

## BEST PRACTICES IN BUSINESS PROCESS MODELLING

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The paper explores and analyses approaches and opinions about best practices and recommendations in business process modelling. In the process modelling literature, also as a part of any business modelling activity methodologies, there are no explicit texts about best practices. Additionally, business process modelling is a part of different (approximately 30) business and enterprise modelling architectures, references and frameworks. The paper addresses the following questions: What is the best way to undertake business process modelling? What procedures and core activities are essential during stages of modelling? What are the most important rules, practices and standards to guide the business process modelling community?

Keywords: Enterprise Modelling, Business Process Modelling, Business Architecture

### 1. Introduction

The investigation for any improvement is not new, neither is the one for best practices. According to Nattermann [19], best-practices research also can be one of the most effective tools for organizational improvements. More than a century ago, within theory of organizational management (e.g. by Frederick Taylor) some empirical bases for best practices in organizations were already presented. Thus began the real search for best practices as means for organizational improvement. Business process management (BPM) modelling is applied in practice, but failures, pitfalls, and quality of models as a result of best practice guidelines, have not been

considered very often. It seems that, a problem is still the low level of modelling competence and a lack of commonly accepted standards.

The aim of this paper is to recognize and evaluate some selected aspects of BPM modelling best practice recommendations. Even if much has already been published on the BPM modelling in different approaches and contexts (e.g. macro- vs. microscopic view, architectures/frameworks/references, BPM standards), sometimes making sense of all of the guidelines is difficult (especially for novices in the field). Unfortunately there is rather little consensus about best modelling practice, no commonly held set of rules and standards to guide the BPM modelling community (see e.g. [1, 12, 13, 15, 20, 23, 27]), and something can be done about it. The paper addresses the following questions: What is the best way to undertake business process modelling? What specific core activities are essential for modelling activity through different stages of the modelling in BPM cycle? And what are the most important practices during the different stages of the modelling activities? Possibly, following the advice contained in the best-practice statements/recommendations, and following rules related to process model building – it potentially can improve the practice of BPM modelling.

The paper starts with a synthetic review of the extensive bibliography available on modelling best-practice and guidance formation for business model design and implementation. Then, a short review of the BPM modelling literature on best practices in the field is presented, concluding that most of the development of best practices is described, reasonably enough in teaching texts and training documentations, but still difficult to follow and to accept in practice. The study discovered a large number of statements about what experts (practitioners and academicians) see as best practices in the BPM field during stages of modelling activity.

## 2. Background

Practices classified as “best” and recognized as relevant for action have rule-like attributes capable of important and influencing action. Rules, by being interpreted and implemented, motivate and delimit action. Action, in turn, influences the creation of results that, through adaptation, form goal setting. Formalization and operationalization of goals effectively determine new rules and changes in existing rules, resulting in an evolutionary cycle of rule development and change. Bardach [2] defines the goal of best-practices research as related to widening the range of solutions to organizational problems, implying that implementing best practices can become the solution to real problems. Overman and Boyd [22] categorize best-practices research as a version of the method of inductive practice-to-principles research and define it as “*the selective observation of a set of exemplars across different contexts in order to derive more generalizable principles and theories*” (p. 69). Best-practices research should be pragmatic, practice-driven, innova-

tive and promoting business, positive and prescriptive, commercial and user friendly. Following examples of other best-practices research in organizations (e.g. Bogan and English [4]), researchers also have linked the concepts of best practices and benchmarking to evolutionary processes of best organizations. Sources for identifying best practices include literature reviews, industry trends, best-practice centers, Internet and networking resources, benchmarking activities and site visits, cooperative agreements, and the advices of experts (e.g. [11, 17]). Identifying and clarifying best practices can be challenging, and the implementation of those practices can be overwhelming, individuals and organizations face in identifying and implementing best practices. Pfeffer and Sutton [25] identified barriers to implementing best practices in productivity improvement, including the powerful knowing - doing gap. An example of an attempt to explore best practices in a field of knowledge is presented by Bourque *et al.* in [6] on exploration of fundamental principles of software engineering with a search for core concepts in this field as a journey geared toward improving the practice. In some latest research studies, a quality of BPM models is also undertaken, as a component of methodological best practice application (e.g. [18]).

