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# **A BUSINESS CONTINUITY MANAGEMENT MATURITY MODEL**

## **The Search for an ISO 22301 Compliant BCM Maturity Model**

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## Table of contents

1	INTRODUCTION .....	9
1.1	Motivation for the research .....	9
1.2	Research questions .....	11
1.3	Structure of the research.....	11
2	MATURITY MODELS.....	13
2.1	Foundation for the literature review .....	13
2.2	Maturity models in general .....	14
2.3	Definition and structure.....	16
2.4	Purposes of use.....	19
2.5	Criticism.....	20
2.6	Developing and evaluating maturity models.....	21
3	BUSINESS CONTINUITY MANAGEMENT (BCM) .....	29
3.1	BCM as a management discipline .....	29
3.2	Regulations and standards .....	30
3.3	BCM system according to ISO 22301.....	34
3.3.1	Context of the organization.....	35
3.3.2	Leadership.....	36
3.3.3	Planning .....	37
3.3.4	Support.....	37
3.3.5	Operation.....	38
3.3.6	Performance evaluation .....	39
3.3.7	Improvement .....	39
4	EXISTING BCM MATURITY MODELS .....	41
4.1	Model selection .....	41
4.2	Evaluation methodology .....	43
4.3	Design processes .....	44
4.4	The form, function and BCM coverage .....	49
4.4.1	The Business Continuity Maturity Model® (BCMM) by Virtual Corporation (2005).....	49
4.4.2	Maturity Model for BCM by Smit (2005) .....	54
4.4.3	BCMS Capability Model by Sheth et al. (2007).....	59
4.4.4	Maturity Model for BCM by Randeree et al. (2012).....	64
4.5	Summary of the evaluation results .....	67

5	DRAFTING THE ENHANCED BCM MATURITY MODEL .....	70
5.1	Determining the development strategy .....	70
5.2	BCM process maturity levels .....	70
5.3	Key process areas for each maturity level.....	73
5.4	BCM scope maturity levels .....	75
5.5	Combined grid.....	77
6	RESEARCH METHODOLOGY .....	79
6.1	Research design.....	79
6.2	Selection criteria.....	80
6.3	Data collection .....	82
6.4	Data analysis .....	83
7	RESULTS .....	84
7.1	Dimensions for measuring the maturity .....	84
7.2	Maturity levels and their descriptions .....	85
7.2.1	Process maturity .....	85
7.2.2	Scope maturity .....	86
7.3	Key process areas for each maturity level.....	89
7.4	Requirements for each key process area .....	92
7.5	The enhanced BCM maturity model .....	94
8	CONCLUSIONS AND DISCUSSION .....	98
8.1	Conclusions .....	98
8.2	Limitations .....	99
8.3	Implications for further research .....	99
	REFERENCES.....	101
	APPENDICES .....	106
APPENDIX A	Interview cover letter .....	106
APPENDIX B	Interview themes and the draft model .....	107
APPENDIX C	Overview of the conceptual model.....	108
APPENDIX D	Maturity level descriptions in the conceptual model ....	109
APPENDIX E	Maturity requirements matrix.....	110

## List of figures

Figure 1 Accumulated number of identified maturity models with respect to their year of publication (Mettler & Rohner 2009, 1).....	15
Figure 2 BPM Maturity Model Mark II (Rosemann & de Bruin 2004, 16).....	17
Figure 3 Procedure model for developing maturity models (Becker et al. 2009, 218)25	
Figure 4 The business continuity life cycle in BS 25999 (Mason 2010, 427) .....	32
Figure 5 PDCA model applied to BCM system processes (ISO 22301:2012, vi) .....	34
Figure 6 The Business Continuity Maturity Model® (Virtual Corporation 2005, 11)50	
Figure 7 Maturity Model for BCM (Smit 2005, 51) .....	55
Figure 8 Process quality levels and their characteristics (Smit 2005, 49) .....	56
Figure 9 Overview of the BCMS Capability Model (Sheth et al. 2007, 228) .....	60
Figure 10 Maturity levels for planning in BCMS Capability Model (Sheth et al. 2007, 231) 60	
Figure 11 Cross-capability correlations (Sheth et al. 2007, 238).....	61
Figure 12 Maturity Model for BCM (adapted from Randeree et al. 2012, 481).....	64
Figure 13 Maturity levels of the five areas (Randeree et al. 2012, 480).....	65
Figure 14 Draft of BCM process maturity dimension .....	71
Figure 15 Comparison of key process areas between Smit's model (2005, 49) and the draft model.....	73
Figure 16 Draft of BCM scope maturity dimension .....	76
Figure 17 Draft of the enhanced BCM maturity model .....	77
Figure 18 An example of the BCM maturity assessment .....	96
Figure 19 Key process areas for the final model version.....	97

## List of tables

Table 1 Maturity levels in QMMG (redrawn from Jokela et al. 2006, 264).....	17
Table 2 Design-science research guidelines (redrawn from Hevner et al. 2004, 83)	22
Table 3 Maturity model development requirements (Becker et al. 2009) compared to the design-science research guidelines (Hevner et al. 2004).....	23
Table 4 Main phases of the maturity model development process .....	27
Table 5 Development of business continuity management (further developed from Herbane 2010a, 992) .....	30
Table 6 Explanation of PDCA model and related key clauses in ISO 22301 (adapted from ISO 22301:2012, vi) .....	35
Table 7 BCM maturity assessment frameworks, their type and availability .....	41
Table 8 Evaluation of existing BCM maturity models on the basis of model design process .....	45
Table 9 Evaluation of existing BCM maturity models on the basis of scientific documentation .....	48
Table 10 Conformity of BCMM (Virtual Corporation 2005) to ISO 22301 .....	52
Table 11 Conformity of Smit's (2005) BCM maturity model to ISO 22301 .....	57
Table 12 Conformity of BCMS capability model (Sheth et al. 2007) to ISO 22301.	62
Table 13 Conformity of the BCM maturity model by Randeree et al. (2012) to ISO 22301 .....	66
Table 14 Conformity of existing BCM maturity models to the ISO 22301 key clauses	68
Table 15 An overview of the respondents .....	81
Table 16 Scope maturity level descriptions comparison of draft and final model ....	94
Table 17 Process maturity level descriptions comparison of draft and final model ..	95

## Abbreviations

BC	Business Continuity
BCI	Business Continuity Institute
BCM	Business Continuity Management
BCMS	Business Continuity Management System
BCP	Business Continuity Planning
BIA	Business Impact Analysis
BPM	Business Process Management
BSI	British Standards Institution
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
COBIT	Control Objectives for Information and related Technology
DoS	Denial of Service
DRI	Disaster Recovery Institute
DRII	Disaster Recovery Institute International
DRP	Disaster Recovery Planning
HIPAA	Health Insurance Portability and Accountability Act
ISACA	Information Systems Audit and Control Association
ISO	International Organization for Standardization
ITGI	Information Technology Governance Institute
ITIL	Information Technology Infrastructure Library
NFPA	National Fire Protection Association
PAS	Publicly Available Specification
PDCA	Plan-Do-Check-Act
SEI	Software Engineering Institute
SPQS	Scoped Process Quality Stage
QUAGOL	The Qualitative Analysis Guide of Leuven
QMMG	Quality Management Maturity Grid



# 1 INTRODUCTION

## 1.1 Motivation for the research

Organizations are facing a versatile risk landscape, where natural and man-made disasters are threatening to interrupt the business. Japan was hit by a massive tsunami in 2011, resulting in a nuclear plant meltdown and massive devastation along the coast. It also punched the local car manufacturing industry hard, but as 35 % of the US imports from Japan consisted of cars and related parts, also the US-based car manufacturers were more or less dependent on these parts, resulting in supply interruptions for these manufacturers (Nanto, Cooper and Donnelly 2011, 10–11).

In another recent event a common method of cybercrime, a denial-of-service (DoS) attack, brought down a part of the Internet in China for several hours in August 2013 affecting thousands of domains (Mozur 2013). When it comes to IT related risks, even a relatively smaller-scale event such as a hardware failure in a critical network component can paralyze an e-business until a replacement part is acquired, installed and configured. According to a recent study (CA Technologies 2011, 3) the total amount of revenue loss caused by IT downtime and data recovery was calculated to be 17.7 billion euros annually in European organizations in 2011.

As organizations are tackling with these threats, there is a demand for securing a level of confidence which enables the organizations to prevent these risks from realizing, but at the same time to mitigate the impacts and to cope with the aftermath in case these risks are realized. This is where the Business Continuity Management (BCM) comes into play. According to the international ISO 22301 standard, BCM is defined as “a holistic management process that identifies potential threats to an organization and the impacts to business operations that those threats, if realized, might cause, and which provides a framework for building organizational resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities” (St-Germain, Aliu, Lachapelle & Dewez 2012, 4).

Considering the importance of BCM to practically any modern organization, it does not come as a surprise that business continuity and disaster recovery plans and capabilities were ranked as the first priority in a recent Ernst & Young survey conducted among 1600 information security managers (Ernst & Young 2011, 2). According to another study (IBM 2011, 2), 64 % of organizations claimed already having some sort of business continuity plans. Although the majority of companies seem to have plans for continuity, the losses due to interruptions can be tremendous – even when counting only those caused by IT downtime. Therefore creating a plan for managing possible business

interruptions is not enough; the plan has to be rehearsed, maintained and communicated to be effective.

BCM is considered as an iterative management process (Randeree, Mahal & Narwani 2012, 475). Therefore creating a plan just to be left dusting on a shelf waiting for an auditor's visit will not ensure business continuity. This aspect of BCM makes it important to take a closer look at the process as a whole. In order to evaluate the state of a BCM system in an organization, not only the existence of a certain recovery plan is a sufficient measure.

Maturity models offer organizations a tool for evaluating an organization's current maturity in a certain process. Maturity models have been widely adopted in the software development industry since the Capability Maturity Model for Software (CMM) was introduced in 1993 (Paulk, Curtis, Chrissis & Weber 1993). Typically a maturity model consists of a sequence of levels, which forms a logical path to process maturity. The maturity level indicates the organization's capabilities in a specific class of objects and application domain (Röglinger, Pöppelbuss & Becker 2012, 329). The maturity models can be used to assess an organization's as-is situation, to guide organization's initiatives aiming at achieving higher maturity levels, to control progress, to assure its customers the quality of the process and to benchmark against other organizations in the industry or against best practices (Röglinger et al. 2012, 329; Smit 2005, 17).

According to a 2008 BCM benchmarking study (Continuity Insights & KPMG LLP 2008, 4), less than 10 % of the organizations were reviewing their BCM performance capabilities versus standards, while approximately 15 % of the organizations were using maturity modeling for measuring BCP program performance. A similar study was conducted a few years later in 2011–2012 (Continuity Insights & KPMG LLP 2012, 10), revealing an increasing trend as 30 % of the organizations were now reviewing performance capabilities versus standards and 30 % of the organizations were using maturity modeling.

During the same time period BCM has been subject to an increasing amount of regulation and standardization, to the point where seemingly competing standards have been battling for recognition as the de facto international BCM standard (Herbane 2010a, 990; Mason 2010, 428; American Society for Industrial Security 2008). The CFO and Executive Vice President of an information storage and management company was quoted saying "I recently saw a statistic that there are 16 000 regulations around the world related to internal controls and business continuity" (Krell 2006, 21). Considering the challenges surrounding the standardization and regulation, it is essential to have an understanding of BCM's history and current state from this aspect in order to be able to choose from the abundance of available standards to comply with.

Over four decades since disaster recovery planning emerged as a practice amongst the financial sector aiming at protecting its data centers, the business continuity man-

agement has finally matured into a management discipline defined by the international ISO standards and practiced by organizations globally across industries. Despite the discipline itself having matured, attempts at designing BCM maturity models have been scarce. At the advent of a new phase in the history of BCM introduced by the international ISO standardization, accompanied by the increasing popularity of using maturity models and reviewing BCM capabilities versus standards, it is time to review the existing BCM maturity models to see whether they are still compliant with the latest international standards or in need of an update.

## **1.2 Research questions**

The main research question of this thesis is how the existing BCM maturity models could be improved (RQ1). In order to answer this question, two sub-questions have been defined. Firstly, are the existing BCM maturity models compliant with the new ISO 22301 standard (RQ2) and secondly, how can the quality of a maturity model be measured (RQ3).

By answering all these three research questions the aim is to determine whether the existing BCM maturity models are adequate in comparison to the current standardization. Furthermore, if there is room for improvement, an attempt will be made to improve the existing models to fill this possible gap.

## **1.3 Structure of the research**

The introductory chapter describes the motivation for the research, the research questions and the structure of the research. This chapter helps the reader to gain an overview of the research topic and an understanding of how the research is conducted.

The second chapter introduces the concept of maturity models. It begins by describing the theoretical framework used in conducting the literature review, followed by a brief overview of the concept of maturity models before drilling down to defining maturity models and their common structures. Furthermore, the purposes of use as well as the emerged criticism towards maturity models are discussed. The chapter ends with a review of the maturity model development and evaluation frameworks suggested in the literature, aiming at answering the third research question of how the quality of a maturity model can be measured (RQ3). This knowledge is fundamental to discuss prior to reviewing the existing business continuity management maturity models, as the frameworks introduced in this chapter are later on utilized when evaluating and updating the existing BCM maturity models.

In order to evaluate existing BCM maturity models, it is essential first to be able to define what is considered to be part of contemporary BCM. The third chapter introduces the BCM by first discussing the evolution of BCM as management discipline and then reviewing the development phases of BCM through a narrative from a regulations and standards point of view. Furthermore, the recently introduced international BCM standard ISO 22301 is taken as the basis to explain the key components of BCM – the rationale behind this selection will be revealed in the chapter by examining BCM's history from the regulative perspective.

When the concept of maturity models and the BCM have been discussed, these two concepts are combined by introducing the existing BCM maturity models in the fourth chapter. The chapter begins by selecting models for evaluation from existing BCM maturity models and explaining the evaluation methodology, followed by an evaluation of the existing BCM maturity models in terms of their design processes, form, function and their conformity to the ISO 22301 standard.

In the fifth chapter a development strategy is selected and a conceptual draft model for the enhanced BCM maturity model is developed, building on the results from the evaluation of existing BCM maturity models. Later on the draft model presented in the fifth chapter will be iteratively developed by validating and improving it based on empirical data collected from expert interviews.

The sixth chapter describes the research methodology by presenting the research design, selection criteria, data collection as well as the methods of data analysis. The results of the research are presented in chapter seven, including the final iteration of the enhanced BCM maturity model.

