Questioning the Design of Business Process Maturity Models

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Abstract. The importance of business process management goes without saying. As its realization is less straightforward, maturity models have been developed to gradually assess and improve business processes. Although their aim is to assist organizations, the proliferation of maturity models also confuses organizations. They have no overview of existing models and their differences, which makes an informed choice difficult. Choosing the right business process maturity model (BPMM) is however important, as previous research indicated the existence of different maturity types being measured by the existing models [1]. We now add further design elements to our comparative framework by conducting a content analysis of 69 BPMMs. Afterwards, the identified design elements are transformed into a questionnaire that practitioners can use to find the BPMM that best fits their needs. In this paper, we present 16 questions to be included in the questionnaire, without elaborating on the mapping of individual maturity models.

Keywords: business process maturity, business process management, business process orientation

1 Introduction

Today's globalized market is characterized by demanding customers and growing IT possibilities. Organizations are therefore increasingly relying on their way of working, i.e. business processes, to excel [2,3]. However, merely modeling and deploying a business process does not imply that your business process is also an excellent one, or at least a good one. Therefore, the notion of 'maturity' is introduced as a measure to indicate how excellent business processes can perform [2,4]. Maturity

requires continuous process improvements, which are not easy to realize. Hence, business process maturity models (BPMMs) have been designed from which organizations gradually benefit. In general, a maturity model (MM) is a tool to systematically assess and improve capabilities, i.e. abilities or competences, to reach a goal. Translated to BPMM, it concerns the capabilities of business processes and their organizations to reach business (process) excellence. An example is given below.

Fig. 1. A BPMM example [5]

Currently, a BPMM proliferation exists [6]. This proliferation raises questions about the differences between BPMM designs. To our knowledge, some comparative attempts have been made by Hüffner [7], Lee, Lee, and Kang [8], Maier, Moultrie, and Clarkson [9], and Rosemann and de Bruin [10]. Nonetheless, they do not intend to offer a comprehensive comparative study on a large number of BPMMs. For this purpose, two research questions are raised.

RQ1. On which design elements do existing BPMMs differ?
⇨ A comparative framework is built to classify existing BPMMs.

RQ2. Which BPMM must be chosen when?
⇨ A questionnaire is derived from the comparative framework to obtain a practical instrument that managers can use while choosing a BPMM.

We start with defining a maturity model in section 2, and more specifically a BPMM in section 3. Section 4 clarifies the methodology. It is followed by presenting (section 5) and discussing (section 6) the BPMM comparative framework (RQ1) and the BPMM questionnaire (RQ2). Finally, we summarize the results and future research.

2   Maturity Model (MM)

An overall definition for a maturity model (MM) is provided by Tapia *et al.* [11]: '*MMs have been developed to assess specific areas against a norm. Based on maturity assessments, organizations know the extent to which activities in such areas are predictable*' [11,pp.71].

MMs share some design elements, independent of whether they deal with business processes, business-IT alignment, e-government, quality management, etc. Table 1 lists those design elements found in the literature on MM design [12,13,4,14,11,15]. The emphasis is on <u>who</u> measures maturity (i.e. assessors – 'WHO'), and <u>how</u> it is measured (i.e. assessment method – 'HOW'). Furthermore, the table clarifies <u>what</u> is measured as maturity, i.e. capability areas and their improvements necessary to reach each consecutive level (i.e. improvement method – 'WHAT').

Table 1. The MM design elements.

	[12]	[13]	[4]	[14]	[11]	[15]
Assessors – WHO						
• Assessment unit	X	X	X	X	X	X
• Lead assessor	X	X	X	-	X	X
• Other assessors and respondents	X	X	X	X	X	X
Assessment method – HOW						
• Data collection technique to obtain information to assess	X	X	X	X	-	X
• Calculation to interpret the collected data as lifecycle levels	X	X	X	-	X	X
• Representation to visualize lifecycle levels	-	X	X	X	X	X
Improvement method – WHAT						
• Capability areas to assess and improve	X	X	X	X	X	X
• Lifecycle levels	X	X	X	X	X	X
• Architecture or road map, to link capability areas with levels	X	X	X	X	X	X

3   Business Process Maturity Model (BPMM)

Translated towards business processes, BPMMs are evolutionary models for measuring (AS-IS) and improving (TO-BE) maturity, or '*the extent to which an organization consistently implements processes within a defined scope that contributes to the achievement of its business goals*' [16,pp.2]. Mature business

processes acquire the necessary capabilities to reach excellence. Capabilities are competencies (e.g. skills and knowledge) to achieve the targeted results, i.e. the ability to perform, or the expected performance of a business process. Related capabilities are collected into capability areas. Maturity levels indicate the growth through all capability areas together. Sometimes, capability levels are present to indicate the growth through each capability area separately [17,18,10].

