecture to accommodate new requirements and/or technological improvements, is the motivation scenario for the development of the approach. As a means to bridge the gap between customers’ needs and wishes, and their realization in technology, the work uses five architectural views, named Customer, Application, Functional, Conceptual and Realization (CAFCR). A variation model is then constructed for each of these views. The idea is to “build smaller models around the issues that are most difficult to decide on” and to mix variation models, relating variation points in different views.

The work claims that, once changes to future requirements are very uncertain, it is worth analyzing representative possibilities, which will emerge from a group of scenarios. These scenarios “form a good basis for business decisions” [29] and are therefore strategic. They can represent an initial estimate about the characteristics of the future market (based on market relevant information), market segments, customer preference criteria, among others. For each scenario are then described business strategies – organizational responses to the future market and business environment. These strategies should be linked to one or more architectural scenarios, identified through the variation models. The choices in these models are guided by a set of quality attributes (e.g. performance, cost, etc), given by the strategic scenarios and customers’ preference criteria. For each attribute are defined acceptance levels for
different factors, allowing thereby a quantitative assessment. Based on it, architectural scenarios are evaluated to obtain adequate information to make decisions [29].

The development of the approach of [30] was motivated by the limited attention paid to the subject of justifying architectural decisions for variability. Above all, the work highlights that little guidance exists as to how to choose among the available choices. These issues are addressed through the use of cost modeling and dependency modeling. Regarding economic considerations associated with de product line, the work is concerned with the designer’s point of view, analyzing the cost of different variability options for the same requirement. The approach describes how to carry out the computation in the presence and in the absence of any tactic to support variability. In the case of introducing a variability supporting tactic, seven different phases during the development cycle when a variability can be introduced and realized are considered. It claims that “the choices a designer makes would have a better basis if cost models like this would exist” [30].

With respect to the dependency model, it follows that there exists a dependency between software layers, which with some probability leads to additional costs. According to [30], “the realization of a variability extends beyond one module if there is a dependency of the responsibilities in the second module on the responsibilities in the first”. Hence, it uses two measurement criteria when discussing the architectural tactics for variability: the number of responsibilities affected by the exercise of a variability and, the probability of side effects on responsibilities not involved in the variability itself. Furthermore, architectural tactics to support variability were grouped in three categories: localize changes, prevent the ripple effect, and defer binding time. The work, therefore, guides the designer in the evaluation of the consequences of his choices when choosing a tactic to achieve variability.

A decision-making framework is proposed in [31], which determines architectural preferences and examines tradeoffs for product-line architectural design. The decision-making problem is described in this work as the process of selecting architecture that matches the design policy (quality attributes) and also make it possible to trace how candidates were chosen. In order to address this issue, the work applies AHP (Analytic Hierarchy Process) to the architectural design. This method allows the user to compare different options based on quality attributes (e.g. reliability, safety, extensibility and so on). Firstly, each criterion receives a priority, obtained through pair wise comparison. Secondly, for every criterion, it is carried out a pair-wise comparison among candidates. Thereby, to each architectural option is given a weight, which is just a result obtained by small decisions made [31].

Concerning business process field, a systematic requirements-driven approach for BP design and configuration management is presented in [27]. The work employs requirements goal models to capture alternative process configurations and provides the ability to tailor deployed processes to changing business priorities or customer preferences (i.e., non-functional constraints) by configuring their corresponding goal models at the goal level. The process configuration activity is guided by a set of quality attributes (e.g. customer satisfaction), which serve as selection criteria for choosing among business process alternatives induced by the goal models [27].

Firstly, the approach identifies the business goal associated with the business process. This goal becomes the root of the goal model and is then refined using AND/OR decomposition. The work classifies as variation points (VPs) OR
decompositions independent on data/events. From the functionality perspective of process, the achievement of any alternative subgoal of these points is exactly the same [27]. The only difference is in how each choice contributes to process’ quality attributes. Therefore, VPs help the process owner in the configuration activity, as it allows the selection of the best way to meet quality constraints of the stakeholders while delivering the required functionality of business processes. As the work demonstrates, goal models can be a useful artifact for business processes configuration based on stakeholder prioritization among quality criteria.

The proposal of [32] guarantees an improved business process configuration with the aid of a questionnaire-based variability framework. The variability of a given domain is captured via domain facts, which will represent the answers to a set of questions – the modeler should be in close collaboration with the domain experts while conducting this activity. Similarly, process variability is modeled with process facts, which are identified with the variants of the process model for the particular domain. Domain facts and process facts are then linked via a mapping procedure. The configuration is then conducted from the set of facts grouped into questions.

When employing the approach in [32], subject matters experts do not need to master the process modeling notation, with domain variability being represented through a questionnaire. However, the main benefit of the framework is that it provides a substantial guidance to process owners, working as a decision support tool that extracts a valid configuration from the answers given to a set of questions.

4 Problem Statement

There may be several sources of process change – as remarked in Section 1 and detailed in Section 3 – and this requires the process owner to carry out adjustments on processes. The sequence of actions taken can be characterized as design decisions and, as such, consider potential alternatives and a group of parameters (objectives, constraints, indicators, etc.) for the formulation and provision of arguments and justifications regarding the choices made.

Decision-making in process modeling/configuration activity was discussed in [30]. According to the work, despite being a wide explored field, variability management suffers from an absence of decision-making support. It highlights two main problems concerning this aspect: 1) limited attention to the subject of justifying architectural decisions for variability and, 2) little guidance as to how to choose among architectural options. Therefore, there is a need to guide the process owner through the selection of alternatives; providing instruments which allow him to rationalize the choice of one option in place of another, justifying the decision taken.

This perspective was also analyzed by [18]. The work states that reference models do not provide decision support regarding the selection of relevant variants. In other words, they do not orientate the decision maker as to what might be a recommended alternative, enhancing the trade-off decision among the available options.

More recently, [8] emphasizes the fact that there is a lack of decision support by configurable process models. Therefore, it is not easy to estimate the impact of configuration decisions on the process model and, moreover, the absence of explicit
links between variation points in process models and business decisions demands an expertise both in the application domain and in the process modeling language. The work goes beyond and proposes an integrated framework to manage the configuration of process models, including a questionnaire-driven approach for process model configuration, providing decision support and abstraction from modeling notations.

In light of the shortcomings mentioned, this research has as its core objective developing a decision support model for guiding business process owners in the evaluation of configuration possibilities, considering a set of business drivers. Among the components orchestrated by the model, are: analysis criteria, qualitative/quantitative scales, process objectives, process configuration and parameters crossing (defining conflicts, constraints and opportunities).

References