

## Chapter 2

# Research

**Abstract** This chapter provides an executive summary of the three studies covered by this book, as an expansion of and redirection to journal articles (explicitly acknowledged by references). First, the literature study distinguished business process management (BPM) from business process orientation (BPO), in order to obtain a common understanding among researchers and practitioners. An essential difference in scope exists, with: (1) BPM being limited to the characteristics of business processes and the traditional business process lifecycle, and (2) BPO adding the organisation-specific characteristics to BPM, i.e. to make the organisational culture and structure more process-oriented. Furthermore, definitions were derived for maturity (levels), capability (levels) and for a business process maturity model (BPMM). Afterwards, the classification study identified the capability areas and maturity types of 69 existing BPMMs (see [Chap. 1](#) for references), in order to strengthen the BPMM foundation. The maturity types were called: BPM maturity, intermediate BPO maturity (i.e. BPM plus culture), and BPO maturity (i.e. BPM plus culture and structure), and this for one, more or all business processes in an organisation. Finally, the selection study identified criteria for choosing one BPMM out of the wide array, resulting in a free and online decision tool (called BPMM Smart-Selector). Evaluation scores were calculated per collected BPMM, allowing an additional quality check.

**Keywords** Business process • Maturity • Capability • Business process management • Business process orientation • Continuous improvement • Excellence • Conceptual framework • Decision support system • Delphi technique • Analytical hierarchy process

### 2.1 Definitions

Reference to the literature study:

Van Looy A, De Backer M, Poels G (2011) Defining business process maturity. A journey towards excellence. *Total Qual Manag Bus Excell* 22(11):1119–1137. doi:[10.1080/14783363.2011.624779](https://doi.org/10.1080/14783363.2011.624779)

### ***2.1.1 Scope and Purpose***

The introduction chapter explained that typically two maturity types are assumed to exist in the context of business processes: (1) the maturity of specific processes, and (2) the maturity of all processes in an organisation. The former is frequently called ‘process maturity’, whereas the latter is often referred to as ‘business process management maturity’ (de Bruin and Rosemann 2007). Nonetheless, at first sight, this traditional dichotomy was not clear when collecting existing BPMMs (see Chap. 1 for references to our sample with 69 BPMMs). It turned out that some BPMMs have model names that differ from the above, and that many BPMMs with the same model name partly measure different things. Also other concepts like ‘maturity’, ‘capability’, and ‘maturity model’ were used incoherently, and remained ambiguous as such. In order to solve these inconsistencies, the first study defined the terminology to be used in this book, in order to obtain a common understanding for researchers and practitioners.

- RQ1a. What is the appropriate BPMM scope? When does a maturity model consider business processes, and can be called a BPMM?
- RQ1b. What is the appropriate BPMM terminology? When does a maturity model consider maturity and capability?
- RQ1c. What is the appropriate BPMM design? When does a maturity model provide practical guidance to achieve process excellence?

### ***2.1.2 Research Methodology***

First, a literature study was conducted to define three umbrella terms in the process literature, to which BPMM names frequently refer: business process (BP), business process management (BPM) and business process orientation (BPO). For instance, examples of BPMM names are ‘process maturity grid’ (Harrington 2006), ‘business process management maturity model’ (de Bruin and Rosemann 2007), or ‘business process orientation maturity model’ (McCormack and Johnson 2001). Clear and recognised definitions were compared to find distinct components that clarify a difference in scope between these umbrella terms, and between BPMMs as such.

Afterwards, definitions were sought for ‘maturity’, ‘maturity level’, ‘capability’, and ‘capability level’ by primarily comparing the respective definitions in the main BPMM tracks (see Chap. 1), and by considering their meaning with regard to other literature on business process maturity.

A similar approach was taken to define a ‘business process maturity model’. Besides definitions of the BPMM main tracks and literature on business process maturity, we relied on the general design elements of a maturity model.