Capability areas differentiate a BPMM from other MMs. Previous research [1,19] has identified six main capability areas from the definitions for three fundamental domains in the business process literature: (1) business process (BP), (2) business process management (BPM), and (3) business process orientation (BPO).

First, business process definitions implicitly focus on *business process modeling* and *deployment*. The latter means running processes in real life. It requires modeling or predefining business processes in textual or graphical descriptions [20]. For instance, *'a process is a series of interconnected activities that takes input, adds value to it, and produces output. It's how organizations work their day-to-day routines'* [2,pp.xxii]. Both aspects are selected as main capability areas.

Secondly, BPM involves continuously managing and improving business processes, guided by process owners. Gillot [21], Gulledge Jr. and Sommer [22] summarize four foci in BPM definitions: (1) *modeling*, (2) *deployment*, (3) *optimization*, or improving business processes based on real metrics, and (4) the *management* of business processes, each with a process owner and a cross-functional team. For instance, Weske [20] defines BPM as '*concepts, methods, and techniques to support the* (1) *design,* (4) *administration,* (2) *configuration, enactment, and* (3) *analysis of business processes*' [20,pp.5]. Similarly to BP, these four foci are selected as main capability areas. BPM differs by also addressing optimization and managerial efforts for one, more or all business processes.

Some authors go beyond these four BPM areas by also referring to organization management. Particularly, by adopting (5) a process-oriented culture with rewards linked to the performance of business processes instead of departments, and (6) a horizontal structure [23]. For instance, McCormack [24] defines BPO as '*an organization that emphasizes process, a process oriented way of thinking, outcomes and customers as opposed to hierarchies*'[24,pp.6]. Although the distinction between BPM and BPO is not always explicitly made, e.g. in [10], it allow separately examining the different nuances.

Consequently, six main capability areas are derived from the BP, BPM and BPO definitions. Each area must be assessed and improved in order to reach business process maturity. It turned out that some BPMMs measure BPM maturity, by addressing the first four capability areas, whereas others measure BPO maturity, by also addressing the cultural and structural capability areas [1].

4 Methodology

4.1 BPMM Sample (N=69)

The research scope was set to generic business processes. It excludes BPMMs addressing specific process types, such as in the initial software engineering maturity models. However, models that integrate various specific BPMMs were withheld to represent those specific topics. Also maturity models for supply chains and collaboration processes were selected to study cross-organizational value chains.

Data was collected during the second quarter of 2010. First, we searched for articles in academic databases and search engines on the Internet by using the combined keywords of '*process*' and '*maturity*'. Secondly, we traced the references in the identified articles to get access to other relevant sources.

We acknowledge some restrictions regarding the accessibility of articles (in Ghent University engines), the language (English, Dutch, French or German), and the keywords. Notwithstanding these limitations, the technique turned out to be fruitful in terms of the number of maturity models identified.

4.2 Content Analysis

Due to the lack of a Meta theory on BPMM designs, the variables within each design element of Table 1 were primarily identified by the 'Grounded Theory' [25], which systematically generates: (1) 'codes', i.e. BPMM attributes or variable values, (2) 'concepts', i.e. variables, (3) 'categories', i.e. design elements to group variables, and (4) a 'theory', i.e. a comparative framework. The successive coding stages were:

- initial (open) coding: we read the collected texts by constantly going back and forth to compare existing BPMM designs. Hence, we identified possible attributes and variables;
- intermediate (axial) coding: the attributes and variables were rethought and linked to the initial design elements. It resulted in the variables to be included in the framework;
- advanced (selective) coding: we reread the collected texts to encode what is literally written in these texts to the obtained variables.

5   Results

5.1   BPMM Comparative Framework (RQ1)

The comparative framework, shown in Figure 2, was built iteratively.