After the results have been presented, it is time to conclude the findings and discuss their meaning. This is done in the eighth chapter which also discusses the limitations of the research and implications for further research on the topic.

## 2 MATURITY MODELS

### 2.1 Foundation for the literature review

The objective of this chapter is to give a comprehensive view on the maturity model research before drilling down to its intended application domain in the thesis – the BCM. To achieve this objective, a comprehensive literature review as suggested by Webster and Watson (2002) is conducted. The same approach is taken in the following chapters 3 and 4 discussing BCM and existing BCM maturity models. The literature review is organized as concept-centric to enable proper synthesis of the existing literature (Webster & Watson 2002, xvi).

A structured approach was used to determine the source materials for the literature review. The chosen structured approach for finding the source materials, drawing on the suggestions by Webster and Watson (2002, xv–xxi) and the work of Tranfield, Denyer and Smart (2003, 214–220), consisted of ten phases:

- 1) Choosing the databases to be used in the search process. A set of well-known and respected research article databases covering most of the essential and top ranked IS journals (Levy & Ellis 2006, 186) were selected as the basis for the search process. The selected databases were:
  - a. ProQuest ABI/INFORM Global
  - b. EBSCOhost Business Source Complete
  - c. ScienceDirect
  - d. IEEE Xplore
  - e. ACM Digital Library
  - f. Google Scholar
- 2) Selecting the search strings. The selected search strings were aiming for comprehensive results, thus synonyms were used when applicable. For example articles related to maturity models were also searched with terms “maturity grid”, “stage-of-growth”, “stage model” and “stage theory”. The synonyms were identified from the keywords of sample articles in each topic.
- 3) Selecting the exclusion criteria. According to Tranfield et al. (2003, 214), the exclusion decisions should be supported by an explanation. A selection was made to include only articles written in English, as an assumption was made this would suffice for identifying the most relevant research in each topic. Further exclusion was made when the nature of the article was analyzed; scientific journals and proceedings papers with proper bibliography were favored, as they tend to assure a certain quality and completeness of research (Wendler 2012, 1322) as well as being built on the existing body of knowledge in the respective field of science.

- 4) Initial search. The search was made using the selected search strings for each of the selected databases and as a result all matching articles were found.
- 5) Initial scan of the results. Initial scan of the results was done by reading the titles, abstracts and keywords. This resulted in identifying potentially relevant articles.
- 6) Deeper scan of the results. A more comprehensive scan was made by scanning the whole content and as a result, relevant articles were identified.
- 7) Removing the duplicates. This resulted in identifying unique relevant articles.
- 8) Going backward. After initial search was made and relevant articles identified, a process of “going backward” was initiated by reviewing the citations for the articles identified. This resulted in finding many valuable prior research articles for each topic.
- 9) Going forward. Finally a process of “going forward” was initiated by utilizing Reuters Web of Science for identifying articles citing the articles found during the previous steps of the process. This resulted in finding some of the most recent relevant articles for each topic.
- 10) Reading the articles. The articles which made it to this point were read thoroughly for a deeper analysis.

## 2.2 Maturity models in general

Maturity models are used to give a representation of an organization’s capabilities in a specific class of objects and application domain (Röglinger et al. 2012, 329). In a wider interpretation the “organization” can be replaced by any entity the maturity of which is being assessed, such as a human being (Wendler 2012, 1318). The application domain can be for example IT management, project management or business management (de Bruin, Rosemann, Freeze & Kulkarni 2005, 2).

Earliest examples of maturity models include the Maslow’s hierarchy of human needs from 1954 (Pöppelbuß & Röglinger 2011, 3), Nolan’s model for data processing from 1979 and Crosby’s Quality Management Maturity Grid (QMMG) from 1979 (Wendler 2012, 1318). Especially the latter two have inspired the later development of maturity models, such as the Capability Maturity Model (CMM) by Software Engineering Institute (SEI) at Carnegie Mellon University initially published in 1993 (Paulk, Curtis, Chrissis & Weber 1993, 5–6; Röglinger et al. 2012, 330). The CMM was widely adopted in the software industry and for example the recent trend to outsource software development to India has been credited for the fact that several Indian software development companies have been able to certify themselves as CMM level five, which is the highest maturity level in the CMM model (Brocke, vom & Rosemann 2010, 42).

The introduction of CMM served as a catalyst for the maturity model research, resulting in an increasing number of attempts to utilize the framework across a variety of application domains (Rosemann & Bruin, de 2005, 2). A recent systematic mapping study of maturity model research was able to identify a total of 237 articles in academic journals discussing maturity models as their main focus (Wendley 2012, 1321). Another interesting finding was that there were 110 articles discussing the development of different maturity models, distributed over 22 application domains (Wendley 2012, 1328–1329). Another review on the published IS maturity models research revealed 135 different maturity models being published already by 2008 (Mettler & Rohner 2009, 1) and the increasing trend in published maturity model articles seems to continue (Wendler 2012, 1329). This increasing trend in the available IS maturity models is shown in Figure 1, where the x-axis represents time and y-axis shows the accumulated number of maturity models.

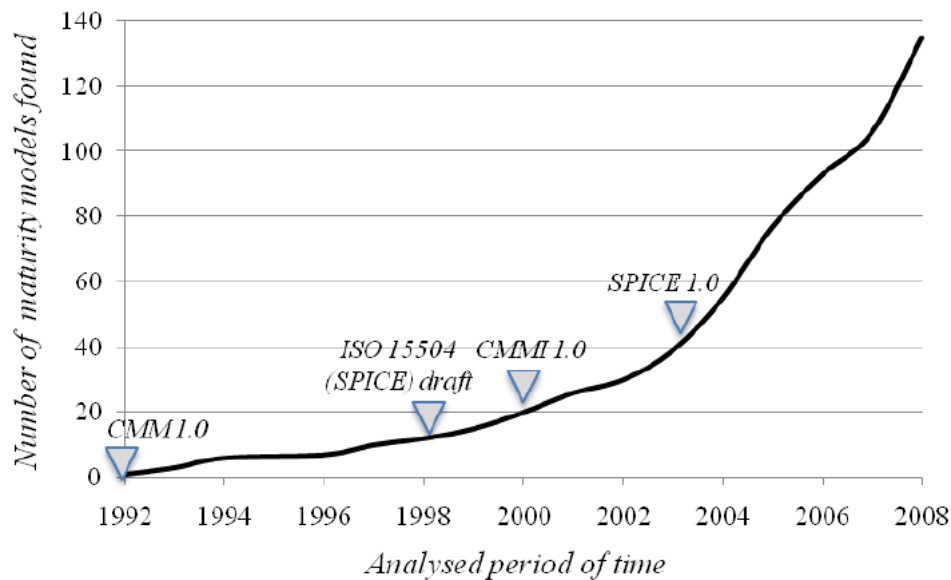


Figure 1 Accumulated number of identified maturity models with respect to their year of publication (Mettler & Rohner 2009, 1)

As in so many other contexts, quantity does not always correlate with quality. Despite the abundance of available research on maturity models, most of the research is concentrated on discussing the development, application and validation of a specific maturity model (Wendler 2012, 1324). Furthermore, according to a literature review on software process maturity models by Hansen, Rose and Tjørnehøj (2004, 466), most of the maturity model literature was considered descriptive or prescriptive by nature, while only 6 % were considered theoretically reflective. Meta-articles such as literature reviews and process models for development and evaluation of maturity models are relatively scarce (Wendler 2012, 1324), although these would undoubtedly be very beneficial for the researchers when evaluating and improving the existing models.

As there are multiple applicable domains and a large amount of maturity models available, exploring the existing maturity model literature beyond a narrow application domain makes sense. In order to be able to better understand or even improve from the existing maturity models in the application domain of BCM, it is essential to first have a deeper understanding of the concept of maturity models. A closer look is taken at the definition, structure, purpose and the expected benefits of maturity models, followed by a review of literature related to maturity model development and evaluation.

## 2.3 Definition and structure

Maturity models typically have a logical path of levels or stages for a class of objects starting from the initial state and ending to a mature state (Röglinger et al. 2012, 329; Wendler 2012, 1319). The number of levels varies depending on the maturity model, but the difficulty of providing a description for each level as well as the complexity of the model increases along with the number of levels (Fraser, Moultrie & Gregory 2002, 245–246). As there is no golden rule as to how many levels a maturity model optimally should have, Gottschalk and Solli-Sæther (2009, 1268–1269) suggested identifying and classifying the required levels according to four criteria; 1) the levels should be conceptualized and theoretically defined as significantly different from each other, 2) the levels should not overlap in terms of content, 3) no level should be perceived as a subcategory of another and 4) each level should be transferable to an empirical setting.

The levels represent an anticipated, desired or typical evolution path to maturity for the objects (Becker, Knackstedt & Pöppelbuss 2009, 213). In addition to being sequential by nature, the progress from one level to another should occur hierarchically (Wendler 2012, 1319). Therefore achieving the highest maturity level requires meeting the preconditions for all of the preceding maturity levels. Due to their nature, maturity models have also been called as stages-of-growth models, stage models or stage theories (Pöppelbuß & Röglinger 2011, 3).

An example of the logical path of levels in a maturity model can be seen in Table 1, which shows the maturity levels of Crosby's QMMG, which are then assessed for the six aspects of quality management described in the model (Jokela, Siponen, Hirasawa & Earthy 2006, 264). Each maturity level is numbered and given a name, representing the level of maturity ranging from 'uncertainty' to the final level of maturity, labeled as 'certainty'. In addition to naming the levels, each level is given a generic description.

Table 1 Maturity levels in QMMG (redrawn from Jokela et al. 2006, 264)

Stage	Description
5 Certainty	We know why we do not have problems with quality
4 Wisdom	Defect prevention is a routine part of our operation
3 Enlightenment	Through management commitment and quality improvement we are identifying and resolving our problems
2 Awakening	Is it absolutely necessary to always have problems with quality?
1 Uncertainty	We don't know why we have problems with quality

The maturity model serves as a scale to measure the entity's current position on its path to maturity. In order to do so, it must contain the criteria and characteristics required for achieving each maturity level (Becker et al. 2009, 213). The criteria for evaluating the capabilities can be conditions, processes or application targets and they have to be measurable (Wendler 2012, 1319). Furthermore, if a maturity model refers to only one criterion, for example a process, it is called one-dimensional. Most of the modern maturity models are multi-dimensional, where each dimension relevant to the application domain is assessed with its own maturity level (Pöppelbuß & Röglinger 2011, 6; Wendler 2012, 1319).

An example of a multi-dimensional maturity model is presented in Figure 2, showing the BPM maturity model developed by Rosemann and de Bruin (2004, 16). Instead of just assessing a single maturity level for the application domain of BPM, the model is divided in six key dimensions of BPM (called “factors” in the model); 1) IT/IS, 2) Methods, 3) Governance, 4) People, 5) Culture and 6) Strategic Alignment. Each of these dimensions is assessed its own maturity level.

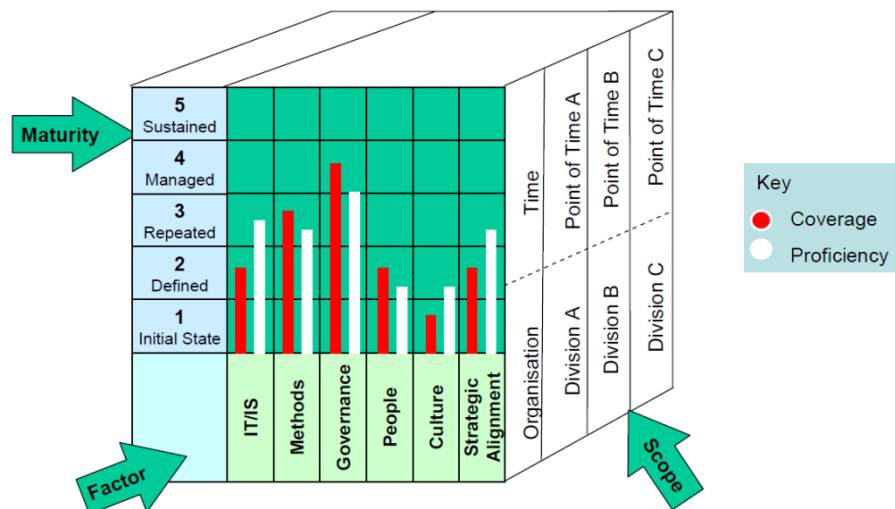


Figure 2 BPM Maturity Model Mark II (Rosemann &amp; de Bruin 2004, 16)

In addition to breaking the application domain down to six key dimensions, the model adds another dimension by assessing the maturity in each dimension in terms of coverage and proficiency. According to Rosemann and de Bruin (2004, 18) the additional knowledge brought by this dimension enabled the organizations applying the model to determine priorities by asking whether they wanted to broaden the scope or improve the execution in a certain dimension.

Dictionaries describe the maturity as “the state of being mature; fullness or perfection of development or growth” and in immaterial contexts it can be further clarified as “the state of being complete, perfect or ready” (Wendler 2012, 1318; Mettler & Rohner 2009, 2). Judging from the definition of maturity, the aim of the maturity models is to define the conditions in which the objects under assessment reach the best possible state for their purpose (Wendler 2012, 1318).

When analyzing whether the maturity, or “perfection of development”, has been reached, two approaches emerge; a life cycle perspective and a potential performance perspective. Maturity models utilizing the life cycle perspective have a well-defined final stage, which will be achieved by evolving over time (a defined evolution path), while the potential performance perspective emphasizes the potential improvements when advancing in the maturity level and the fact that the model user has to decide the desired maturity level to aim for. Most of the existing maturity models adhere to the life cycle perspective (Wendler 2012, 1318). The Crosby’s QMMG’s maturity levels presented in Table 1 provides an example of a maturity model utilizing the life cycle approach.

To summarize the definition and structure of maturity models, the maturity models are used to give a representation of an entity’s capabilities in a specific class of objects and application domain. Maturity models typically have a logical, sequential path of levels for a class of objects. The levels represent an anticipated, desired or typical evolution path to maturity. In addition, the progress between maturity levels should occur hierarchically. A maturity model must contain the criteria (conditions, processes or application targets) and characteristics required for achieving each maturity level. Furthermore, a maturity model can be either one-dimensional or multi-dimensional by its nature depending on whether it is referring to only one capability criterion such as a process, or several criteria derived from the key components of the application domain. Additionally, the progress to maturity can be seen from two perspectives; either as a defined evolutionary path to maturity (the life cycle perspective) or as potential improvements (the potential performance perspective).