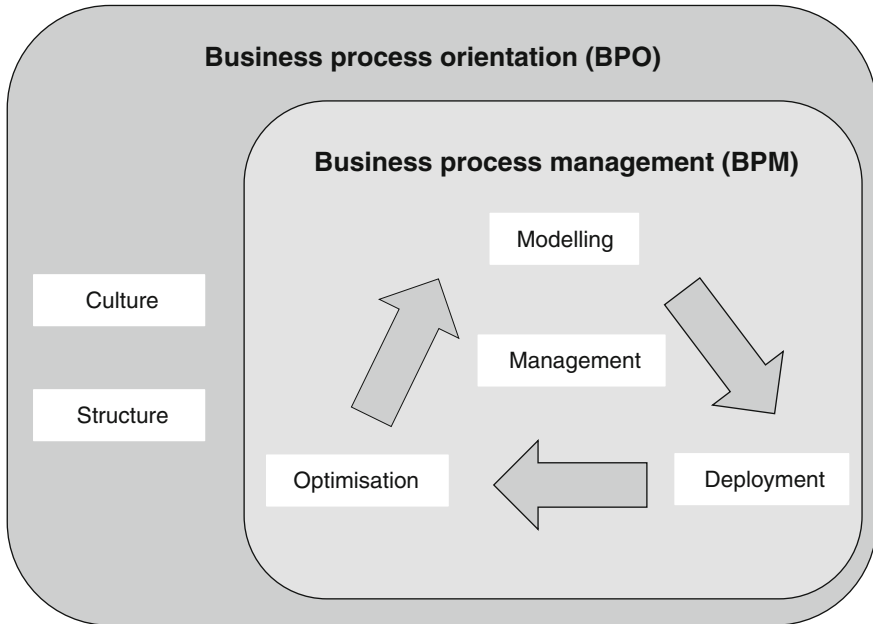
### 2.1.3 Overview of the Findings

The literature study revealed that business process definitions implicitly focus on (1) **business process modelling** and (2) **deployment**. For instance, *‘a process is a series of interconnected activities that takes input, adds value to it, and produces output. It’s how organisations work their day-to-day routines. Your organisation’s processes define how it operates’* (Harrington 2006: p. xxii). Deployment means performing or running processes in real-life, and can be emphasised by verbs like ‘work’ and ‘operate’. It implicitly requires modelling or predefining business processes to clarify which inputs, activities and outputs are part of them. It concerns the first phases of a typical business process lifecycle (Weske 2010). The implicit assumptions of business process definitions are made explicit by BPM definitions.

BPM definitions additionally focus on (3) **business process optimisation** and (4) **management** by a process owner and a cross-functional process team. For instance, *‘business process management includes concepts, methods, and techniques to support the (1) design, (4) administration, (2) configuration, enactment, and (3) analysis of business processes’* (Weske 2010: p. 5). This well-known and accepted definition clearly shows the four components, which conform to all phases of a typical business process lifecycle. They can be applied to one, more or all processes in an organisation.

Besides process characteristics, recent business process literature starts to recognise the importance of organisational characteristics (i.e. culture and structure) to obtain business (process) excellence (vom Brocke and Sinnl 2011). In order to stipulate this difference in scope, the notion of business process orientation (BPO) is introduced as an organisation that *‘emphasises (1–4) process, (5) a process-oriented way of thinking, customers, and outcomes (6) as opposed to hierarchies’* (McCormack and Johnson 2001: p. 185). BPO theoretically combines the four BPM components with two BPO-specific components. The latter refer to the adoption of: (5) a **process-oriented culture**, e.g. with top management support and rewards linked to the performance of business processes instead of departments, and (6) a **process-oriented structure**, e.g. with a centre of excellence and a horizontal or matrix chart instead of vertical departments. These BPO-specific components impact the whole process portfolio of an organisation, whereas the BPM components remain limited to specific business processes (i.e. one, more or all).

A summary is visualised in Fig. 2.1 as a funnel structure with BPM being a subset of BPO. A maturity model considers business processes if it addresses these theoretical components, though not necessarily all these components. Depending on which of these components are actually addressed, a BPMM can deal with BPM maturity (i.e. modelling, deployment, optimisation or management, but not the organisational culture or structure) or BPO maturity (i.e. including the organisational culture or structure). Business process maturity as such (i.e. addressing merely modelling and deployment) is rather unlikely to exist, given the inherent



**Fig. 2.1** The funnel structure of BPM and BPO

importance of continuous improvements (i.e. ‘optimisation’) to reach business (process) excellence.

Furthermore, the literature study clarified that these components are called capabilities (or rather areas of related capabilities) in the context of maturity models. They serve as a collection of necessary competences, skills or knowledge for an organisation to be capable of achieving the targeted process results. Maturity, on the other hand, considers the collection of capability areas in order to express *‘the extent to which an organisation has explicitly and consistently deployed processes, according to their business objectives’* (Van Looy et al. 2011: p. 1129). This means that a capability level refers to the growth per capability area, whereas a maturity level refers to the overall growth of capability areas. The main BPMM tracks (see Chap. 1) often refer to ‘organisational maturity’ and ‘process capability’ to emphasise this difference in scope.