Existing approaches towards selection of better attitudes to increase quality of BPM models might be of benefit, but frameworks like *SEQUAL* and the *Guidelines of Modelling* are too abstract to be applicable for beginners and non-experts in practice, and collections of pragmatic issues are presented without a research foundation. Becker *et al* [3] presented a framework (GoM) to structure factors for the evaluation of process models. Also Mendling *et al* [16] presented a study of research on relationships between model structure and error probability with a synthesis as a set of seven process modelling guidelines (7PMG). These guidelines are built on strong empirical insights, and are formulated to be rational to practitioners. Even though some theoretical frameworks are available in the area of BPM modelling, these usually require a level of competence and distinguishing the major quality attributes remains too abstract to be directly applicable by non-experts. In other words, such guidelines are hardly related to the real actions that process modelers undertake in capturing e.g. the activities and actors in a process. The problem behind the guidelines is that hardly any empirical support is provided for them and, if available, it is a memoir at best. From a research perspective, it can be noted that much of the existing work into process modelling describes more formal side, and does not focus on providing modelling support either.

A process (business process) is the combination of a set of activities within an organization with a structure describing their logical order and dependence whose objective is to produce a desired result. Process modelling enables common understanding and analysis of a business process. A process model can provide a comprehensive understanding of a process. An organization can be analyzed and integrated through its processes. Therefore there is a need and an importance of rele-

vant modelling of organizational (business) processes. Using the right model involves taking into account the purpose of the analysis, and knowledge of the available architectures, frameworks, process modelling methodologies, techniques and tools. The number of possible references on organization and BPM modelling and BPM implementation is quite large, which does not facilitate process oriented management and professionals in their work (see e.g. [1, 7, 8, 26]).

There are basically two intentions behind the use of business models in enterprises today [24] - the business development (developing visions and strategies, designing/redesigning business and developing information systems), and ensuring the quality of the business (maintaining/sharing the knowledge and ensuring the acceptance of decisions). For the purpose of successful management each organization develops and implements models, especially business and/or business process models. There are some differences between these two kinds of models. The substantial difference is in a set of questions and interests to be asked and represented within a model. Also differences can be found in a level of model data aggregation. For example, business model is usually understood in the following ways [9]:

- a business model shows what the organisation's environment is and how the organisation acts in relation to its environment,
- a key element of the business model is a description of the organisation's architecture, and a usable business model reduces and delimits aspects,
- usually a business model is developed for only those parts of the organisation that make up the key business processes,
- a business model should include description of the dynamic behaviour of the elements in the architecture.

The main design decisions to be represented in a business model are [9]: value adding business actors being involved, offerings of which actors to which other actors, elements of offerings, value-creating/adding activities producing/consuming these offerings, which value-creating or adding activities are performed by which actors. On the other hand a business process model typically shows the following design decisions: actors involved in the operations, operational activities which can be distinguished, activities executed by which actors, inputs and outputs of activities, sequence of activities to be carried out for a specific case, activities which can be carried out for a specific case.

There are five modelling goals to facilitate human understanding, communication and developing a new management vision in process oriented approach implementation in an organization: supporting process improvement, supporting process management, automating process guidance, and automating execution (enactment) support. These goals together with some additional goals to automate process execution and to automate process management are the goals of using BPM systems. It forms a progression from problem description to solution design, and then action would be impossible to achieve without a process model. This is be-

cause an operational (enactable) model gives a BPM system a limited decision-making ability, the ability to generate change request signals to other sub-systems, or team “members,” and the ability to take account of endogenous or exogenous changes to itself, the business processes it manages or the environment. Together these abilities enable the BPM system to make automatic changes to business processes within a scope limited to the cover of its decision rules, the control privileges of its change request signals and its ability to recognize patterns from its sensors. In business process model seven elements are usually linked [14, p. 458]:

- internal or external customers of the business process,
- products (or services) created by the business process,
- business process flow: operation view (number of tasks in a job, relative size of tasks, nature of tasks, degree of customization), behavior view (patterns of process and task flow, task consolidation, scheduling of jobs, etc.),
- participants in the business process: organization structure (roles, responsibilities, users, groups, departments, etc.), and organization population (individuals, agents having tasks assigned for execution and relationships),
- information the business process uses or creates,
- technology the business process uses, and
- external environment other than the customers.