## 2.4 Purposes of use

The basic purpose for a maturity model is to outline the stages of maturation paths (Röglinger et al. 2012, 330). Although this is a straightforward and common way to describe what a maturity model is intended for, it does not elaborate the full potential of the application of maturity models. A more comprehensive approach was suggested by de Bruin et al. (2005, 3). They suggested an application-specific classification by categorizing the maturity models into being descriptive, prescriptive or comparative. This classification has also gained support later on in the maturity model research (Becker et al. 2009, 213; Pöppelbuß & Röglinger 2011, 3–4; Pöppelbuß et al. 2011, 507; Röglinger et al. 2012, 330). Similar purposes have also been suggested by other authors (Iversen et al. 1999, 67; Maier et al. 2012, 149; Paulk et al. 1993, 48), but usually only one or two of the purposes have been mentioned. As this classification seems to be the most comprehensive while still being simple, and as it has received support amongst researchers, it will be selected as the approach to describe the purposes of maturity models in this thesis.

A purely descriptive maturity model would only describe the as-is situation without attempting to suggest improvements to maturity or providing linkage to performance (Bruin, de et al. 2005, 3). This type of model would be suited for assessing the current situation without a need to improve the as-is state, which seems to be a rather theoretical scenario. A prescriptive model would improve the descriptive model by providing a roadmap to improving the maturity and indicating the linkage between maturity improvement and increase in business value (Bruin, de et al. 2005, 3).

Finally, a comparative maturity model enables the assessed entity to compare itself to other entities in and across regions and, in case the entity is an organization, in and across industries (Bruin, de et al. 2005, 3). The comparison can also occur against the best practices in the model's application domain (Maier et al. 2012, 149), which are often laying the foundation for the model's prescriptive attributes (Maier et al. 2012, 149; Paulk 2008, 6). Another expected benefit from the comparison can be achieved by appropriate communication; the results can be used to signal the quality of the organization's processes to its stakeholders, such as existing or potential customers. This could eventually lead to increase in revenues due to favoring more mature organizations. A recent study by Gopal and Gao (2009, 489) confirmed, that for Indian organizations offering offshore IT services, acquiring a CMM certification resulted in a strong positive impact on exports. Thus, the comparative nature of the maturity assessment does not only serve the organization under assessment by offering comparisons to competition or best practices, but it can also serve its stakeholders by offering assurance of its process excellence.

To summarize the purposes and benefits of maturity assessments, a classification to three categories can be made. Firstly, the models can be descriptive by assessing the current situation in the organization. Secondly, they can be prescriptive by offering a roadmap for improving the maturity and by indicating the linkage between maturity improvement and increase in business value. Thirdly, they can be comparative by enabling the organization to benchmark itself against other organizations or best practices. This comparative purpose can be further extended by communicating the results to the stakeholders for added transparency and assurance of process excellence.

## 2.5 Criticism

Although the maturity models have gained a lot of attention from researchers and practitioners in the business, they have also been subject to criticism. As outlined in the previous chapter, the increasing attention from researchers has resulted in vast amounts of new maturity models. This has been criticized for leading to multiple similar models being published in same or similar application domains, suggesting certain arbitrariness (Becker et al. 2009, 214). Also the design of these new models has been claimed to be too much influenced by the existing models, often hindering the utilization of other relevant theoretical approaches (Pöppelbuß, Niehaves, Simons & Becker 2011, 511). In addition, majority of the models have been accused of being presented without adequate reference to the precedents of those models and new terminology and definitions have been introduced for concepts that have already been defined in the existing literature (Maier, Moultrie & Clarkson 2012, 139; Fraser et al. 2002, 248).

The researchers have also been accused of hiding their motivation, development of the model, procedural methods or the results of their evaluation (Becker et al. 2009, 214; Fraser et al. 2002, 247). This can probably at least partly be blamed for the proprietary nature of some of the models, resulting from the vast array of model developers coming from different backgrounds with different motivations – after all, the model developers consist of academic researchers, practitioners and consultants (Maier et al. 2012, 139). Furthermore, cross-academic co-operation efforts have been called for in order to reflect on the theoretical aspects of the maturity models (Hansen et al. 2004, 467–468; Maier et al. 2012, 139; Wendler 2012, 1317).

From the structural point of view, the maturity models have been criticized for not taking in account the fact that alternative maturation paths might exist (Teo & King 1997, 189). In addition, the emphasis on processes has been accused of leading to disregard on people's capabilities (Iversen, Nielsen & Nørbjerg 1999, 75; Mettler & Rohner 2009, 1). Mettler and Rohner (2009, 3–4) further argued that maturity models such as CMM were designed with large companies in mind, resulting in some requirements

being very hard to reach for smaller companies. As a solution they suggested that maturity models involved in organizational engineering should be equipped with configuration parameters for adjusting the models according these factors for extending the models' focus.

Further criticism has been pointed due to the nature of maturity models as being over-simplified step-by-step recipes to success, while failing to grasp the complexities of their application domains and thus failing in providing enough meaningful information to their intended audience (Bruin, de et al. 2005, 5; Röglinger et al. 2012, 330). In addition the lack of quantitative studies supporting the evidence that these "success recipes" actually lead to success has been questioned, and the presented evidence has been described as anecdotal or consisting of case studies merely describing success stories (McCormack, Willems, van der Bergh, Deschoolmeester, Willaert, Štemberger, Škrinjar, Trkman, Ladeira, de Oliveira, Vuksic & Vlahovic 2009, 793).

## 2.6 Developing and evaluating maturity models

To mitigate some of the criticism mentioned in the previous chapter and to aid researchers and practitioners in developing maturity models, several procedure models have been suggested to aid this process (Becker et al. 2009; Bruin, de et al. 2005; Gottschalk & Solli-Sæther 2009; Maier et al. 2012; Mettler & Rohner 2009; Steenbergen, van, Bos, Brinkkemper, Weerd, van de & Bekkers 2010). Furthermore, Pöppelbuß and Röglinger (2011) developed a framework of general design principles for maturity models to assist the model development and evaluation process.

Interestingly, it seems that design science approach as suggested by Hevner, March, Park and Ram (2004) and especially the seven research guidelines they proposed are heavily dominating the scientific background of the suggested approaches, as the only ones not referring to it are the approaches suggested by de Bruin et al. (2005) and Gottschalk and Solli-Sæther (2009). According to the comprehensive literature review on maturity models by Wendler (2012, 1326), this trend seems to be similar amongst articles attempting to develop maturity models, as 39 % of the articles had adopted design-oriented research design. The design science does indeed fit particularly well to the maturity model development and evaluation. A further elaboration on the design science research guidelines is required prior to explaining the connection.

The design science is essentially a problem solving process, used for creating innovative and purposeful solutions, called artifacts, for a specified problem domain. It emphasizes the novelty of these artifacts as well as the process of evaluating them. Furthermore, it requires the solution to be rigorously defined and represented. The design process is characterized as a search process, where formulating the problem as well as cre-

ating the mechanism to solve it are seen as part of the search process. When a solution has been eventually found, the results have to be effectively communicated (Hevner et al. 2004, 82). Together these features can be represented in the form of the seven design science research guidelines, which have been seen as the “de facto standard” in design science research ever since their publication (Venable 2010, 109). These guidelines are presented in Table 2 along with a brief description of each guideline.

Table 2 Design-science research guidelines (redrawn from Hevner et al. 2004, 83)

Guideline	Description
1 Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
2 Problem Relevance	The objective of design-science research is to develop technology-based solution to important and relevant business problems.
3 Design Evaluation	The utility, quality and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
4 Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
5 Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
6 Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
7 Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

As noted by several researchers (Becker et al. 2009, 214; Maier et al. 2012, 140, Wendler 2012, 1330), the maturity model development process fits very well in these guidelines. Becker et al. (2009) took this opportunity of integrating the model development process and the design-science research method the furthest by presenting eight requirements for the development of maturity models based on the seven research guidelines suggested by Hevner et al. (2004, 83). Furthermore, they suggested an eight-step procedure model for the model development process which satisfies those eight requirements. The maturity model development requirements (Becker et al. 2009, 214–

216) and the corresponding research guidelines (Hevner et al. 2004, 83) are presented in Table 3.

Table 3 Maturity model development requirements (Becker et al. 2009) compared to the design-science research guidelines (Hevner et al. 2004)

<b>Requirement (Becker et al. 2009)</b>		<b>Research Guideline (Hevner et al. 2004)</b>	
R1	Comparison with existing maturity models	#1	Design as an Artifact
		#4	Research Contributions
R2	Iterative Procedure	#6	Design as a Search Process
R3	Evaluation	#6	Design as a Search Process
		#3	Design Evaluation
R4	Multi-methodological Procedure	#5	Research Rigor
R5	Identification of Problem Relevance	#2	Problem Relevance
R6	Problem Definition	#2	Problem Relevance
R7	Targeted Presentation of Results	#7	Communication of Research
R8	Scientific Documentation	#7	Communication of Research

The first requirement demands for a comparison with the existing maturity models – this comparison should point out the need for a new model or an improvement to an existing model. This requirement is aligned with the first guideline referring to the objective of developing an artifact and the fourth guideline suggesting contributions to the research (Becker et al. 2009, 214; Hevner et al. 2004, 82–83, 87).

The second requirement states the procedure must be iterative, referring to a step-by-step approach in the development process. This iterative approach is also called for in the sixth research guideline, which suggests generating alternative designs and testing them against the requirements and constraints when searching for the optimal solution (Hevner et al. 2004, 88–89).

The third requirement is evaluation, which is directly aligned with the third guideline (Hevner et al. 2004, 85). Becker et al. (2009, 214) suggest not only to evaluate the developed model in terms of usefulness, quality and effectiveness, but also the principles and procedures chosen for the model development. As the evaluation is of iterative nature (the evaluation results are reflected back to the design of the model), this requirement also supports the sixth guideline, design as a search process (Becker et al. 2009, 214).

The fourth requirement, multi-methodological procedure, is derived from the research rigor guideline, which encourages the researcher to effectively select the theoretical foundations and research methodologies for the artifact construction and evaluation purposes (Hevner et al. 2004, 88). Becker et al. (2009, 214) suggest different methods could be used for the development and evaluation phases, resulting in research rigor.

The fifth and sixth requirements, identification of problem relevance and problem definition, are linked to the problem relevance guideline. Before developing a model, the relevance of the maturity model for the selected application domain must be confirmed as well as the expected benefits and possible constrictions (Becker et al. 2004, 214).

The seventh and eighth requirements, namely targeted presentation of the results and scientific documentation, are aligned with the seventh research guideline on communication of research. As Becker et al. (2009, 124) point out, Hevner et al. (2004, 90) are only addressing the communication to technology-oriented and management-oriented audiences, while the research community and requirements related to it are not mentioned. A solution is proposed by the requirement for scientific documentation, which emphasizes the need to document the model design process in detail.

Together these requirements form a framework which can be utilized not only when developing maturity models, but also when evaluating existing maturity models (Becker et al. 2009, 216). These requirements have recently gained support in the literature, as they have been used as the guideline in several suggested maturity model development process approaches (Maier et al. 2012, 145; Steenbergen, van et al. 2010, 330).

In addition to defining the requirements for maturity model development, Becker et al. (2009, 218) also proposed an approach for the model development procedure based on the requirements and available documentation of existing maturity model development research. The procedure consists of eight phases, which are presented in Figure 3 by the gray rectangles. Furthermore, the maturity model development requirements presented in Table 3 are linked to the process phases with gray ovals indicating the corresponding requirement.

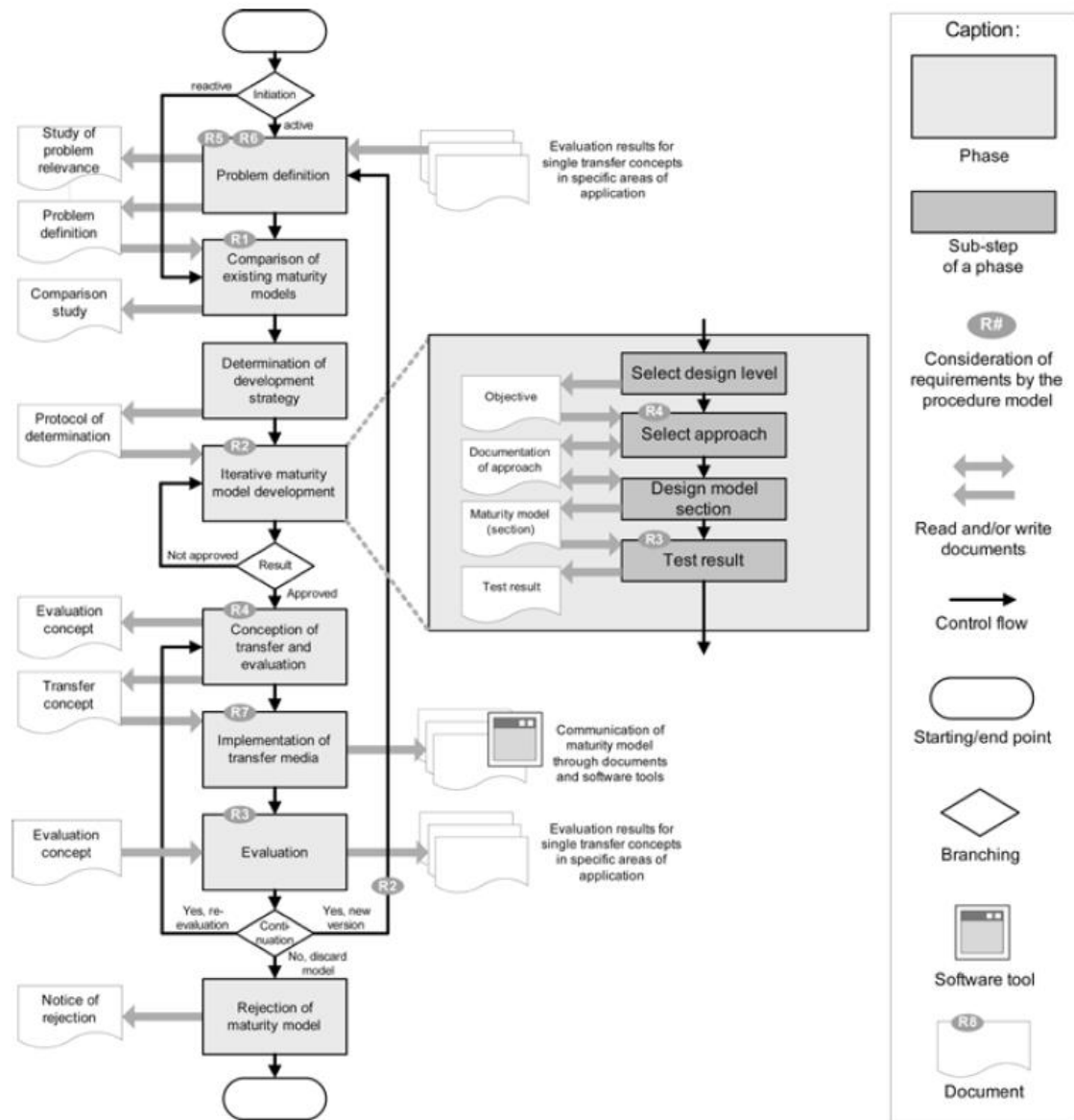


Figure 3 Procedure model for developing maturity models (Becker et al. 2009, 218)

The first two phases in the model, the problem definition and comparison of existing maturity models, are straightforward as they match the corresponding requirements (R5, R6 and R1) explained in the previous paragraphs. In the third phase a development strategy is chosen. Becker et al. (2009, 218) have identified four main strategies for the development; 1) creating a new maturity model from scratch, 2) improving an existing model, 3) merging several models into one, 4) transferring the structure or content from an existing model into a new application domain.