Consequently, we defined a business process maturity model as *‘a model to assess and/or to guide best practice improvements in organisational maturity and process capability, expressed in lifecycle levels, by taking into account an evolutionary road map regarding (1) process modelling, (2) process deployment, (3) process optimisation, (4) process management, (5) the organisational culture, and/or (6) the organisational structure’* (Van Looy et al. 2011: pp. 1132–1133). This definition stipulates that, in order to be of practical use, a BPMM design should include both (1) an assessment method to determine actual levels, and (2) an improvement method with a road map to reach desired levels.

### ***2.1.4 Recommendations***

This study defined the fundamentals of a business process maturity model (BPMM). We recommend scholars and practitioners to apply the defined concepts accordingly, in order to obtain a common understanding and clear communication. For instance, the sampled BPMMs were created without much BPMM-specific literature to guide them, which explains some inconsistencies among them. It also explains why BPMMs are expected to differ in quality. One of these quality differences concerns the degree to which BPMMs provide guidance. Hence, we recommend the use of a BPMM with both a detailed assessment method and improvement method. Study 3 continues to elaborate on this BPMM choice. Additionally, we recommend practitioners to strive for an optimal, desired maturity level or capability levels, depending on their organisational needs and context (instead of blindly striving for the highest levels).

Of paramount importance is our unique arrangement of BPM and BPO components into a funnel structure, suggesting different types of maturity. Particularly, the current business process literature refers to BPM and BPO as synonyms, without stipulating a difference in scope. Instead, we refined those two umbrella terms by explicitly recognising their distinct components and to relate them accordingly. We recommend researchers to adopt the same critical reflection, for the scope of their research being clear at a glance.

**Acknowledgments** We acknowledge the written permissions of ISO/IEC, OMG, and SEI to cite their definitions for academic purposes. We also note that Capability Maturity Model and CMM are registered trademarks in the U.S. Patent and Trademark Office. CMM Integration and CMMI are service marks of Carnegie Mellon University.

## **2.2 Classification**

Reference to the classification study:

Van Looy A, De Backer M, Poels G (2012) A conceptual framework and classification of capability areas for business process maturity. *Enterp Inf Syst.* doi:[10.1080/17517575.2012.688222](https://doi.org/10.1080/17517575.2012.688222)

### ***2.2.1 Scope and Purpose***

The classification study elaborated on the distinct components of BPM and BPO (study 1) by decomposing them into sub components. This specification was required to enable a rigorous mapping of the capability areas in existing BPMMs to their theoretical equivalents, and to find evidence of a process capability

framework. We recall that maturity refers to the expected performance, which is an indicator of the actual performance. Consequently, process capability areas are assets or critical success factors for business (process) performance, and can be underpinned in the broader literature. However, no consensus exists on the process capability areas. Many scholars have (mostly empirically) examined the critical success factors for business (process) excellence, which frequently resulted in a new BPMM (Hammer 2007; Harrington 1991; McCormack and Johnson 2001; de Bruin and Rosemann 2007). Unlike a sound methodology or use, these alternative solutions are not grounded by established theories and still differ in the capability areas covered. Therefore, this study looked for theories that underlie the process capability areas in order to create a BPMM-independent foundation. The intended conceptual framework not only serves our research on business process maturity, but helps to consolidate and advance the business process literature.

The ultimate aim of this study was to verify whether different maturity types are being measured by existing BPMMs, both by referring to what they assess and improve (i.e. the capability areas, study 1) and to their number of business processes addressed (i.e. as suggested by de Bruin and Rosemann (2007)). Consequently, this study intended to add a novel perspective to the literature of business process maturity by verifying the traditional dichotomy of maturity types and by supplementing this division with well-grounded capability areas.

- RQ2a. Which capability areas can be assessed and improved by a BPMM in order to reach business (process) excellence?
- RQ2b. Which capability areas are actually assessed and improved by existing BPMMs?
- RQ2c. If RQ2b shows that different capability areas are actually assessed and improved, do existing BPMMs measure different types of maturity?