### **3. Approach method**

Within this study a multi-method approach is used, that included BPM textbooks and reports analysis, case studies, results of Web-based BPM community discussions, some statistical analysis of the collected data about popularity of BPM modelling, design and enactment standards; and a facilitated, face-to-face discussions with some BPM modelling practitioners. Because there are many ways in which BPM modelers represent the widely practiced, although informally implemented, modelling heuristics they use, the framework used in this study was determined on the basis of the existing literature and on “suggestions from practice” – experts opinions. As an approach, the paper uses the following research methods:

- informal speculations drawn from a selection of BPM modelling papers, which address modelling results without presenting any validity analysis,
- sample of investigations with an exemplification (real-business or not),
- literature review of prior research on modelling practice (successes or failures) and prior surveys investigating process modelers opinions,
- case studies for empirical inquiries that investigate a contemporary practice within its real-business context.

Basic questions, hints and topics in the best practice search within BPM modelling must particularly focus on specific and essential core activities to be considered

within modelling stages: process identification and definition, BPM system and process conceptualization, process model formulation, process model testing and evaluation (validation and verification), model utilization, implementation, dissemination, and integration within BPM system structure, and design of learning, training and communication infrastructure and strategies in BPM modelling.

#### **4. Practical recommendations and guidelines in BPM modelling**

In the BPM modelling literature, there are no explicit texts about best practices. However, this literature brings together a number of implicit examples related to the concept of best practices from different branches of modelling, starting with the earliest works done in workflow mapping. Specific studies provide overview on what practices are currently used, such as in BPM community attempts with benchmarking in the field, or indicate where in the bibliography we can find basic modelling recommendations. Moreover, textbooks such as: [28] by Scheer, [30] by Van der Aalst *et al*, [29] by Scheer *et al*, [10] by Jacka and Keller, [21] by Ould, [31] by Weske, have selected views, and implicitly reflect, the practices their authors consider “best”. These textbooks capture many, if not all, of the best practices in the field. The opinions analyzed here create just a small sample of the methodological analyses and conclusions drawn by experienced BPM modelling practitioners over the past 25 years.

The criteria that can be identified within BPM modelling cycle practice (e.g. model analysis, redesign, implementation, monitoring and controlling), in order to select the best practices and guidelines, are as follows (e.g. [18, p.191]):

- transformations from one BPM modelling language to another,
- strengths and weaknesses of specific languages and IT tools support,
- algorithms for the formal verification of process models as target guidelines for practitioners,
- the integration of business processes with IT systems or web services,
- business process model execution,
- business excellence, and business process redesign and reengineering,
- cost optimization,
- business process reference models implementation, and
- process mining.

The set of practices identified in this paper is intended to be independent of the type of system and processes to be modelled, the tool used to develop the model, the purpose of the model, and the type of practitioner. The results of the research and the comments expressed by the experts suggest that, as proposed by Bourdieu [5] work, the development of a theory of practice in BPM modelling seems to be also possible to achieve. BPM modelling guidelines provide sets of recommenda-

tions on how to build a process model from scratch and how to improve models. It is important to note that also there are different ways to describe the same process behavior using different model versions (patterns of flow) of this process. Such guidelines as recommendations (Table 1) identify desirable properties that can be used as directions when changing a process model to an enactment-equivalent, but more understandable with better quality.

**Table 1.** Examples of practical guidelines for business process modelling

Recommendation	Statements
Define measures and indicators of process performance for monitoring	The process performance measures and indicators must follow RUMBA principle (reasonable, understandable, measurable, believable, achievable), and additionally these measures must be sensitive, stable, relevant, reliable, and dependent only on the factors to be measured.
Develop a model with syntactic and semantic correctness	This guideline of model correctness is a recommendation to create consistency and completeness against its meta model, and also a postulate of model structure and behavior in relevance to real world (selection of relevant object system, modelling technique, and minimal structure).
Manage the process modelling project	This guideline suggests an application of relevant project management method (hard and fast rules for the modelling procedure to follow).
Model process and system with relevance	This guideline of relevance postulates selection of a relevant object system, getting the right people as process participants, taking a relevant modelling technique, configuring an existing meta model adequately, and developing a relevant (minimal) model system.
Develop a model with economic efficiency	The guideline of economic efficiency is a cost/benefit constraint to all other guidelines and creates the feasibility criterion with possibility to restrict the correctness or the clarity of a model. It leads directly to an application of reference frameworks and models.
Model process with clarity and pay attention to model aesthetics	This guideline of clarity is based on pragmatic aspect of semiotic theory applied to process modelling. As a subjective recommendation it postulates that the model must be understandable to the user with level of details cone concept (differentiation to communication purpose) to be applied.
Model process with comparability	This guideline of comparability postulates the consistent use of all guidelines within modelling in order to compare information from models (e.g. type of business, periods, standards, layout and naming conventions), and setting the hypothesis on how the process is structured at different levels.
Model process as a part of systematic and integrated design	The guideline of design recommends well-defined relationships between all business perspectives (views) in overall business architecture/framework in modelling (e.g. organization, data, function, process, outputs).
Implement a process model in integrated external systems	This guideline postulates external BPMS integration of models, as depending on the support provided by selected systems, tool integration may require considerable coding and extensive testing (simulation, field testing).
Model as structured as possible	A process model is structured if every split connector matches a respective join connector of the same type. Structured models can be seen as formulas with balanced brackets, i.e., every opening bracket has a corresponding closing bracket of the same type. Unstructured models are not only more likely to include errors, but people also tend to understand them less easily.