After a strategy has been chosen, an iterative design phase is conducted. The selection of design level refers to the different dimensions in a maturity model. The highest abstraction level defines the core structure and therefore should be developed first, after which each dimension is designed and the corresponding attributes are determined.

Before the actual development phase, a design approach is chosen. The design approach determines the method used and it is typically a literature analysis or an explorative research method. Eventually the results of each development action are verified in an evaluation test until the result is accepted in to the model (Becker et al. 2009, 218).

When the iterative development cycles have produced a satisfactory model, it is time to determine how to deliver and further validate the results. The conception of transfer and evaluation refers to defining the appropriate methods for transferring the results to the intended audiences. Not only does it include the traditional options of publishing the model documentation and possible manuals for use, but a viable option is also for example to utilize a web-based tool for access to the model. Becker et al. (2009, 218) also emphasize the need to integrate a possibility to evaluate the model by its users to facilitate further model development.

The implementation of the transfer media phase puts the decisions made in the previous phase into action. In this phase the model is made accessible for the intended audience via transfer media chosen in the previous phase (Becker et al. 2009, 218). Also the next phase, the evaluation, is conducted on the basis of the evaluation concept created during the conception of transfer and evaluation phase. In this phase, the objectives for the model are compared to the actual results, usually by applying the model to the actual business for example by using case studies or publishing the model on the Internet (Becker et al. 2009, 219).

The evaluation can lead to three outcomes. Firstly, if the results suggest making changes to the model, a reiteration can occur and the process goes back to the problem definition phase. Secondly, if the results suggest model validity, there is no need to change the model but instead to further evaluate it. In this scenario the process goes back to the conception of transfer and evaluation phase. Finally, if the results are negative, the model should be discarded and actively taken off the market (Becker et al. 2009, 218). This last outcome is usually overlooked by other researchers, as this is the only model suggesting a full lifecycle for the maturity model.

When comparing the process model suggested by Becker et al. (2009) to the other available maturity model design process models (Bruin, de et al. 2005; Gottschalk & Solli-Sæther 2009; Maier et al. 2012; Mettler & Rohner 2009; Steenbergen, van et al. 2010), a lot of similarities can be found. The main phases of each process model are listed in Table 4, where columns represent different approaches and the corresponding main process phases are listed in the rows.

Table 4 Main phases of the maturity model development process

	Becker et al. (2009)	de Bruin et al. (2005)	Gottschalk & Solli-Sæther (2009)	Maier et al. (2012)	Mettler & Rohner (2009)	van Steenberg et al. (2010)
Main phases in the development process	1. Problem definition	1. Scope	1. Suggested stage model	1. Planning	1. Problem identification and motivation	1. Problem identification and motivation
	2. Comparison of existing maturity models	2. Design	2. Conceptual stage model	2. Development	2. Objectives of the solution	2. Define the objectives for a solution
	3. Determination of development strategy	3. Populate	3. Theoretical stage model	3. Evaluation	3. Design and Development	3. Design and development
	4. Iterative maturity model development	4. Test	4. Empirical stage model	4. Maintenance		4. Demonstration
	5. Conception of transfer and evaluation	5. Deploy	5. Revised stage model			5. Evaluation
	6. Implementation of transfer media	6. Maintain				6. Communication
	7. Evaluation					
	(8. Rejection of maturity model)					

In order to properly compare the different approaches, also the actual contents of each main phase should be evaluated. However, this turned out to be very challenging task, as depending on the model, the authors emphasize very different aspects of the process. For example, while the comparison of existing maturity models was appointed its own process phase in the approach by Becker et al. (2009), on one hand the same action is performed during the scoping phase in the model by de Bruin et al. (2005, 4) and on the other hand there might be models which refer to “finding ideas from previous research”, while still failing to explicitly state that previous maturity models in that application domain should be examined (Gottschalk & Solli-Sæther 2009, 1270).

After reviewing and comparing also the actual contents of each main phase in the models, it became apparent that the model suggested by Becker et al. (2009) was the most comprehensive and suitable for being used in this thesis. While the approach suggested by de Bruin et al. (2005) successfully captures most of the same topics, it still lacks emphasis on documenting the development process. The same aspect is missing from the approach suggested by Mettler and Rohner (2009). Gottschalk and Solli-Sæther (2009) emphasize the iterative design process, but their suggested model might seem even restrictive to some as they suggest specific research methods for each design phase. In addition, their model focuses more on the design phase of the model, while defining the need for a maturity model in the selected application domain is left without attention.

Maier et al. (2012, 145) and van Steenberg et al. (2010, 330) have explicitly stated that their approach is based on the requirements for maturity models as suggested by

Becker et al. (2009, 214–216). However, although Maier et al. claim their model is a roadmap for developing new and evaluating existing maturity models (Maier et al. 2012, 148), comparing and evaluating the existing maturity models is not included in any phase of their suggested development process. Reviewing the existing maturity models in the selected application domain is also missing from the approach by Mettler and Rohner (2009).

The approach by van Steenbergen et al. (2010) seems to adhere to the requirements defined by Becker et al. (2009, 214–216), but it has a clear focus on focus area maturity models. Furthermore, their model can be argued to be slightly over-complex with its mathematical formalization of the commonalities.

### **3 BUSINESS CONTINUITY MANAGEMENT (BCM)**

#### **3.1 BCM as a management discipline**

Business continuity management has its roots in disaster recovery planning (DRP) – a crisis management approach first introduced in the 1970s and adopted by the financial industry to protect their data centers (Herbane 2010a, 981–982). Gradually from the 1970s to the mid-1990s the functional- and recovery-oriented focus in DRP shifted to strategic- and prevention-orientation. These shifts in the foci led to the introduction of business continuity planning (BCP) (Herbane 2010a, 982–983).

Furthermore, the terrorist attacks in the early 1990s in London and New York resulted in organizations recognizing the need for an organization-wide crisis management approach, encompassing all value-creating activities instead of the narrower view from the IT perspective (Herbane 2010a, 983–984). At around the same time, two of the most well-known business continuity institutions, the Business Continuity Institute (BCI) in UK and its US counterpart, the US Disaster Recovery Institute (DRI), were formed, further supporting the business continuity management in being recognized as a management discipline (Herbane 2010a, 984).

By the late 1990s, business continuity had already gained interest not only among its practitioners, but also among the academic researchers. The resulting publications aided in formalizing the BCM methodology (Herbane 2010a, 984). The activities discussed in the publications included for example business impact analysis (BIA), recovery resource requirements, awareness and training – concepts which were absent or not considered as important during the era of DRP. The terrorist attacks on September 11 in 2001 further shaped the practice to include organization-wide resilience and more flexibility to the planning to better support larger disasters (Herbane 2010a, 984).

In addition to an organization-wide approach, contemporary BCM takes a socio-technical approach to the causes and responses of potential crises. This approach emphasizes the fact that the crises often are caused by the interaction of human and technology, as well as the required responses to these crises. These characteristics along with the comprehensive approach where the actions before, during and after a crisis are effectively managed, set BCM apart from crisis management, risk analysis and disaster recovery planning disciplines (Herbane 2010b, 46).

### 3.2 Regulations and standards

According to an international standard ISO 22301, BCM is defined as a “holistic management process that identifies potential threats to an organization and the impacts to business operations those threats, if realized, might cause, and which provides a framework for building organizational resilience with the capability of an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities” (ISO 22301:2012, 2). Before drilling down further into the contents of this process, it is imperative to explain the significance of the fact this definition comes from the International Organization for Standardization, the ISO. This analysis will also shed light to the decision to select the ISO 22301 as the regulation to adhere to while evaluating and developing the BCM maturity model.

From the regulations and standards perspective, five phases can be recognized in the history of BCM – the first four of which were introduced by Herbane (2010a) and the fifth which can be argued to have emerged since 2012. These five phases, their drivers, practices and nature of progress are presented in Table 5.

Table 5 Development of business continuity management (further developed from Herbane 2010a, 992)

Phase	Time period	Drivers	Practice	Nature of progress
1	Mid-1970s → mid-1990s	Emerging legislation	DRP, BCP	Development
2	Mid-1990s → 2001	Emerging standards	BCM	Development
3	2002 → 2005	Acceleration and focus	BCM	Diffusion
4	2006 → 2011	Competing standards and breakout	BCM	Local standardization
5	2012 →	International standardization	BCM	International standardization

The first initiative forcing companies to consider disaster recovery and business continuity related issues came from the US, where the Flood Disaster Protection Act was introduced in 1973. Eventually the regulation was expanded from covering a single type of disaster to covering whole fields of industry and disaster scenarios, by introducing legislation such as the Health Insurance Portability and Accountability Act (HIPAA) in 1996, the Telecommunications Act in 1996 and the Gramm–Leach–Bliley Act in 1999. This first phase, from mid-1970s to mid-1990s, represents the emerging legislation phase (Herbane 2010a, 985).

Although the importance of business continuity for certain industries was recognized during the emerging legislation phase, it was not until the second phase, the emerging standards phase stretching from mid-1990s to 2001, when the first standards emerged bringing business continuity into the focus across industries and also outside the US (Herbane 2010a, 986).

During the second phase, the “control objectives for information and related technology version 4.0” (COBIT 4.0), a good practices guideline for IT management and gov-

ernance, was introduced by the IT Governance Institute (ITGI) and the Information Systems Audit and Control Association (ISACA) in 1992. Ensuring continuous service was now incorporated to the high level control objectives, which explicitly recognized business continuity management as a suggested solution (Herbane 2010a, 986).

Furthermore, in the US the National Fire Protection Association (NFPA) published a set of business continuity guidelines in 1995, and eventually the NFPA 1600 “standard for disaster/emergency management and business continuity programs” in cooperation with BCI and DRI in 2000 (Herbane 2010a, 986). Another important initiative during this phase came from the Ministry of Defence in United Kingdom, as they published the ministry’s continuity management policy and good practices called “Joint service publication 503 – business continuity management” in 2000. It was based on the BCI’s BCM model (Herbane 2010a, 986), which eventually transformed via the “BCM Good Practice Guidelines” published in 2002 to the widely adopted BS 25999 standard published in November 2006 (Gallagher 2007, 34).

The third phase, from 2002 to 2005, emerged from the aftermath of the terrorist attacks on September 11 in 2001 in the US, where three hijacked airplanes were crashed to the World Trade Center and Pentagon causing massive casualties and numerous companies going out of business. According to a Business Operations Specialist Carolyn Castillo of Boeing’s Navigation Systems Programme (2004, 9), not only did the lessons learned from these events affect one of the largest global companies in the aerospace industry, but it had given a “new meaning to disaster preparedness and Business Continuity Planning”. Indeed, the event triggered a series of new business continuity guidelines and regulations being published not only in the US, but also in Europe, Asia, Africa and Middle-East. Most of the regulation was targeting the financial institutions, public authorities and utilities sector (Herbane 2010a, 988).

During the third phase, the BCI published BCM “Good practice guidelines”. These guidelines influenced the publication of “Publicly available specification (PAS) 56: Guide to business continuity management” by the British Standards Institution (BSI), which was a discussion document related to proposing a new standard for BCM. Unlike any similar PAS document before, the PAS 56 received a huge interest in the organizations internationally, as 2500 responses to the document were received (Gallagher 2007, 34; Mason 2010, 423).

At the verge of the fourth phase driven by competing standards, a CFO and executive vice president of an information storage and management company was quoted claiming: “I recently saw a statistic that there are 16 000 regulations around the world related to internal controls and business continuity” (Krell 2006, 21). Whether the claim was accurate or not is irrelevant – the point being regulations were fragmented across industries and countries and there was still no consensus over a global standard.

As the BSI combined the BCM body of knowledge from the PAS 56 and its feedback, the BCI Good Practice Guidelines, the Australian BCM standard HB 221, NFPA 1600 and the parts from Information Technology Infrastructure Library (ITIL) covering IT service continuity, it subsequently introduced the British Standard BS 25999 at a record-breaking speed in November 2006 (Gallagher 2007, 34; Mason 2010, 423). Not only was the BS 25999 published in a record-breaking time since the inception of PAS 56, but it became also the best-selling standard in the number of global sales (Mason 2010, 423).

The standard was divided in two parts, the BS 25999-1 describing the overall objectives, guidance and recommendations and the BS 25999-2 describing the requirements for a BCM system. Furthermore, the second part was auditable, which enabled organizations to certify their compliance via third party auditors (Tammineedi 2010, 37). The core of BS 25999 was formed from the BCM policy, BCM program management, understanding the organization, determining business continuity strategy, developing and implementing a BCM response, exercising, maintaining and reviewing BCM arrangements and embedding BCM in the organization's culture (Tammineedi 2010, 37–38; Herbane 2010a, 989; Mason 2010, 424). Together these six factors formed the business continuity life cycle presented in Figure 4, which aimed at representing the continuous operation of the business continuity program (Mason 2010, 424).