### ***2.2.2 Research Methodology***

As a continuation of study 1, a literature study was conducted to theoretically identify the business process capability sub areas. Houy et al. (2010) argue that the business process literature is mainly empirically based, with currently a poor tradition of theory construction. To our knowledge, only the business process lifecycle theories are well established, which are mostly limited to ‘modelling’, ‘deployment’, and ‘optimisation’. Therefore, we concretised the other main capability areas by relying on the broader business process literature, among others the business process evolutions of Chap. 1 and review articles that differ from maturity models (Kohlbacher 2010; Lee and Dale 1998; Palmberg 2009). We underpinned these findings by organisation management theories regarding: (1) performance and change management, (2) human resource management, and (3) strategic management. Further on, the resulting main areas and sub areas were empirically validated by mapping our sample of 69 BPMMs (see Chap. 1) to them.

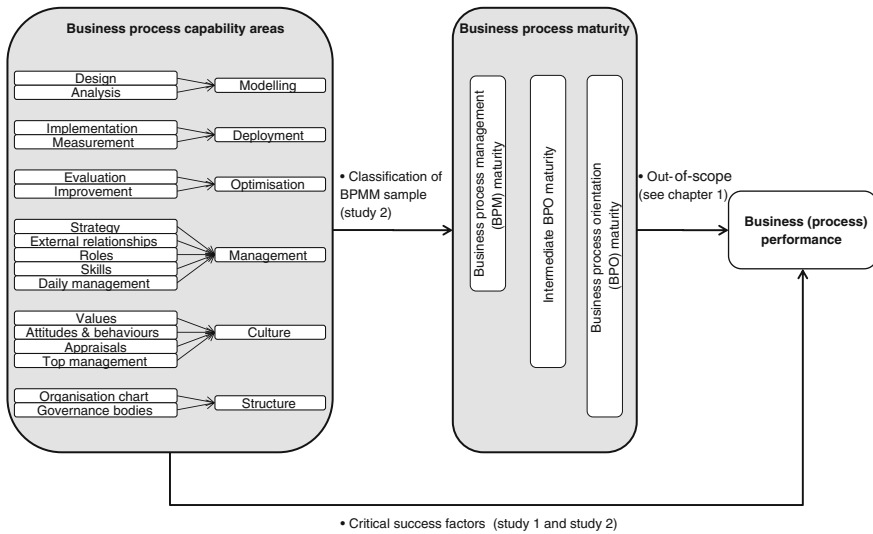
Regarding the maturity types, a classification study was conducted by combining exploratory cluster analysis (i.e. to identify maturity types) with confirmatory discriminant analysis (i.e. to validate maturity types) (Punj and Stewart 1983; Romesburg 1984). As an exploratory classification technique, any cluster analysis tends to produce a classification, regardless of whether data actually comprise natural groupings (Punj and Stewart 1983). This requires some precautions to avoid a solution that just occurred ‘*by chance or as an artefact of a clustering algorithm*’ (Jain et al. 1999: p. 268). For this purpose, Romesburg (1984) advises to choose the most meaningful clustering solution, which generates interesting and useful conclusions, and which is stable on both the complete and split dataset. All clustering methods in SPSS (version 18) were evaluated in this respect. A Cohen’s Kappa was computed as a measure of agreement on group membership between solutions, e.g. between complete and split datasets or between cluster and discriminant analysis.

Cluster analysis can be conducted without assumptions about the underlying data distribution. On the other hand, discriminant analysis is enhanced by seven assumptions (Klecka 1980), which were translated to our research as follows: (1) at least two clusters, (2) at least two BPMMs per cluster, (3) the number of discriminating variables (i.e. capability sub areas) is less than the total number of BPMMs minus 2 (i.e.  $N = 69 - 2$ ), (4) the discriminating variables are at the interval level or binary, (5) non-linear relationships between discriminating variables, (6) homogeneity of variance, i.e. equal variance within each of the clusters, and (7) a multivariate normal distribution on the discriminating variables. Our discriminating variables are expected to be binary (i.e. sub areas are present or absent in the BPMM design documents), and thus likely to dissatisfy the sixth and seventh assumption. Nonetheless, Klecka (1980) asserts that a discriminant analysis can still be performed for binary data. Only in worst case, when the discriminant functions are not statistically significant, the intended discriminant analysis cannot be used as a classification technique.

### 2.2.3 Overview of the Findings

Figure 2.2 illustrates the resulting conceptual framework. On the left, it shows the sub areas per main area of study 1. For a description per sub area, we refer to Van Looy et al. (2012).