**Table 1 cont.** Examples of practical guidelines for business process modelling

Recommendation	Statements
Use one start and one end event in process flow	The number of start and end events is positively connected with an increase in error probability. Most workflow engines require a single start and end node. Moreover, models satisfying this requirement are easier to understand and allow for all kinds of analysis.
Minimize the routing paths per model element	The higher the degree of an element in the process model, i.e. the number of input and output arcs together, the harder it becomes to understand the model. There is a strong correlation between the number of modelling errors and the average/maximum degree of model elements.
Avoid OR routing elements	Process models that have only AND/XOR connectors are less error-prone. Furthermore, there are some ambiguities in the semantics of the OR-join leading to pitfalls, paradoxes and implementation problems.
Use verb-object activity labels	A wide exploration of labeling styles that are used in actual process models, discloses the existence of two popular styles and a rest category. Modelers consider the verb-object style, as significantly less ambiguous and more useful than action-noun labels or labels that follow neither of these styles.
Decompose a model if it has more than 50 elements	This guideline relates to simplicity recommendation that is motivated by a positive correlation between size and errors. For models with more than 50 elements the error probability tends to be higher than 50%. Large models should be split up into smaller models, and sub-components with a single entry and a single exit can be replaced by one activity that points to the original sub-component as separate models.
Verify, check syntactic, semantic and pragmatic quality of process model, and certify it	This guideline means that content of the model should comply with the syntax as defined by the process modeling language in use. Verification addresses formal structural and behavioral properties of a model that can be checked without knowing the real-world process. Structural correctness relates to the types of element that are used in the model and how they are connected while behavioral correctness checks potential sequences of execution as defined by the process model. Certification investigates process model usage by aspects of understandability, maintainability, and learning.

*Source:* own work on the basis of bibliography analysis

## 5. Results of BPM modelling practice analysis and discussions

A possible compendium of best practices cannot entirely substitute for textbook reviews. However, it can become a natural complement to textbook-type materials for the practitioner: a quick reference for BPM modelling practice. Even for novice practitioners, the compendium offers a guide that can direct them to textbooks and other resources to increase their knowledge. According to the nearly “classic” BPM modelling methodology (procedures, approaches), basic stages of business process modelling are: business process identification and definition; BPM system and process conceptualization; business process model formulation; business process model testing and evaluation (validation and verification); business process model utilization, implementation, dissemination, and integration

within BPM system structure; and design of learning, training infrastructure and strategies for BPM modelling. Table 2 presents a summary of the BPM modelling best-practice statements that seem to have the highest importance and high agreement within BPM modelling practitioners.