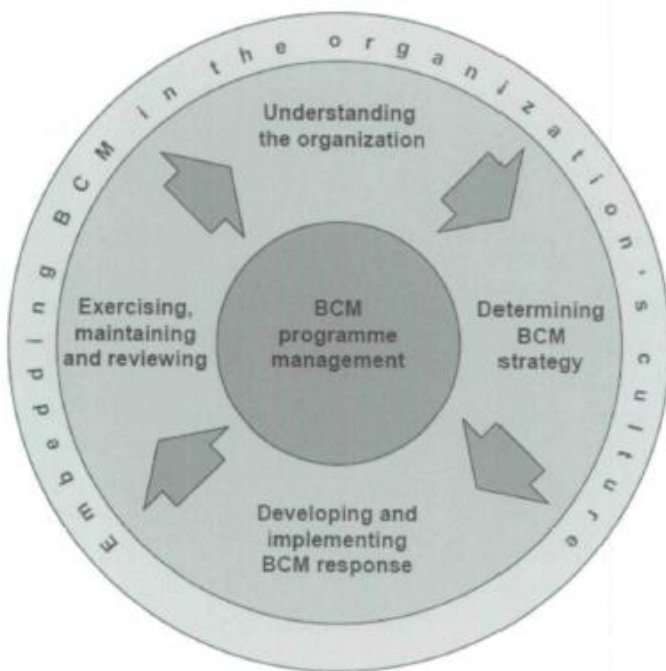


Figure 4 The business continuity life cycle in BS 25999 (Mason 2010, 427)

During the fourth phase from 2006 to 2011, the internationalization of BCM standards began, as national BCM standards were being increasingly transformed into international standards and at the same time the ISO was introducing new international stand-

ards (Herbane 2010a, 990). Business continuity was now mentioned as a subset in the ISO 27000 series of standards related to information security (Mason 2010, 424), the Singaporean business continuity standards for business continuity and disaster recovery service providers had been transformed into an international standard ISO/IEC 24762, and the ISO/IEC 27031 standard was trying to merge the national standards NFPA 1600, BS 25999, HB 221 and the Japanese and Israeli equivalents into one international standard (Herbane 2010a, 990).

Although the BSI had started this phase by introducing the BS 25999 which quickly gained international attention in organizations (Mason 2010, 428), it was still unclear which standard would become the de facto international BCM standard or whether such standard was even required, as the repository of national standards was so vast (Herbane 2010a, 990).

One could argue the race for the de facto international BCM standard was started as the ISO workshop on “Emergency preparedness” gathered in Italy in 2006. During the workshop, the experts were arguing over the best national standard suited for internationalization. After identifying the similarities between the national standards a consensus was eventually found, and the results were published as a guidance document ISO/PAS 22399 in 2007 (Tangen & Austin 2012).

Almost simultaneously at the other side of the Atlantic a project with similar objectives was established by the American Society for Industrial Security (ASIS) (Stack 2008). This initiative was objected by the Disaster Recovery Institute International (DRII), which claimed the NFPA 1600 was already an internationally recognized standard in the field and that another new BCM standard would add confusion in the industry (Herbane 2010a, 990). The open letter sent as a response from ASIS to the DRII’s objections reflects their motive to create a BCM standard which would eventually be selected as the basis of the upcoming BCM ISO standard (American Society for Industrial Security 2008). Despite the resistance, ASIS eventually managed to publish a national standard, “ASIS SPC.1-2009: Organizational Resilience: Security, Preparedness and Continuity Management Systems – Requirements with Guidance for Use” (Stack 2009).

The fifth and the current phase in the development of BCM can be argued to have started in 2012, as the race for the international BCM standard was finished upon the introduction of ISO 22301 “Societal security – Business continuity management systems – Requirements” and the optional complementary standard ISO 22313 “Societal security – Business continuity management systems – Guidance” (Tangen & Austin 2012). The BS 25999 was used as the main foundation of the new ISO 22301 (Sharp 2012, 4), although the NFPA 1600, ASIS SPC.1 along with the Israeli, Singaporean and Japanese equivalents are also listed in its bibliography (ISO 22301:2012, 24).

As a consensus on the content of an international BCM standard seems to have been finally found, validating the adequacy of existing frameworks for assessing the maturity

of BCM in organizations in the light of this new consensus seems justified. Furthermore, this contributes to the study of problem relevance – the first phase in the maturity model development process as suggested by Becker et al. (2009, 218). Before going further into evaluating the existing maturity models in the application domain of BCM, drilling down to the contents of the ISO 22301 standard is required for a more comprehensive understanding of the topic.

### 3.3 BCM system according to ISO 22301

The ISO 22301 standard views the business continuity management system (BCMS) as a cyclic process and applies the Deming's Plan-Do-Check-Act (PDCA) model to the BCMS context (ISO 22301:2012, v). The PDCA model was originally introduced by Deming in the 1950s as a framework for quality improvement activities (Tang 2008, 54). It has been later on incorporated to other management systems standards such as ISO 9001 (quality management), ISO 14001 (environmental management), ISO/IEC 27001 (information security management) and ISO 28000 (supply chain security management), facilitating a consistent and integrated implementation and operation within these related standards (ISO 22301:2012, v). Figure 5 shows how the PDCA model is applied to the BCMS processes.

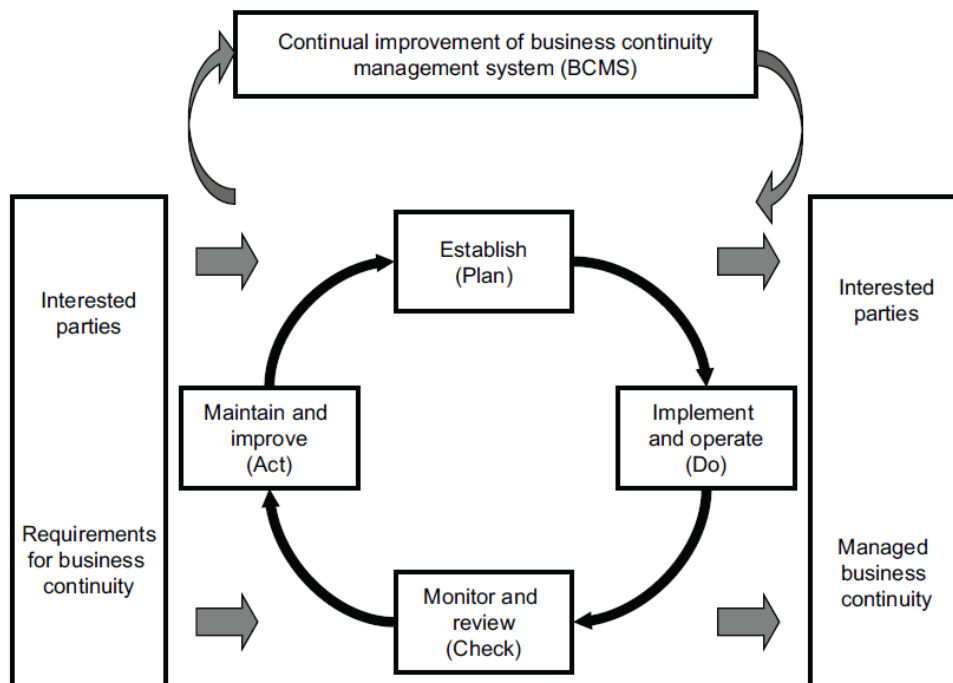


Figure 5 PDCA model applied to BCM system processes (ISO 22301:2012, vi)

The BCMS process in the above figure has interested parties as stakeholders and requirements for business continuity as an input, and after applying the process steps in the PDCA cycle it produces managed business continuity as an output, meeting the business continuity requirements. As the maintaining and improving step (Act) is performed, the BCMS is continually improved.

The ISO 22301 standard defines BCM activities through seven key clauses, which together cover the PDCA cycle: 1) context of the organization, 2) leadership, 3) planning, 4) support, 5) operation, 6) performance evaluation and 7) improvement. Table 6 explains each step of the cycle as they are explained in the standard's specification. As an addition to the original table also the key clauses related to each step are presented.

Table 6 Explanation of PDCA model and related key clauses in ISO 22301 (adapted from ISO 22301:2012, vi)

PDCA step	Explanation	Related key clauses
Plan (Establish)	Establish business continuity policy, objectives, targets, controls, processes and procedures relevant to improving business continuity in order to deliver results that align with the organization's overall policies and objectives.	1) Context of the organization 2) Leadership 3) Planning 4) Support
Do (Implement and operate)	Implement and operate the business continuity policy, controls, processes and procedures.	5) Operation
Check (Monitor and review)	Monitor and review performance against business continuity policy and objectives, report the results to management for review, and determine and authorize actions for remediation and improvement.	6) Performance Evaluation
Act (Maintain and improve)	Maintain and improve the BCMS by taking corrective action, based on the results of management review and reappraising the scope of the BCMS and business continuity policy and objectives.	7) Improvement

Although the steps in the PDCA model are briefly explained on a general level in the table above, the related key clauses deserve a further explanation as they form the core of the BCMS in the ISO 22301 standard. In the following chapters each of the seven key clauses are explained to give a comprehensive understanding of the standard.

### 3.3.1 *Context of the organization*

The first key clause "context of the organization" sets the scope for the BCM activities. It emphasizes the strategic alignment between the business continuity objectives and organization's values, mission and objectives (St-Germain et al. 2012, 5).

As part of this planning activity, an organization should identify and document its activities, functions, services, products, partnerships, supply chains, relationships with

interested parties and the potential impacts related to disruptive incidents. Furthermore, connections between the business continuity policy and other policies such as overall risk management strategy should be identified as well as the organization's risk appetite (ISO 22301:2012, 9).

In order to define the scope for the BCM, the organization has to identify the interested parties and their needs and expectations regarding the BCMS (ISO 22301:2012, 9). Although the interested parties might explicitly state their requirements, it is worth noting the requirements might also be of legal or regulatory nature, as mentioned in chapter 3.2.

If some part of the organization is excluded from the BCM scope, it has to be made sure such exclusion does not affect the organization's ability to provide continuity of business operations as defined in the BCMS requirements (ISO 22301:2012, 10).

### **3.3.2 Leadership**

The second key clause "leadership" emphasizes the need for top management and other relevant management roles to show an ongoing commitment to the BCMS (St-Germain et al. 2012, 5). This part of the clause should not affect not only the planning, but every step in the PDCA cycle.

Establishing a business continuity policy in the organization belongs also to this clause. The policy should provide a framework for setting the business continuity objectives and it should align with the purpose of the organization. On the one hand it should include a commitment to satisfy the applicable business continuity requirements and on the other hand it should also include a commitment to continually improve the BCMS (ISO 22301:2012, 11).

The policy should be documented and communicated to the organization. Furthermore, it should be made available to the interested parties as appropriate and reviewed regularly or at least when such changes occur which could affect the validity of the policy (ISO 22301:2012, 11).

In addition to the management commitment and business continuity policy, the leadership encompasses assigning the responsibilities and authorities for relevant roles in the organization. The responsibilities and authorities should cover not only the implementation of the BCMS, but also reporting on the performance of the BCMS to the top management (ISO 22301:2012, 11).

### 3.3.3 *Planning*

As the name suggests, the third key clause “planning” forms an essential part of the planning step in the PDCA cycle. With the scope defined in the first key clause in mind, the organization should determine the risks and opportunities that need to be addressed to ensure the BCMS can achieve its intended outcome. Then it should plan the actions required to address these risks and opportunities as well as how these actions can be integrated and implemented to its BCMS. Finally a plan is made on how to evaluate the effectiveness of these actions (ISO 22301:2012, 12).

Defining the business continuity objectives is an essential part of this key clause. The BCMS objectives express the intent of the organization to treat the risks identified and to comply with requirements of organizational needs (St-Germain et al. 2012, 5). The objectives should be consistent with the business continuity policy and take account of the minimum level of products and services acceptable to the organization to achieve its objectives. In order to achieve the business continuity objectives, the organization should determine who is responsible, what will be done, what resources are required, deadlines and measures for evaluating the results (ISO 22301:2012, 12).

### 3.3.4 *Support*

The fourth key clause “support” forms the last part of the planning step in the PDCA cycle. Support consists of resources, competence, awareness, communication and documented information. Managing the BCMS requires appropriate resources for each task. Competent staff is required to accomplish these tasks and in this context support means acquiring the required competency either by training, mentoring, reassigning or hiring employees (ISO 22301:2012, 13).

Awareness is another key part of the support clause. Staff should be aware of the business continuity policy and their role during a possible disruptive event. Furthermore, the implications of not conforming to the BCMS requirements should be clear for everyone (ISO 22301:2012, 13).

Communication is linked to raising awareness in the organization, but also the external communication should be considered – referring to customers, partners, local community and media. The organization should determine what, when and with whom to communicate. Depending on the organization, adapting and integrating to a national or regional threat advisory system might be necessary and also considered part of the communication. Furthermore, a procedure should be established for operating and testing the communication capabilities to be used during disruption of normal communications (ISO 22301:2012, 13).

The last part of the support clause, documented information, defines the guidelines for creating, updating and controlling documented information related to the BCMS. Generally the extent of documented information varies in organizations due to differences in size, type of activities, processes and competence of staff. Therefore, instead of listing required documents, the clause lists recommended practices related to managing the documents. These include for example version control and adequate protection against improper use, loss of confidentiality or loss of integrity (ISO 22301:2012, 14).

### **3.3.5 Operation**

The fifth key clause “operation” forms the Do-step in the PDCA cycle. It consists of business impact analysis (BIA) and risk assessment, business continuity strategy, business continuity procedures, exercises and testing.

Various methodologies exist for performing a BIA, but generally it should identify the activities supporting the provision of products and services and assess the impacts over time for not performing these activities. Based on this information, prioritized timeframes for resuming these activities at a specified minimum acceptable level should be set, taking into consideration the time within which the impacts of not resuming them would become unacceptable. Also the dependencies and supporting resources for these activities should be identified, including suppliers and outsourcing partners (ISO 22301:2012, 15).

During the risk assessment the organization identifies and systematically analyzes risks of disruption to its prioritized processes, systems, information, people, assets, outsourcing partners and other supporting resources. It is then evaluated which of these risks require mitigation and what kind of mitigation actions are suitable while keeping the business continuity objectives and the organization’s risk appetite in mind (ISO 22301:2012, 16). The order in which the BIA and risk assessment is made depends on the chosen methodologies for these actions (ISO 22301:2012, 15).

The BIA and risk assessment produce the requirements for developing the business continuity strategy. The strategy should include how to protect the prioritized activities during normal operation, how to mitigate, respond and manage impacts during a disruptive event and how to stabilize, recover and resume the activities after a disruptive event. The strategy should also include an approval of the prioritized time frames for the resumption of activities as well as means to evaluate the business continuity capabilities of suppliers (ISO 22301:2012, 16).