The six sub areas related to ‘modelling’, ‘deployment’, and ‘optimisation’ were directly derived from the traditional business process lifecycle theories. Although many lifecycle variants exist, they do not fundamentally differ (Shewhart 1986; Deming 1994; Harrington 1991; Kannengiesser 2008; Netjes et al. 2006; Smith and Fingar 2002, 2006; Weske 2010; zur Muehlen and Ho 2006). The main difference is that some variants also mention the ‘management’ of business processes, albeit without considering all aspects (Weske 2010; zur Muehlen and Ho 2006). This is where organisation management theories come to the foreground.



**Fig. 2.2** The process capability framework and types of business process maturity

First, the organisation performance and change theories of Waterman et al. (1980) and Burke and Litwin (1992) (causally) describe aspects that affect business performance. Although we acknowledge differences between business performance and process performance, all theoretical aspects affect our six main areas and were mapped to our 17 sub areas.

Secondly, theories on strategic management emphasise that the organisational strategy must be translated into the strategy of a specific business process (i.e. ‘management’). For instance, a balanced scorecard systematically derives key performance indicators regarding four perspectives of business performance, with business processes being one of the perspectives (Kaplan and Norton 2001).

Thirdly, the human resource management theory of Boswell et al. (2006; Colvin and Boswell 2007) impacts both the ‘management’ and ‘culture’ areas. Particularly, this theory argues that the behaviours of employees can be directed: (1) by obtaining the skills and knowledge to perform a single process (i.e. ‘management’—‘skills’) and (2) by obtaining the motivation to perform through top management communication, employee involvement in decision-making, extrinsic motivation and intrinsic motivation (i.e. ‘culture’—‘top management’, ‘attitudes and behaviours’, ‘appraisals’, ‘values’ respectively).

Content analysis validated the comprehensiveness of the conceptual framework by mapping all capability areas of 69 BPMMs to a theoretical equivalent. No other sub areas were present in the sample. Appendix illustrates how a detailed mapping was established per sampled BPMM. This mapping showed many similarities with alternative process capability frameworks. For instance, an almost perfect comparison could be made with the process capability areas of de Bruin and Rosemann (2007), except for the organisation chart. Their BPMM was thoroughly



designed by using international Delphi studies, and validated by case studies. It consists of six main areas, each with five sub areas: (1) strategic alignment, (2) governance, (3) methods, (4) information technology, (5) people, and (6) culture. Our conceptual framework consolidates their findings with other BPMMs, and, most importantly, complements them with underlying theories.

Descriptive statistics showed, however, that BPMMs usually do not cover all theoretical areas, which makes classification worthwhile to detect maturity types. Only the Ward's and k-means methods with three clusters satisfied the classification assumptions, mentioned in the methodology section. Since both solutions statistically fit our data (on both the complete and different split datasets), the final clustering was guided by its meaningfulness. Ward divides the 69 BPMMs in three clearly separated clusters of almost equal size (i.e. 23, 20, and 26 BPMMs): a partial BPM cluster (i.e. with some modelling, deployment, optimisation, and management areas), a quasi-full BPO cluster (i.e. with almost all areas), and an intermediate cluster (i.e. by combining BPM with some BPO-specific capability areas). On the other hand, k-means proposes unequal clusters (i.e. 15, 16 and 38 BPMMs) with a more ambiguous cluster membership: a minimal BPM cluster (i.e. with some modelling, deployment and optimisation areas), a partial BPM cluster (i.e. by also including some management areas), and a partial BPO cluster (i.e. by also including culture-related areas and some structure-related areas). As the k-means method has a less distinct representation of the capability areas per cluster, the Ward's method was preferred for our study. The adequacy of the three resulting clusters was judged by the discriminant methods available in SPSS (version 18), i.e. the regular and stepwise methods. As the vast majority of the sampled BPMMs were predicted in the same clusters as in cluster analysis, the BPMM classification was strongly confirmed. Consequently, we obtained a reliable classification solution, which appeared to guarantee cross-validation by adhering to our prior expectations of BPM maturity and BPO maturity (study 1) (Punj and Stewart 1983; Romesburg 1984). It also refined the funnel structure of our previous study by revealing a third and yet unknown intermediate cluster.

In sum, the three maturity types resulting from the classification study are:

- **business process management (BPM) maturity**, primarily focusing on business process modelling (1), deployment (2), optimisation (3) and management (4);
- **business process orientation (BPO) maturity**, combining BPM maturity with a process-oriented culture (5) and structure (6);
- **intermediate BPO maturity**, limiting BPO maturity to some process-oriented aspects, usually cultural (5).