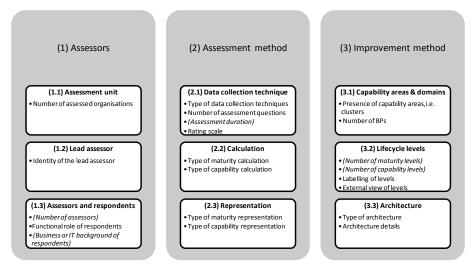| (1) Assessors	(2) Assessment method	(3) Improvement method
(1.1) Assessment unit • Number of assessed organisations	**(2.1) Data collection technique** • Type of data collection techniques • Number of assessment questions • *(Assessment duration)* • Rating scale	**(3.1) Capability areas & domains** • Presence of capability areas, i.e. clusters • Number of BPs
(1.2) Lead assessor • Identity of the lead assessor	**(2.2) Calculation** • Type of maturity calculation • Type of capability calculation	**(3.2) Lifecycle levels** • *(Number of maturity levels)* • *(Number of capability levels)* • Labelling of levels • External view of levels
(1.3) Assessors and respondents • *(Number of assessors)* • Functional role of respondents • *(Business or IT background of respondents)*	**(2.3) Representation** • Type of maturity representation • Type of capability representation	**(3.3) Architecture** • Type of architecture • Architecture details

Fig. 2. The comparative BPMM framework.

After coding the identified variables, descriptive statistics were used to enhance our dataset and to keep only those variables important to our questionnaire (RQ2). Variables without fundamental differences among the collected BPMMs were eliminated, because of less differentiating power. This applies to the number of lifecycle levels, which was mostly three to six levels, with a mode of five levels. To maintain the quality of the questionnaire, we also decided to eliminate all variables with missing values on more than one third of the collected BPMMs, i.e. (1) the number of assessors, (2) the background of respondents, and (3) the assessment duration. All variables eliminated at this stage are italicized in Figure 2. Nonetheless, they remain important design elements.

5.2   BPMM Questionnaire (RQ2)

The final step is to transform the comparative framework into a questionnaire that practitioners can use to select a BPMM. For this purpose, the 16 resulting variables were reformulated into a similar number of questions, available in appendix. Their comprehensiveness was approved by other BPM scholars within the faculty.

6 Discussion

We have found 16 design elements on which existing BPMMs substantially differ. Consequently, they can be used to motivate the choice for one or another BPMM. We deliberately excluded a discussion on the methodology and validation used to design the particular BPMMs. Notwithstanding their relevance for BPMM credibility, such information remains elusive in many design documents (e.g. found on websites or white papers). However, this does not necessarily exclude rigorous research, which makes a comparison arguable. For reasons of objectivity, the comparative framework was restricted to the BPMM design itself.

We advise organizations to choose a BPMM that best fits their needs. Therefore, our questionnaire allows answering only those questions that are considered as relevant by a particular organization. However, given the importance of capability areas, we make Q11 mandatory. This implies that an organization must decide whether to address BPM maturity, or BPO maturity. Next, further refinements can be optionally made by answering the other 15 questions.

7 Future Work

The 16 questions will be used to create a decision table, which visually maps only the proven BPMMs to the variables and the trade-offs of each variable (i.e. expected efforts and benefits). Its use will be tested in real business scenarios by conducting field studies. We will first ask practitioners to indicate which questions they consider the most important for their organization. For instance, some organizations may prefer a BPMM that certifies the assessed maturity level, whereas other organizations may look for an informal and quick assessment with only a few assessment items. Based on these answers, the decision table will select a BPMM that best fits such requirements. Afterwards, interviews will be conducted to evaluate whether practitioners are satisfied with the result, and whether they will use the resulting BPMM in their organization.

8 Conclusion

Business process maturity has received a lot of attention in the business process literature, but mainly as individual maturity models. To our knowledge, no comprehensive overview currently exists. Our research tries to fill this gap by conducting a comparative study on a sample of 69 BPMMs. This paper only focuses on a small, though important part of that research. Particularly, it presents a questionnaire with 16 questions, derived by a content analysis of the design documents from the sampled BPMMs. It can be used by practitioners to select a BPMM that best fits their organizational needs.

Indeed, organizations wishing to start improving business process maturity must first choose a BPMM out of a wide array. Since existing BPMMs vary on many

design elements, this choice may impact their further progression in business process management. Frequently, such organizations are not aware of those differences. Therefore, our questionnaire supports their BPMM choice by considering the most important design differences among existing BPMMs.