**Table 2.** Best practice important recommendations and statements for stages

Stage	Rule-like statements
Process identification and definition	<p>Speak with and listen carefully and reflectively to process owners (clients) to identify and understand the BPM problem situation.</p> <p>Explicitly clarify and state the purpose of the modelling effort (e.g., process strategy development, policy analysis, theory building, education, and training).</p> <p>Identify the reference modes of central processes to be studied for the purpose of clarifying expectations of process “to-be” performance.</p> <p>Ask why the current process behavior of key process attributes and measurements generated is the way it presently is, and what is causing it.</p> <p>Formulate a hypothesis for process dynamic performance.</p>
Orchestration and choreography model conceptualization	<p>Approach the process conceptualization precisely and from different views, avoiding a rigid separation of the identification stages.</p> <p>Generate a dialogue with the process owners and participants to focus on their mental models and on process behavioral hypotheses.</p> <p>Identify the critical activities, events and messages that describe the system, making certain that their names are correct (verbs, nouns phrases).</p>
Model formulation with process notation	<p>Develop the structure through a series of simple to more comprehensive models, adding detail as needed to improve realism and policy impacts.</p> <p>Formulate and define process attributes that make sense, carefully supporting parameters with data or experience based on real-life meanings.</p> <p>Make sure that the model always exhibits dimensional consistency.</p>
Model testing/evaluation	<p>Compare simulated and animated process behavior patterns with real behavior (data) using statistical measures of pattern fit, not point-by-point fit.</p>
Model implementation and integration	<p>Make sure that the entire BPM modelling process focuses on the problems of concern of the process stakeholders (owner, participants, other modelling perspectives and views).</p>
Design of learning and training infrastructure	<p>Use simplified diagrams to present BPM model system stories in a variety of ways and contexts, rather than relying on the model to tell its own story.</p>

*Source:* own work on the basis of bibliography analysis

For example, in process identification and definition (Table 3), there is rather high agreement on the importance of (1) involving process owners and participants in the modelling stage, (2) clearly identifying the purpose of the process modelling, (3) formulating a dynamic hypothesis about “as-is” and “to-be” process performance, and (4) clearly articulating the process flow using current and expected patterns of behavior. A high priority of agreement in these practices reflects a well-established set of processes in the field, leading to a shared understanding of how to identify and define a BPM model. However, there seems to be a lower priority of agreement regarding where the focus of the modelling effort should be; i.e., in modelling the system (class of case being studied) or the problem (case).

In BPM system and process conceptualization, there is a high level of agreement about using different approaches creatively to gain a clear understanding of the mental models of the process owners. Such an approach leverages the power of thinking in terms of process flow hypotheses and identifying the critical aspects of the system. The high level of agreement about conceptualizing, both by focusing on how the actors in the BPM think about the processes and by using hypotheses as a guiding framework, reflects a shared understanding of the importance of a multi-level base of model development using empirical evidence (mental models of system participants) and theoretical thinking (instance flow hypothesis).

**Table 3.** Best-practice statements in process identification and definition

Importance	Summarized statements
Highest priority	Survey, elicit and thoroughly understand the identified process attributes. Clarify the purpose of the process modelling and measures of process performance. Elicit reference modes – process flow patterns of all pools and lanes actors and types of triggering events to happen to see as central to the process model. Ask process owners and participants what is generating the current process flow problem or of key performance indicators and process risk factors. Formulate a dynamic hypothesis - an initial concise overview of the process structures believed to be responsible for the problem (process performance).
High priority	Clearly identify the process actors for the orchestration and choreography modelling. Identify and engage key BPM system stakeholders. Clarify the symptoms that initiated the modelling activity (e.g. BPM implementation). Agree on the time horizon for the model and settle on the appropriate time unit. Identify desirable and undesirable future behaviors, over time, of key process variables.
Average priority	Verify whether process identified by the actors is suitable for standard modelling notations and study. Form a process study team consisting of BPM and technical experts with participants. Generate a concise and specific process flow and performance descriptions, identifying a clear information flow and dynamic phenomenon. Identify and set clear expectations for the duration and budget of the modelling study Identify all available data sources and base the study on these data.

*Source:* own work on the basis of bibliography analysis

## 6. Conclusions and final remarks

Some may consider the identification of best practices in BPM modelling by an analysis of rather recognized academic experts in the BPM field as a search for an ultimate truth that can unavoidably stop all debate and development of the field. The purpose of this research study is rather to help light up different truths that BPM community, through its experts, recognizes as valuable and worth to reveal. Searching for best practices can be productive, and yet it remains challenging - stimulating a dialogue about improvement of practice by BPM modelling commu-

nity knowledge as an instrument of improvement. Therefore, continued exploration and integration of best practices in the BPM modelling field seems to be warranted, creating force in BPM methodology improvements.

The highest-importance/low-agreement best-practice statements can be considered as vehicle to expand the limits of the field and drive improvements in the development of business process models. The interaction of the modelling individuals and the BPM community also generates the frames of best practices. This study of opinions about best practice will trigger learning processes in the BPM modelling community that are based in best-practices research and action. Involving more practical reports made by expert practitioners in future studies would have the potential of yielding a more comprehensive view of the status of practices considered as best practice and their use in the BPM modelling field.

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