These maturity types are, however, strictly limited to the capability coverage of sampled BPMMs. They do not take into account the number of business processes addressed. This variable was, however, also registered during content analysis. We noticed that the assessment items in BPMMs literally refer to one, more or all business processes in an organisation, and this for BPMMs of all maturity types. Consequently, nine maturity types appeared to exist:

- **BPM** maturity for **one, more or all** business processes;
- **Intermediate BPO** maturity for **one, more or all** business processes;
- **BPO** maturity for **one, more or all** business processes;

The advanced maturity types refine the dichotomy of de Bruin and Rosemann (2007) by dividing specific processes in either a single process or either a business domain with multiple (sub) processes (e.g. a value chain). We also argued that these findings allow to compare the completeness of BPMMs. Such a critical view on BPMMs turned out to be crucial for the sake of clarity, as their names not always correctly represent the exact coverage (i.e. with possible over- or under-estimates). For instance, some BPMM names refer to ‘BPM maturity’, whereas they actually measure BPO maturity for all processes (i.e. being more complete), or vice versa, etc. Nevertheless, the best suited maturity type for a particular organisation is not necessarily the most complete one. Future research is required to investigate which contextual factors determine the choice of maturity type, e.g. based on the degree of top management support, etc.

### 2.2.4 Recommendations

This study theoretically and empirically strengthened the findings of study 1. It responded to the lacking consensus on capability areas necessary for business process excellence, and grounded the BPMM literature to some degree. Internal validity and reliability were obtained by an iterative and top-down approach for identifying and validating both capability areas and maturity types. As our BPMM sample includes different process types (i.e. generic, supply chains, collaboration), it suggests versatility and external validity to some extent. External validity is ensured when recognising the classification utility in a larger sense, i.e. as a first and essential step towards a theory of business process maturity. Researchers are encouraged to further examine the effects of capability areas and maturity types on business (process) performance. Hence, our conceptual framework has the potential to contribute to a theoretical framework in future research (see Fig. 2.2 and Chap. 3).

Study 2 illustrated that blindly comparing results from different BPMMs (e.g. for benchmarking) is not justified, as not all BPMMs measure the same maturity type. We recommend scholars and practitioners to adopt a critical view on the BPMM names by applying our nine business process maturity types. These maturity types are also more informative than the traditional dichotomy of maturity types, and therefore more recommended. Furthermore, our maturity types are helpful to practitioners in order to interpret the direction of BPMMs, i.e. which capability areas are to be assessed and improved, and to motivate their choice for one or another maturity type based on their organisational needs. We strongly recommend practitioners to choose a maturity type that best fits their organisational context, instead of blindly choosing one maturity type or ambitiously taking the most complete one. Finally, researchers are encouraged to investigate these contextual factors in more detail.

## 2.3 Selection

Reference to the selection study:

Van Looy A, De Backer M, Poels G, Snoeck M (2013) Choosing the right business process maturity model. *Inf Manag.* doi:[10.1016/j.im.2013.06.002](https://doi.org/10.1016/j.im.2013.06.002)

### 2.3.1 *Scope and Purpose*

The third study continued to focus on the great BPMM variety by advising on which BPMM must be chosen when, based on discussions with international subject-matter experts. This study broadened our BPMM comparison from capability areas and number of business processes to other BPMM characteristics. It evaluated the sampled BPMMs with regard to more aspects than merely our BPMM classification (by means of evaluation scores), and particular organisations can use our findings to evaluate which BPMMs best fit their needs (by means of an online decision tool). The emphasis is on BPMM selection as a first essential phase before BPMM application, given the multitude of diverse BPMMs.

- RQ3a. Which criteria help users (i.e. organisations or academics) choose a BPMM?

### 2.3.2 *Research Methodology*

The design-science paradigm was followed to develop and test a BPMM decision tool, called BPMM Smart-Selector. A solution was proposed by relying on: (1) the IS design research cycle and guidelines of Hevner et al. (2004), (2) the IS artefact types of March and Smith (1995), and (3) the IS design theory components of Walls et al. (2004). The design hypotheses (or requirements) were formulated based on the following decision-making theories: (1) the theory of bounded rationality (Simon 1979), (2) the theory of information symmetry (Afzal et al. 2009), (3) the theory of managerial work (Mintzberg 1971), and (4) the multi-attribute utility theory (Keeney and Raiffa 1993). The tool operates like a decision table, and is freely available at: <http://smart-selector.amyvanlooy.eu/>.