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Appendix

Variables	Questions
(1) Assessors	
(1.1) Assessment unit	
Q1. How many organizations must be included in the assessment?	
• One, i.e. the maturity model mentions a single organization	
• More, i.e. the maturity model mentions more organizations	
(1.2) Lead assessor	
Q2. Must the assessment be lead by an independent person? More options are possible.	
• No	
• Yes, without certification of the assessment results	
• Yes, with certification of the assessment results	
(1.3) Assessors and respondents	
Q3. Must people from outside the assessed organization(s) be included as respondents?	
• No	
• Yes	
(2) Assessment method	
(2.1) Data collection technique	
Q4. How must information be collected? More options are possible.	
• Objectively, e.g. by document reviews.	
• Subjectively, e.g. by questionnaires, interviews, observations.	
Q5. How many questions must be maximally answered in a particular assessment?	
• 1-20, i.e. twenty questions or less	
• 21-50, i.e. between twenty-one and fifty questions	
• >=51, i.e. more than fifty questions	
Q6. Which type of data must be collected? More options are possible.	
• Qualitative, i.e. with open questions or with nominal or ordinal rating scales	
• Quantitative, i.e. with discrete, interval or ratio rating scales	
(2.2) Calculation	
Q7. If maturity levels are applicable (Q16: staged architecture), must the resulting maturity level be directly observable (e.g. the exact or lowest score on assessment questions), or indirectly (i.e. requiring calculations or statistical formula)? More options are possible.	
• Directly	
• Indirectly	
Q8. Idem Q7, but for capability levels (applicable if Q16: continuous architecture)	

Variables	Questions

(2.3) Representation

Q9. If maturity levels are applicable (Q16: staged architecture), how must the calculated maturity level be displayed? More options are possible.
- Textually (e.g. 'defined' or 'quantitatively managed')
- Numerically (e.g. 3, or 3.7, or 67%)
- Graphically
- Matrix, i.e. table with questions in the rows, levels in the columns, explanations in the cells.

- Q10. Idem Q9, but for capability levels (applicable if Q16: continuous architecture)

(3) Improvement method

(3.1) Capability areas and domains

Q11. Which capability areas must be primarily assessed and improved?
- BPM maturity, i.e. primarily focusing on business process modeling, deployment, optimization and management (e.g. for team initiatives)
- BPO maturity, i.e. combining BPM maturity with a process-oriented culture and structure (e.g. for top management initiatives)

Q12. How many business processes must be assessed and improved? More options are possible.
- One, i.e. a single business process or sub process
- More, i.e. more than one, but not all business processes. Assessment questions deal with a particular business domain or value chain and their (sub) processes
- All, i.e. all business processes in the involved organization(s) or supply chain. Assessment questions focus on how the organizations deal with business processes in general

(3.2) Lifecycle levels

Q13. What must the labels of the lifecycles indicate? More options are possible.
- Business process optimization
  E.g. from 'initial', to 'managed', 'standardized', 'predictable', and 'innovating' processes
- Business process management
  E.g. from 'BPM initiation', to 'BPM evolution', and 'BPM mastery'
- Business process integration
  E.g. from 'ad hoc', to 'defined', 'linked', 'integrated', and 'extended' processes

Q14. To which extent must the lifecycles take into account possible relationships between individual organizations?
- No notion, i.e. all lifecycle levels are limited to one organization
  E.g. from 'initial', to 'managed', 'standardized', 'predictable', and 'innovating' processes
- Highest levels, i.e. as from the highest levels, external relationships are taken into account
  E.g. from 'ad hoc', to 'defined', 'linked', 'integrated', and 'extended' processes
- All levels, i.e. as from the lowest levels, external relationships are taken into account
  E.g. from 'ad hoc', to 'planned', 'aware', and 'reflexive' collaboration

(3.3) Architecture

Q15. Must a road map be defined per capability area and/or overall maturity? More options are possible.
- Continuous, i.e. capability levels exist and are linked to each capability area separately.
- Staged, i.e. maturity levels exist and are linked to all capability areas together.

Q16. How much guidance must the road map give on your journey towards higher maturity levels and/or capability levels?
- Descriptive, i.e. the road map is limited to a high-level description, without criteria.
- Implicit prescriptive, i.e. the road map has criteria interwoven in the assessment questions
- Explicit prescriptive, i.e. the road map has a separate list of criteria