The business continuity procedures aim at managing disruptive incidents and continuing the prioritized activities based on recovery objectives identified in the BIA. The business continuity procedures should include incident response structure, warning and

communication procedures, business continuity plans and recovery procedures. The procedures should establish an appropriate internal and external communications protocol and specifically determine the immediate steps following a disruption. Furthermore, the procedures should be flexible to respond to unanticipated threats and changing internal and external conditions (ISO 22301:2012, 17–18).

The last component of operation, exercising and testing, aims at ensuring the business continuity procedures are consistent with the organization's business continuity scope and objectives by regularly testing them (St-Germain et al. 2012, 6). The exercises should produce formalized post-exercise reports containing the outcomes, recommendations and actions to implement improvements (ISO 22301:2012, 19).

### **3.3.6 *Performance evaluation***

The sixth key clause “performance evaluation” reflects the Check-step in the PDCA cycle. It recommends the organization to monitor, measure, analyze and evaluate the effectiveness and performance of the BCMS and to conduct regular internal audits and report the results in management reviews.

An organization should evaluate its business continuity procedures and capabilities to ensure they are adequate, suitable and effective. Not only should the evaluation aim at assessing conformance with its own business continuity policy and objectives, but also with applicable legal and regulatory requirements and industry best practices. The evaluations should take place at planned intervals or when changes occur, which could require adjusting the procedures (ISO 22301:2012, 20).

Internal audits should be used to assess whether the BCMS conforms to the organization's BCMS requirements and whether it is effectively implemented and maintained. The trends revealed in the internal audits are reviewed by the top management in management reviews, which aim at ensuring the BCMS's continuing suitability, adequacy and effectiveness. Furthermore, the management reviews should monitor for changes in external and internal issues that are relevant to the BCMS and consider possible need for changes in the BCMS, including the policy and objectives (ISO 22301:2012, 21).

### **3.3.7 *Improvement***

The seventh and final clause “improvement” covers the Act-step in the PDCA cycle. It emphasizes continual improvement, encompassing all actions taken throughout the organization to increase the effectiveness (reaching the business continuity objectives) and the efficiency (achieving an optimal cost to benefit ratio) of the BCMS processes (St-

Germain et al. 2012, 6). It encourages the organization to continually improve the suitability, adequacy and effectiveness of the BCMS (ISO 22301:2012, 23).

The clause defines corrective actions to be taken when nonconformity occurs. It encourages the organization to review the nonconformity, determine its causes and if similar nonconformities exist and to evaluate the need for corrective actions. Furthermore, an assessment should be made whether the nonconformity requires making changes to the BCMS (ISO 22301:2012, 22–23).

## 4 EXISTING BCM MATURITY MODELS

### 4.1 Model selection

As maturity models are developed by academic researchers as well as practitioners and consultants in the industry, the resulting models are often proprietary or difficult to access (Maier et al. 2012, 139). This proved to be true also in the application domain of BCM, as during the search for literature the maturity models referred to in papers often proved to be no longer publically available, as was the case with Gartner BCP Maturity Model (Smit 2005, 24; Randeree et al. 2012, 477), or parts of the maturity model were not made public as they are considered property of the organization funding the research (Smit 2005, 4–5; Strong 2010, 364).

During the search process, seven frameworks in total were identified for assessing the maturity of BCM in an organization. These models and their authors, as well as the type of the framework and its availability are presented in Table 7, sorted by their availability.

Table 7 BCM maturity assessment frameworks, their type and availability

Model and author	Type	Availability
BCM Self-Assessment questionnaire (Gallagher, 2003)	Self-assessment questionnaire	Public
BCM Maturity Model (Randeree et al., 2012)	Maturity Model	Public
BCMS Capability Model (Sheth et al., 2007)	Maturity Model	Public
The Business Continuity Maturity Model® (BCMM) (Virtual Corporation, 2005)	Maturity Model	Public
BCM Maturity Model (Smit, 2005)	Maturity Model	Model itself is public, but the quick scan method to determine the maturity stage and a generic growth strategy to determine the maturation path are not
BCM programme metrics (Strong, 2010)	Self-assessment questionnaire, scorecard	Self-assessment questionnaire not public
BCP Maturity Model (Gartner)	Maturity Model	Not Public

Initially the intention was to exclude BCM maturity models which were not published in the accepted sources defined in chapter 2.1. This seemed justified as several consultancy organizations seemed to have their own BCM maturity models, which were often not made public or the only information available regarding the model was an

assessment spreadsheet with no background information on how the model was developed. After reviewing the available literature, a decision was made to include also those BCM related maturity models otherwise falling outside the scope which were used as a part of developing the maturity models found in the accepted literature. This led to including the Virtual Corporation's BCMM and Gartner's BCP Maturity Model in the evaluation, as they were mentioned by Smit (2005, 24) and Randeree et al. (2012, 477).

Further exclusion occurred as it turned out the Gartner's BCP Maturity Model was no longer publically available. As no information was available, the model was excluded from the evaluation. Furthermore, a closer analysis of Strong's BCM program metrics revealed the self-assessment questionnaire was not made public either (Strong 2010, 364). As the scorecard in Strong's model contained only a scoring for each main dimension of BCM, the self-assessment questionnaire would have contained the essential questions determining how the model would have conformed to the ISO 22301 standard. Therefore, as the model was only partly public and essential components were not available, a decision was made to exclude the model from the evaluation.

At this point, there were five models left to evaluate. Further analysis of the models revealed Gallagher's BCM self-assessment questionnaire was not exactly a maturity model, as the components of the questionnaire did not form a pre-determined evolution path. Although the model is not considered an actual maturity model and not included in the evaluation, it seems to be the first framework found in the literature for assessing the state of BCM in an organization before proper BCM maturity models emerged and it is therefore briefly introduced.

Gallagher's BCM self-assessment questionnaire consisted of 20 questions, each of which required an answer on a Likert-type scale from 0 to 5. Giving 0 as an answer indicated the topic had not been addressed at all and 5 indicated the respondent was satisfied with the current situation. Based on the total score of summing up the answers an assessment was made whether an effective BCM program was in place or if there was room for improvement. Gallagher noted that constructing a checklist which would apply equally to all types of organizations was challenging (Gallagher 2003, 15). The questionnaire was later on adopted by several consultancy organizations and large businesses world-wide to aid the boards in getting a precise and quick view of the organizations' BCM status (Gallagher 2007, 35–36).

Although undoubtedly useful at the time for assessing an organization's current status, the Gallagher's self-assessment questionnaire was not focusing solely on BCM topics, as it was mixing information security solutions such as anti-virus software with BCM topics. As all questions were equally scored, this could be argued to have affected the assessment results – was the score indicating more of the status of the organization's BCMS or information security management? Also the descriptions for interpreting the

results were seemingly vague and did not provide much aid in improving an organization's BCMS.

Eventually four proper BCM maturity models with enough available information were included in the evaluation; The Business Continuity Maturity Model® by Virtual Corporation (2005), BCM maturity model by Smit (2005), the BCMS capability model by Sheth, McHugh and Jones (2007) and the BCM maturity model by Randeree et al. (2012).

## 4.2 Evaluation methodology

According to the procedure model for developing maturity models as suggested by Becker et al. (2009, 218), after defining the problem the next phase in the maturity model development process is to compare existing maturity models. The evaluation of existing BCM maturity model is done in three phases; 1) the design processes of each maturity model are evaluated against the eight requirements for maturity model development as suggested by Becker et al. (2009, 214–216), 2) the form and function of each model is described and evaluated and 3) each maturity model's coverage of the BCM application domain is evaluated by assessing their conformity to the ISO 22301 standard.

The eight requirements for maturity model development suggested by Becker et al. (2009) were presented in chapter 2.6. There are four main reasons for choosing this approach to be used as the framework for evaluating the existing BCM maturity models and guiding in the following maturity model development process. Firstly, it was explicitly stated that their approach is aimed at facilitating maturity model development in the context of IT management (Becker et al. 2009, 213). As modern BCM is closely related to IT management, it makes sense to choose this approach. Secondly, the model is suitable not only for the maturity model development process, but also for comparing the existing maturity models (Becker et al. 2009, 216). Thirdly, as presented via the comparison in chapter 2.6, it is comprehensive in the sense that on one hand it is not lacking any steps presented in the other approaches, and on the other hand the other approaches do not offer a more comprehensive solution. Furthermore, the model is clearly presented as a process (Becker et al. 2009, 218) and has already been successfully used in guiding well-founded maturity model design and evaluation (Proença, Vieira, Antunes, da Silva, Borbinha, Becker & Kulovits 2013, 1474–1475).

Describing and evaluating the form and function of the existing models aims at giving an overview of the maturity levels, dimensions or process areas and how the models are used for assessing BCM maturity. The focus here is on the highest level of abstrac-

tion in the models, while the lower levels of abstraction are considered in the last phase of the comparison.

The existing models' BCM coverage is addressed in the third phase of the comparison by evaluating the maturity models' conformity to the ISO 22301 standard. This is done by assessing each model's coverage of the seven key clauses of the standard. The key clauses and their content were explained in chapter 3.3 and the following sub-chapters.

### **4.3 Design processes**

An evaluation of the existing BCM maturity models against the first seven model development guidelines proposed by Becker et al. (2009) can be seen in Table 8. The requirements are presented on the left column, and each model's adherence to the requirement can be seen on the corresponding row. The contents of the model development requirements were explained in more detail in chapter 2.6.

Table 8 Evaluation of existing BCM maturity models on the basis of model design process

Requirement	BCMM (Virtual Corporation, 2005)	Maturity Model for BCM (Smit, 2005)	BCMS Capability Model (Sheth et al., 2007)	Maturity Model for BCM (Randeree et al. 2012)
Comparison with existing maturity models (R1)	No specific existing models were mentioned, although authors claim a variety of maturity model structures were studied	BCMM by Virtual Corporation BCP Maturity Model by Gartner	Adoption of concepts from CMM	Adoption of concepts from CMM, CMMI, Business Process Orientation (BPO) Maturity Model, BC model for banks in India (Mohan and Rai, 2006), Maturity model for the implementation of software process improvement (Niazi, Wilson and Zowghi 2005), GPIS model (Saleh and Alshawi, 2005) and Smit's BCM maturity model (2005)
Iterative Procedure (R2)	A draft model was based on literature search on existing maturity models, interactive questionnaire at a conference was used to identify BCM components to include in the model, a cross-industry team was formed to develop the final model	Development of a draft model with literature research and focus group discussions, market scan using multiple case studies followed by focus group discussions to form the final model, validating the model using expert interviews	The model has been evolved as it has been implemented in practice and model users are encouraged to give feedback to the authors to support future iterations	First a conceptual model was made based on the five existing models identified in the literature search, then focus group discussions were used to validate the model
Evaluation (R3)	The model was made publically available and benchmarking was provided via a dedicated BCMM Service Center,	Validation of draft and final model in focus group discussions, a consulting company adopted the model after the research for practical validation	The model has been implemented in practice in several projects	The model was validated by focus group discussions with BCM experts in the UAE banking sector
Multi-methodological Procedure (R4)	Literature research Interactive questionnaire	Literature research Focus group discussion Multiple (30) case studies with interviews	No research methods were explicitly stated, the suggested model draws on the experiences of the authors in developing and implementing BC and DR projects	Literature research Focus group discussions
Identification of Problem Relevance (R5)	No meaningful tools available to objectively and consistently measure the organization's disaster-readiness and state-of-preparedness	An observation was made that several organizations had decided or were planning to develop a tool for assessing and improving their current state of BCM, a clear need was identified from practice	Lack of established BCMS governance dashboards was observed	According to previous research, organizations in UAE lack organization-wide BCMS and do not know how to improve the situation, BCM standards do not offer frameworks to assess their current BCM status
Problem Definition (R6)	Providing a diagnostic tool for objective evaluation of BC program effectiveness and suitable for benchmarking purposes. It should be able to assess current and intended BC program maturity and determine maturation path	Assessment of the current state of BCM and recommendation of actions to improve BCM within an organization	Development of a dashboard for assessing the current BCMS capability level and to aid in focusing on the activities required to achieve higher capability levels	Development of an easily communicable best practices based model to assess current BCM process maturity, give recommendations to improve maturity with action-oriented goals and to benchmark against other organizations and best practices
Targeted publication of results (R7)	71 page description of the model available to the public, 3 published online articles	Master's thesis	Academic publication	Academic publication

According to the first maturity model development requirement (R1) suggested by Becker et al. (2012, 214), existing maturity models should be reviewed to point out the need for a new model or an improvement to an existing model. The only model which contained a proper review of the existing BCM maturity models was Smit's model (2005, 24–26), while Sheth et al. (2007, 221) merely mentioned their BCMS capability model was inspired by CMM and that no existing models to fit the purpose were available. In the case of BCMM no existing reviewed maturity models were explicitly named, but the authors claimed a variety of maturity model structures were studied during the design process (Virtual Corporation 2005, 5). Interestingly Randeree et al. (2012, 478) had excluded Smit's BCM maturity model from the list of models they claimed to have used for developing their own model, but at the same time they had also obviously skipped the literature review on existing BCM maturity models by referencing to the same models and using the same conclusions as presented in Smit's literature review – which was originally performed seven years earlier (Randeree et al. 2012, 477; Smit 2005, 24–26). Not only does this affect the credibility of Randeree et al.'s research practices, but this seems also really odd for a peer-reviewed journal and puts the credibility of the journal's review practices into question.

The second requirement (R2) states the procedure must be iterative, referring to a step-by-step approach in the development process (Becker et al. 2009, 214). On this requirement the model by Sheth et al. (2007) makes an exception to others – no iterative procedures could be identified in designing the model. Although the authors encourage the model users to give feedback on the model for future iterations, there was no evidence of such iterations having occurred during the process of designing the model (Sheth et al. 2007, 222). The design processes of all of the other models had started by developing a draft model based on a literature review, which were then validated and further developed by focus group discussions or interviews (Virtual Corporation 2005, 5; Smit 2005, 3–4; Randeree et al. 2012, 477–478).

According to the third requirement (R3), the model should be evaluated in terms of usefulness, quality, effectiveness, as well as in terms of the principles and procedures chosen for the model development (Becker et al. 2009, 214). On this requirement the models were divided in two categories; the models by Smit (2005, 64–65) and Randeree et al. (2012, 480) used focus group discussions to validate their models, while BCMM (Virtual Organization 2005, 17) and BCMS capability model (Sheth et al. 2007, 222) were applied in practice and revised based on the feedback.