The selection criteria to be included in the BPMM decision tool were discussed and chosen by means of an international Delphi study (i.e. consensus-seeking decision-making) (Dalkey and Helmer 1963), and weighed by the Analytical Hierarchy Process (AHP, i.e. multi-attribute decision-making) (Saaty 1990). Both methods are widely used for exploring ideas and ratings.

More specifically, we applied a ‘modified’ Delphi approach, which started from an initial list of criteria based on content analysis (see Chap. 1), peer feedback and a pilot study. Experts could give open comments at any time and propose an

unlimited list of missing criteria. As this approach typically gives common ground, it allowed including experts of different backgrounds to stimulate normative discussions. In total, 11 BPM academics and 11 BPM practitioners participated in the study, each from five continents. They were carefully chosen conform to Okoli and Pawlowski (2004), and remained anonymous during the study. Only two experts permanently dropped-out after round 1 due to other obligations.

The duration of the Delphi study was directed by strict conditions regarding consensus, stability and fatigue. It took five rounds between November 2011 and April 2012, i.e. one round for brainstorming possible criteria, two for narrowing down, one for weighing the final criteria by AHP, and a wrap-up round.

### 2.3.3 Overview of the Findings

In total, 24 criteria and their trade-offs were discussed by the subject-matter experts (Table 2.1). As these criteria concern BPMM characteristics, they were reorganised into the conceptual model of a BPMM to refine study 1. For a description per criterion and their trade-offs, we refer to Van Looy et al. (2013).

On the left, Table 2.1 presents the 14 criteria that reached consensus to be included in the BPMM Smart-Selector. These criteria and their options were weight by using AHP to know their relative importance, i.e. according to the expert panel. In line with study 1 and study 2, the capability coverage of BPMMs received the highest weight, which means that the experts confirmed the criterion's utmost importance. Moreover, successive warm-up discussions showed that the statistical clusters of study 2 (i.e. maturity types) were experienced quite naturally by almost the entire expert panel. In order to give more guidance on the choice of capability cluster (study 2), two additional contextual factors were derived from the expert discussions: (1) the degree of IT support, and (2) BPM experience.

On the right, Table 2.1 presents the ten criteria that did not reach consensus, and were omitted from the questionnaire in the BPMM Smart-Selector. These criteria did not show a bimodal distribution with academics opposed to practitioners, but were blocked by a small minority with opposite opinions.

Subsequently, two evaluation scores were calculated per sampled BPMM, as an additional quality check before launching the tool: (1) a selection score, and (2) a transparency score. The selection score considered the 14 decision criteria that reached consensus, and assigned the weighed options to BPMMs based on content analysis (Chap. 1). To avoid bias, the mapping of BPMMs to criteria was conducted before the weights were defined, and not known by the experts when weighing. On the other hand, a transparency score verifies whether all 24 criteria considered in the Delphi study (i.e. without consensus to be excluded from the tool) are present in the BPMM design documents. In other words, once a BPMM selected, does the user get sufficient information to start using it? Based on these evaluation scores, nine BPMMs were omitted from the BPMM Smart-Selector.

**Table 2.1** The criteria discussed in the Delphi study

Criteria with consensus to be included in the tool (in the order of importance)	Criteria without consensus to be in- or excluded
<ul style="list-style-type: none"><li>• Presence of capabilities</li><li>• Architecture type</li><li>• Architecture details</li><li>• Type of business processes</li><li>• Rating scale</li><li>• Data collection technique</li><li>• Purpose</li><li>• Validation</li><li>• Number of business processes</li><li>• Assessment duration</li><li>• Assessment availability</li><li>• Functional role of respondents</li><li>• Number of assessment items</li><li>• Direct costs</li></ul>	<ul style="list-style-type: none"><li>• Calculation of (maturity or capability) levels</li><li>• Representation of (maturity or capability) levels</li><li>• Number of assessed organisations</li><li>• Lead assessor</li><li>• Number of assessors</li><li>• Business versus IT</li><li>• Number of (maturity or capability) levels</li><li>• Labelling of levels</li><li>• External levels</li><li>• Methodology</li></ul>

Consequently, the prototype of the BPMM Smart-Selector (<http://smart-selector.amyvanloooy.eu/>) consists of a questionnaire with 14 selection criteria which guide the user through 60 (instead of 69) sampled BPMMs. The questionnaire presents the criteria (i.e. questions with trade-offs) in the order of importance according to our expert panel. The user, however, can also start with those questions that are most relevant to his organisation (and use other questions to refine the results afterwards) instead of following the proposed sequence. An initial version was tested by employees enrolled for the BPM course of a post-graduate training program (as potential users). Afterwards, the prototype tool was successfully applied in three case studies: (1) a profit organisation not yet using a BPMM, (2) a non-profit organisation already using a BPMM, and (3) by an academic for research purposes.

**2.3.4 Recommendations**

The critical view on BPMMs was continued in this third study. In contrast to the previous studies in this book, it directly resulted in practical advice by means of the BPMM Smart-Selector. Although Delphi studies are typically limited by their expert choice and design, several precautions were taken to ensure a sound methodology. Internal validity resulted from a careful selection of 22 experts (by role and region) and four coders (including one coder from another university to avoid bias) who participated throughout successive rounds. The resulting selection criteria turned out to be reliable, with high satisfaction rates among both the experts and the independent testers afterwards. Regarding external validity, the methodology ensured that the BPMM Smart-Selector can be updated with new

BPMMs or new criteria. Reuse for other types of decision tools (e.g. other maturity models) needs to be investigated.

We recommend practitioners to use the BPMM Smart-Selector in order to discover which BPMM best fits their organisational needs (<http://smart-selector.amyvanlooy.eu/>). The tool presents detailed information per criterion, including trade-offs. Organisations that wish to start with maturity assessments will be informed about their best matching BPMM in our sample, including references on how to access the model. On the other hand, organisations that already use a BPMM can evaluate whether that model would also be their best matching model, and possibly change over. Also scholars are recommended to use the BPMM Smart-Selector, for instance, to get to know them or if they consider including BPMMs in their research.

We must, however, note that the BPMM Smart-Selector concerns a 2012 proof-of-concept to validate its way of working. It is based on BPMM design documents of 2010 or earlier. The author of this book can be contacted if you wish to include additional BPMMs or corrections to BPMM details in a next release. Furthermore, we invite practitioners and researchers to give us feedback after using the BPMM Smart-Selector. To enter the feedback form, a button 'Ready? Give us your feedback' is present in the selection table (i.e. above the overview of matching BPMMs). The BPMM Smart-Selector also requests some anonymous data about you and your organisation to track how the tool is used. We guarantee that this data is merely used for academic purposes. For instance, such data collection can be used to explain which organisation types choose for a specific capability cluster (see study 2).

**Acknowledgments** We truly thank the coders and the expert panel for their continuing participation throughout the different Delphi rounds. Furthermore, we thank the testers for using our prototype tool.

## Appendix: An Illustration of the Detailed BPMM Mapping

Please note that a detailed mapping per BPMM can be found at <http://www.amyvanlooy.eu/research/2-classification>

ID	BP modelling	BP deployment	BPM optimisation	BPM management	BPO culture	BPO structure	Other
OMG	Work unit requirements management (1/2 items)	Product and service deployment (3 items)	Work unit performance (3 items)	Work unit requirements management (1/2 items)	Organisational business governance (2 items)	Product and service process integration (1/3 items)	-
	Organisational process management (1/3 items)	Product and service operations (3 items)	Organisational process management (2/3 items)	Work unit planning and commitment (3 items)	Organisational process leadership (2 items)		
	Product and service support (3 items)	Product and service support (3 items)	Product and service work management (2/3 items)	Work unit configuration management (3 items)	Organisational process leadership (2 items)		
	Product and service preparation (3 items)	Product and service process integration (1/3 items)	Organisational capability and performance management (3 items)	Organisational resource management (2 items)	Organisational common asset management (2 items)		
		Organisational improvement deployment (1/3 items)	Quantitative product and service management (2 items)	Sourcing management (3 items)	Organisational performance alignment (2 items)		
		Work unit monitoring and control (3 items)	Quantitative process management (3 items)	Process and product assurance (2 items)	Organisational improvement planning (3 items)		
			Defect and problem prevention (3 items)	Organisational competency development (2 items)	Organisational improvement planning (3 items)		
			Continuous capability improvement (2 items)	Product and service business management (3 items)	Organisational process leadership (1 items)		
			Organisational innovative improvement (3 items)	Product and service work management (1/3 items)			
			Organisational improvement deployment (2/3 items)				
Design: OK		Implementation: OK		Strategy: OK		Chart: OK	
Analysis: OK		Improvement: OK		External: OK		Values:-	
				Roles: OK		Attitudes: OK	
				Training: OK		Rewards: OK	
				Daily management: OK		Top management: OK	

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