The fourth requirement of multi-methodological procedure (R4) was met by all other models except the BCMS capability model. It had no research methods explicitly stated besides a notion of the model drawing on the experiences of the authors in developing and implementing business continuity and disaster recovery projects (Sheth et al. 2012, 222). Literature review was conducted in designing all of the other models, accompa-

nied by focus group discussions (Smit 2005; Randeree et al. 2012), interviews (Smit 2005) or interactive questionnaires (Virtual Corporation 2005).

The fifth and sixth requirements (R5 and R6) cover the identification of problem relevance and defining the problem (Becker et al. 2004, 214). Similar reasoning was made during each model's design process in identifying the problem relevance, as the problem was felt relevant due to lack of meaningful maturity assessment frameworks, shortcomings of the related standards in terms of assessing the current BCM status in the organization and general interest towards such tools and their development in organizations (Virtual Corporation 2005, 5; Smit 2005, 2; Sheth et al. 2007, 222; Randeree et al. 2012, 473–474). The models were also very similar in defining the problem, as all of them were aiming to provide a tool for assessing the current state of BCM in an organization and for benchmarking the results against other organizations and best practices as well as for guiding in improving the BCM process maturity (Virtual Corporation 2005, 5; Smit 2005, 2–3; Sheth et al. 2007, 222; Randeree et al. 2012, 480–482).

The seventh requirement addresses targeted publication of the results (R7) (Becker et al. 2009, 214). The BCMM had most coverage, as in addition to the 71 page description of the model there were three additional online publications published by Virtual Corporation in relation to the model (Virtual Corporation 2005, 71). The models by Sheth et al. (2007) and Randeree et al. (2012) were both published in a peer-reviewed journal, while Smit's model (2005) could be argued to have the least coverage as it was only published as a master's thesis in the Erasmus University of Rotterdam, Netherlands.

The eighth requirement of scientific documentation was added by Becker et al. (2009, 124) to address the problem with Hevner et al.'s (2004, 90) corresponding communication related research guideline; it was only addressing communication to technology- and management-oriented audiences with no references to the academic audience. The requirement consists of the following criteria; 1) comparison with existing maturity models, 2) documentation indicates steps of design and evaluation processes and 3) detailed documentation of the design process. Each model was evaluated against these criteria and the results can be seen in Table 9.

Table 9 Evaluation of existing BCM maturity models on the basis of scientific documentation

Criteria for scientific documentation	BCMM (Virtual Corporation 2005)	Maturity Model for BCM (Smit 2005)	BCMS Capability Model (Sheth et al. 2007)	Maturity Model for BCM (Randeree et al. 2012)
<i>Comparison with existing maturity models : in describing the design process reference is made to existing maturity models (R8-1)</i>	/	+	/	+
<i>Documentation indicates steps of design and evaluation processes : the documentation states that different stages of the design process were discussed (R8-2)</i>	+	+	-	+
<i>Detailed documentation of the design process : the individual phases of the model design are presented clearly and in detail (R8-3)</i>	/	+	-	+

[+] requirement is met; [/] requirement is partially met; [-] requirement is not met

The first criterion (R8-1) requires comparison with existing maturity models. The only model which did not include a recognizable comparison was the BCMM. Although the BCMM's authors claimed to have studied various maturity model structures (Virtual Corporation 2005, 5), no documentation of such comparison was made available. With BCMS capability model the comparison was also relatively vague, as it only compared the form factors of the developed model to CMM and pointed out the differences (Sheth et al. 2007, 222–223). The BCM maturity models by Smit (2005, 24–26) and Randeree et al. (2012, 477) had proper comparisons with existing maturity models, although as discussed earlier, the comparison made by Randeree et al. can be argued to be in fact a summary of the earlier work by Smit (2005).

The second criterion (R8-2) is a requirement for the documentation to indicate steps of design and evaluation processes. All models except the BCMS capability model met this requirement. There was no discussion of the model design and evaluation steps in the article by Sheth et al. (2007), which might suggest the model has emerged from the consulting practice of Satyam Computer Services Limited, a consultancy company represented by Sheth.

The third and final criterion (R8-3) requires detailed documentation of the design process where the individual phases of the model design process are presented clearly and in detail. Only the BCM maturity models by Smit (2005) and Randeree et al. (2012) had clear documentation of the process with enough detail to get a good understanding on how the authors had come up with the model. The BCMS capability model had absolutely no documentation regarding the design procedures, while in BCMM the design process was described on such a level of abstraction that it was unclear how the initial draft model was developed and how the model had evolved into version 1.3 (Virtual Corporation 2005, 4–11).

To summarize the design process evaluation, two models stood out as how comprehensively they had met the model design requirements as suggested by Becker et al. (2009); the BCM maturity models by Smit (2005) and Randeree et al. (2012). The difference to the other two models, the BCMS capability model and the BCMM, was most visible when evaluating whether the requirement of scientific documentation was fulfilled.

## 4.4 The form, function and BCM coverage

An overview of the form and function of the evaluated BCM maturity models is given in the following sub-chapters. The form is analyzed by examining the maturity levels and model dimensions, while the function is addressed by describing how the maturity is assessed. Following an evaluation of the form and function of each model, the BCM coverage of the models is assessed by evaluating their conformity to the ISO 22301 standard.

The evaluation results will indicate whether the existing models conform to the standard, thus answering the second research question (RQ2). In addition, the resulting evaluation together with the results from the previous chapter lays the foundation for actions to be taken to answer the first research question (RQ1) of how the existing BCM maturity models could be improved.

### 4.4.1 *The Business Continuity Maturity Model® (BCMM) by Virtual Corporation (2005)*

The BCMM assesses the organization's BCM maturity on a scale of six maturity levels, of which the first three represent organizations that have not yet met the required BCM program basics to launch a sustainable BCM program, while the latter three represent the evolutionary path to BCM program maturity (Virtual Corporation 2005, 7). The maturity levels are assessed over eight dimensions called "corporate competencies", each of which aims at categorizing a critical attribute of an organization's ability to create a sustainable business continuity program (Virtual Corporation 2005, 9).

An overview of the model is shown in Figure 6, where the corporate competencies are viewed on the left column and maturity levels are presented on other columns, increasing in maturity while moving towards the right end of the figure. On each level the degree of engagement in each corporate competency is summarized by the letters H (high), M (medium), L (low) or VL (very low).

The BCMM<sup>®</sup>  
Standard Reference Chart

Increasing Business Continuity Competency Maturity

Maturity Model Levels	Level 1 Self-Governed	Level 2 Supported Self-Governed	Level 3 Centrally Governed	Level 4 Enterprise Awakening	Level 5 Planned Growth	Level 6 Synergistic
Athlete Analogy	Able to Crawl	Able to Walk	Able to Run	"Fit" Runner	Competitive Runner	Olympic Runner
Comparative Model	Organization "At Risk"		"Competent" Performer		"Best of Breed"	
Corporate Competencies	General Attributes of an Organization at Each Maturity Level					
Leadership	VL	L	M	H	H	H
Employee Awareness	VL	L	L	M	H	H
BC Program Structure	VL	L	L	M	H	H
Program Pervasiveness	VL	L	L	L	M	H
Metrics	VL	L	M	M	H	H
Resource Commitment	VL	L	M	H	H	H
External Coordination	VL	L	L	M	H	H
BC Program Content	VL	L	M	H	H	H

Figure 6 The Business Continuity Maturity Model® (Virtual Corporation 2005, 11)

Each maturity level has a description of general attributes of an organization at that level. In addition to the general description, a broader characterization of the overall state-of-preparedness of an organization at each level is provided. The statement provided on the "comparative model" row is supposed to give a quick assessment of how the organization compares against other organizations (Virtual Corporation 2005, 11).

Criteria categories, criteria descriptors and performance requirements are defined for each of the corporate competencies at each maturity level (Virtual Corporation 2005, 14). The criteria categories define the specific characteristics inherent to each competency, while the descriptors detail the attributes defining how the criteria category matures from level to level. The performance requirements describe the specific accomplishments required to comply with the maturity level in question (Virtual Corporation 2005, 15).

As going into the details by further explaining the criteria categories, descriptors and performance requirements for each maturity level or even at a general level would require several pages to document, it is left for the reader to study the source materials in case a deeper understanding of this model is desired. While evaluating the BCM coverage of this model these details are analyzed by the author but only the results of this analysis will be discussed in this thesis.

The eighth corporate competency "BC program content" differs from the other seven as it is divided into four central disciplines of business continuity, addressing organization's competency in each of them. These four disciplines are incident management, security management, technology recovery and business recovery (Virtual Corporation 2005, 10).

Assessing the maturity using BCMM is executed in four stages. In the first stage of the assessment an estimate is made for each criteria category in each corporate competency on how comprehensively they meet the requirements for the first maturity level.

The estimated score is given in percentage, where 0 % represents the requirements are not met at all and 100 % represents full compliance. In the second stage an average score is calculated for each corporate competency based on the scores from the corresponding criteria categories, resulting in a percentage interpreted similarly as on the first stage. In the third stage the previous steps are repeated for each maturity level, resulting in an estimate of how well the organization complies with the requirements associated with each maturity level on each corporate competency. In the fourth and final stage the scores from every maturity level are added together and divided by 100 for each corporate competency, revealing the maturity level of each corporate competency (Virtual Corporation 2005, 66–70). Interestingly the assessment relies on ‘educated guesses’ when trying to determine the percentage for how much of each requirement is met (Virtual Corporation 2005, 66), which might be at least partly due to the vague requirement descriptors for some of the criteria categories.

Although the maturity assessment process in BCMM is a bit complex, the model conforms very well to the ISO 22301 standard, suggesting good BCM coverage. Conformity to each of the seven key clauses can be seen in Table 10, where the first column lists the key clauses, the second column lists the essential tasks for each clause and the third column describes the conformity as well as how it was embedded to the model.

Table 10 Conformity of BCMM (Virtual Corporation 2005) to ISO 22301

ISO 22301 Key Clauses	Essential tasks in each key clause:	Conformity of the model:
1 <b>Context of the organization</b>	Determining the scope	<i>Conformity</i> ; BCM scope is addressed in the description of each maturity level, corporate competency "program pervasiveness" addresses BC coordination over departments
2 <b>Leadership</b>	Leadership and commitment Management commitment Policy Organizational roles, responsibilities and authorities	<i>Conformity</i> ; All requirements addressed in corporate competencies "leadership" and "BC program structure"
3 <b>Planning</b>	BC objectives and plans to achieve them	<i>Conformity</i> ; planning aspect addressed in corporate competency "BC program content", BC objectives fall outside the model but are considered to be derived from the assessment results
4 <b>Support</b>	Resources Competence Awareness Communication Documented information	<i>Conformity</i> ; all requirements are addressed in the corporate competency "resource commitment"
5 <b>Operation</b>	BIA and risk assessment Establish and implement BC procedures BC strategy Exercising and testing	<i>Conformity</i> ; all requirements are addressed in corporate competencies "BC program structure", "BC program content" and the criteria "BC program justification" under corporate competency "leadership"
6 <b>Performance evaluation</b>	Monitoring, measurement, analysis and evaluation Internal audits Management reviews	<i>Partial conformity</i> ; evaluating the effectiveness and performance of the BCMS and conducting internal audits are included in the corporate competency "metrics", management reviews are not adequately addressed
7 <b>Improvement</b>	Continuous improvement	<i>Conformity</i> ; commitment to continuous improvement included in the description of the highest maturity level

The first key clause "context of the organization", where the scope for BCM activities is set, is addressed on each maturity level's description, where the general attributes of an organization at that level are explained. In addition, the corporate competency of "program pervasiveness" addresses the level of BC coordination between departments, functions and business units, closely related to the BCM scope (Virtual Corporation 2005, 10). The model therefore conforms to the first key clause.

The requirements for conforming to the second key clause "leadership" include addressing management commitment, establishment of a business continuity policy and assignment of the responsibilities and authorities for relevant business continuity roles in the organization. Management commitment is addressed in the corporate competency "leadership" (Virtual Corporation 2005, 55), while establishment of business continuity policy and the assignment of responsibilities and authorities for business continuity roles are both considered in the criteria categories for corporate competence "BC program structure" (Virtual Corporation 2005, 57). As all requirements are met, the model conforms to the second key clause.

The third key clause "planning" requires the model to include a planning aspect in which actions are planned to implement the BCMS within the defined scope and how to

evaluate the effectiveness of the implementation. The planning aspect of BCM is not directly addressed by considering it a criteria category in any of the corporate competencies, but it is however referred to in the description of key concepts of corporate competency “BC program content” (Virtual Corporation 2005, 26). Measuring and analyzing the effectiveness and performance of the BCM program is discussed in the corporate competency for “metrics” (Virtual Corporation 2005, 59), thus complying with the requirements. Furthermore, according to the key clause the business continuity objectives are defined during planning, expressing the intent of the organization to treat the risks identified and to comply with requirements of organizational needs. Defining the business continuity objectives is not included in the model, but organizations are encouraged to define these objectives based on the maturity model assessment results (Virtual Corporation 2005, 70). As all of the requirements are addressed at least on an acceptable level, the model can be argued to conform to the third key clause.

The requirements for the fourth key clause “support” include addressing appropriate resources and competence for the BCM and it emphasizes the need for documented information required for BCM as well as BCM awareness and communication. All of these requirements are met by the corporate competency of “resource commitment” (Virtual Corporation 2005, 10, 61), resulting in the model conforming to the fourth key clause.

To conform to the fifth key clause “operation”, the maturity model is required to include BIA and risk assessment, business continuity strategy, business continuity procedures, exercises and testing in the model. The BIA and risk assessment are addressed in the criteria category “BC program justification” for the corporate competency “leadership”, where they are considered to support the business case for BCM (Virtual Corporation 2005, 55). The BC strategy is incorporated into the corporate competency “BC program structure”, where strategy, culture and goals are considered one of the criteria categories. Furthermore, the requirement for determining and selecting the BC strategy based on the outputs from BIA and risk assessment (ISO 22301:2012, 16) is met as the BIA and risk assessment is aimed at supporting the business case for BCM, as described in the criteria category “BC program justification” for the corporate competency “leadership” (Virtual Corporation 2005, 55). Establishing and implementing the business continuity procedures to respond to a disruptive incident are addressed in the incident management discipline of corporate competency “BC program content” (Virtual Corporation 2005, 26) and exercising and testing are discussed in each of the four business continuity disciplines under corporate competency “BC program content”, increasing in scope as the organization matures (Virtual Corporation 2005, 39, 44). As all of the requirements are met, the model conforms also to the fifth key clause.

The requirements for conforming to the sixth key clause “performance evaluation” include addressing monitoring, measuring, analyzing and evaluation of the effectiveness

and performance of the BCMS and conducting regular internal audits and management reviews. The first and second requirements to address effectiveness and performance evaluation and to conduct internal audits are included in the corporate competency “metrics” (Virtual Corporation 2005, 59), thus meeting these requirements. The third requirement to include management reviews is however not addressed in the model, although on the highest maturity level executive participation is encouraged in the development of a new BCM policy (Virtual Corporation 2005, 57). The model therefore conforms only partially to the sixth key clause.

The seventh key clause “improvement” requires the model to include continuous improvement in order to improve the suitability, adequacy and effectiveness of the BCMS. These requirements are satisfied as the description of the highest maturity level in the model describes such organization as one committed to continuous improvement (Virtual Corporation 2005, 8). The model therefore conforms to the seventh key clause.

Overall the model conforms very well to the seven ISO 22301 key clauses, as it fully conforms to six of them and at least partially to the remaining one (performance evaluation). The result is somewhat surprising, considering it was one of the first available BCM maturity models and at the time it was published, the ISO 22301 standard did not exist – nor did its closely similar predecessor standard BS 25999.

#### **4.4.2 Maturity Model for BCM by Smit (2005)**

Smit’s BCM maturity model defines an organization’s BCM maturity on two dimensions; process quality and scope. The process quality assessed on a scale of six maturity levels refers to the comprehensiveness of the BCM program, as advancing on the maturity levels requires expanding the process content. This is a major difference to BCMM, in which key BCM process areas were assigned their own maturity dimensions.

In Smit’s model (2005, 49–50) the first three levels on the quality dimension represent BCM evolving from an initiative via a blueprint to an implemented project, while in the latter three it evolves into a controlled and optimized process. The scope dimension assessed on a scale of four maturity levels defines the extent to which BCM is exercised in the organization, ranging from single departments and facilities to an organization-wide BCMS (Smit 2005, 48–51).

Smit’s maturity model for BCM is presented in Figure 7. The scope dimension of BCM maturity is represented on the x-axis, while the y-axis represents the BCM process quality maturity.

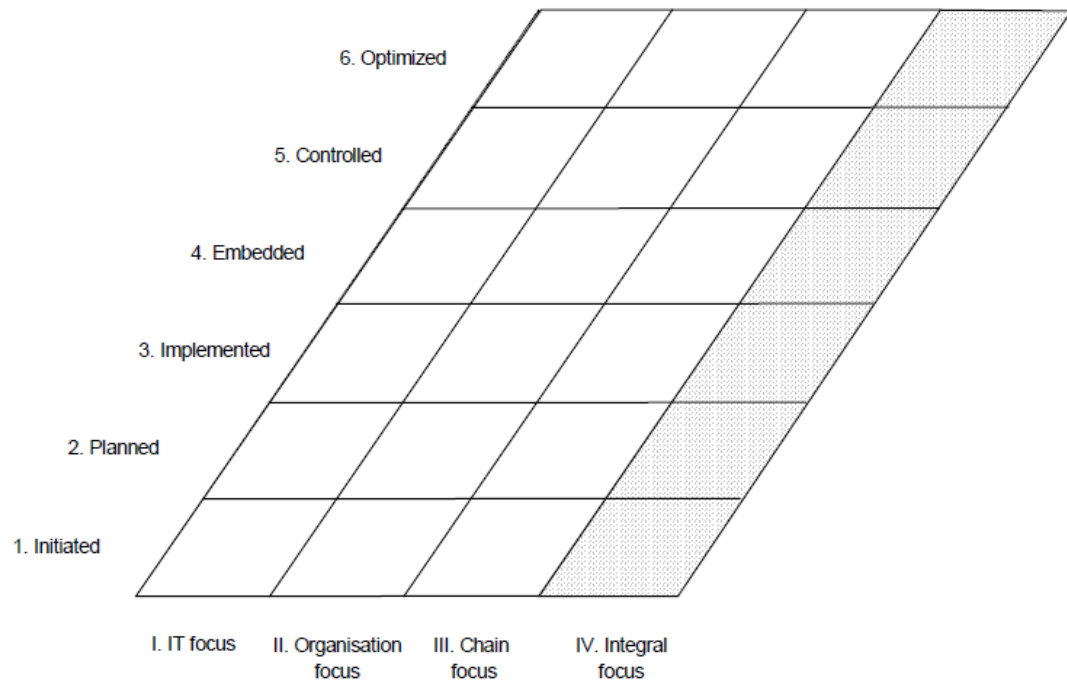


Figure 7 Maturity Model for BCM (Smit 2005, 51)

The combination of the two maturity dimensions forms a grid which is the basis of the model. Each square in the grid forms a scoped process quality stage (SPQS) with its unique features (Smit 2005, 51). As both axes have a cumulative scaling, the maturity of an organization is defined by the rectangle formed of the SPQS's when the maturity on both axes has been assessed (Smit 2005, 52).

In addition to the grid, each maturity level on the process quality dimension has two or three characteristics listed in the level's description. These characteristics for each process quality level can be seen in Figure 8. Furthermore, each of those characteristics is elaborated into several specific objectives, resulting in each SPQS, a combination of process quality and scope maturity, having a defined set of objectives (Smit 2005, 52).

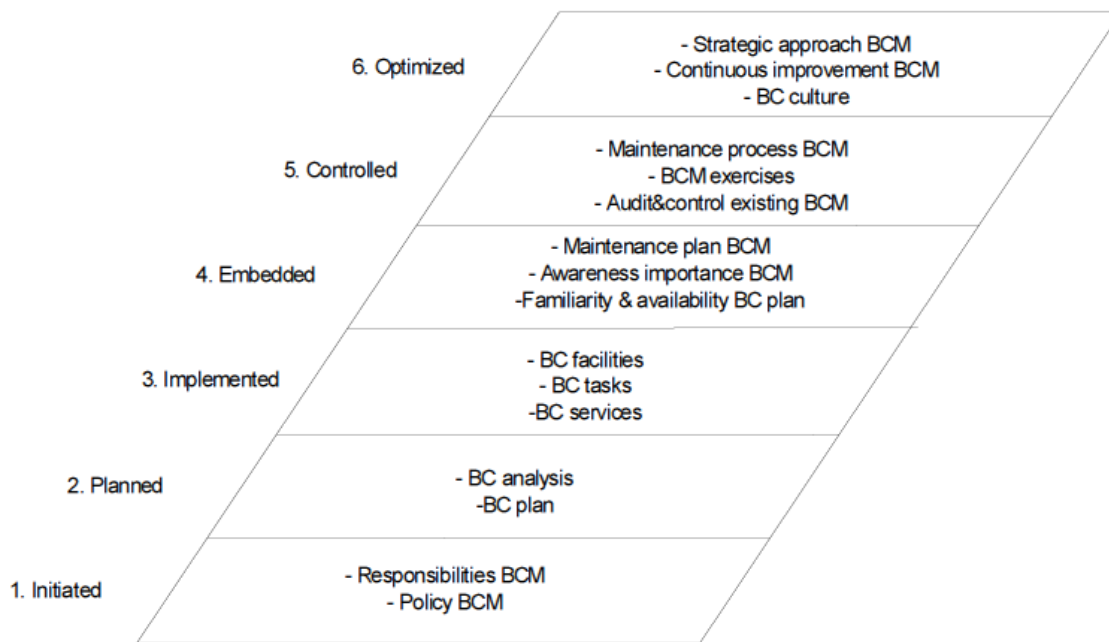


Figure 8 Process quality levels and their characteristics (Smit 2005, 49)

Smit (2005, 52) took the model even further by determining specific requirements for each SPQS to aid in checking whether an organization complies with a certain SPQS, but unfortunately this part of the research fell outside the scope of the thesis. The resulting requirements were considered exclusive property of Verdonck Kloster & Associates, the organization supporting the research (Smit 2005, 4). These specific requirements support extremely well prescriptive purposes of model use, as they provide clear action-based guidance for improving the organization's BCM maturity.

In contrast to BCMM which had a more complex maturity level assessment process but very good BCM coverage, Smit's model conforms fully to four of the ISO 22301 key clauses, while conforming partly to the remaining three. Interestingly the characteristics and deliverables for some of the maturity levels match almost precisely in content to the related key clauses. The conformity to the key clauses is described in Table 11, where the first column lists the key clauses, the second column lists the essential tasks for each clause and the third column describes the conformity as well as how it was embedded to the model.

Table 11 Conformity of Smit's (2005) BCM maturity model to ISO 22301

ISO 22301 Key Clauses		Essential tasks in each key clause:	Conformity of the model:
1	Context of the organization	Determining the scope	<i>Conformity</i> ; BCM scope forms the other maturity dimension in the model in addition to process quality
2	Leadership	Leadership and commitment Management commitment Policy Organizational roles, responsibilities and authorities	<i>Conformity</i> ; description of the first maturity level in the process quality dimension captures all components of this key clause
3	Planning	BC objectives and plans to achieve them	<i>Partial conformity</i> ; creating plans is included in the second maturity level of the process quality dimension, but defining BC objectives is not addressed
4	Support	Resources Competence Awareness Communication Documented information	<i>Partial conformity</i> ; resources, competence, documented information and BCM awareness are included in the third and fourth maturity levels in process quality dimension, only internal communication is addressed
5	Operation	BIA and risk assessment Establish and implement BC procedures BC strategy Exercising and testing	<i>Conformity</i> ; BIA, risk assessment and BC strategy are included in the second maturity level in process quality dimension, exercises and testing in the fifth maturity level, BC procedures must exist when entering the third maturity level
6	Performance evaluation	Monitoring, measurement, analysis and evaluation Internal audits Management reviews	<i>Partial conformity</i> ; evaluating the effectiveness and performance of the BCMS and conducting internal audits are included in the fifth maturity level in process quality dimension, management reviews are not addressed
7	Improvement	Continuous improvement	<i>Conformity</i> ; continuous improvement is included in the sixth maturity level in process quality dimension

The first key clause “context of the organization” sets the scope for the BCM activities. Conformity to this key clause was obvious in this model, as the author had made an observation the BCM in organizations matures in two ways – either by improving the process quality or by widening the scope of BCM activities (Smit 2005, 48). This observation was then integrated into the model by measuring the maturity on two dimensions, namely scope and process quality.

Although the scope is included within the model, the way in which it is incorporated to the model is confusing, resulting from dividing the scope to four levels; 1) facility focus, 2) organization focus, 3) chain focus and 4) integral focus. Facility focus refers to organizations where the BCM scope is limited to a single facility or department, such as the IT department. The second level is organization focus, where the BCM encompasses core business processes in the whole organization, excluding supply chain and outsourcing partners. The third level, chain focus, adds external partners to the BCM scope. The last level, integral focus, is causing confusion in the model. Smit (2005, 51) argues it is intended for organizations which apply BCM only to selected business units and that on this level an organization should align all BC processes in these separate units. It can be argued whether such a level is required, as it actually has the same scope as the previous

levels – only the level of perceived BCMS integration within the business units is higher.

Conforming to the second key clause “leadership” requires the model to include management commitment, establishment of a business continuity policy and assignment of the responsibilities and authorities for relevant business continuity roles in the organization. These requirements are perfectly met in the model, as the lowest maturity level in the process quality dimension reflects and consists of exactly these requirements (Smit 2005, 49).

The third key clause “planning” requires the model to include a planning aspect in which actions are planned to implement the BCMS within the defined scope and how to evaluate the effectiveness of the implementation. Furthermore, the business continuity objectives are defined during planning, which express the intent of the organization to treat the risks identified and to comply with requirements of organizational needs. Smit’s model conforms to the planning as reaching the second maturity level in the process quality dimension requires the organization to have developed all plans required to craft a blueprint of the organization’s BCMS (Smit 2005, 49, 106). However, the model does not mention defining the business continuity objectives at any point, thus conforming only partly to the third key clause.

The fourth key clause “support” requires the model to encompass resources, competence and documented information required for BCM as well as BCM awareness and communication. Smit’s model conforms to these requirements relatively well. Achieving the third maturity level in process quality dimension requires the organization to have established the necessary resources and assigned the BCM tasks to the right people. This can be seen conforming to the requirement to include the necessary resources. The fourth maturity level on the process quality dimension requires organizations to promote BCM awareness and to make the BCM maintenance plans available and known to the employees (Smit 2005, 49). As the communication referred to in the key clause refers not only to the internal communication but also to the external communication with customers and other stakeholders, the model has a slight non-conformity in not addressing this aspect of the communication.

The fifth key clause “operation” requires the model to include BIA and risk assessment, business continuity strategy, business continuity procedures, exercises and testing in the model. Smit’s model conforms to all of these requirements, as the BIA, risk assessment and business continuity strategy are included in the second maturity level of the process quality dimension while exercises and testing are included in the fifth maturity level of the process quality dimension (Smit 2005, 49–50). Although the business continuity procedures are not explicitly stated in the model, they have to exist on the third maturity level of the process quality dimension as on this level the procedures are implemented in practice (Smit 2005, 49).

The sixth key clause “performance evaluation” requires the model to include monitoring, measuring, analyzing and evaluation of the effectiveness and performance of the BCMS and to conduct regular internal audits and management reviews. All of these requirements with the exception of management reviews are met in the model as the fifth maturity level in process quality dimension addresses these topics (Smit 2005, 49–50).

The seventh key clause “improvement” requires the model to include continuous improvement in order to improve the suitability, adequacy and effectiveness of the BCMS. The model conforms to this requirement as the sixth maturity stage in the process quality dimension addresses continuous improvement of BCM (Smit 2005, 49–50).

#### **4.4.3 BCMS Capability Model by Sheth et al. (2007)**

The BCMS capability model (Sheth et al. 2007) is divided in eleven dimensions called capability areas, each of which is assessed a capability level representing the maturity on a scale of one to five (one being immature and five described as “resiliency excellence”). In addition, each capability area is categorized in three requirement silos (good to have, need to have, must have), indicating the importance of each capability area to the organization doing the assessment (Sheth et al. 2007, 227). It is left for the model user to determine the importance of each capability area to the organization.

A three-dimensional overview of the model can be seen in Figure 9. The 11 capability areas, or dimensions of BCMS, are viewed on the x-axis on the left side, the requirement silos are viewed on the y-axis on the right side and the capability levels representing maturity for each capability area are viewed on the z-axis. The figure represents an example snapshot of the maturity model applied to an IT organization providing services to its end users (Sheth et al. 2007, 227).

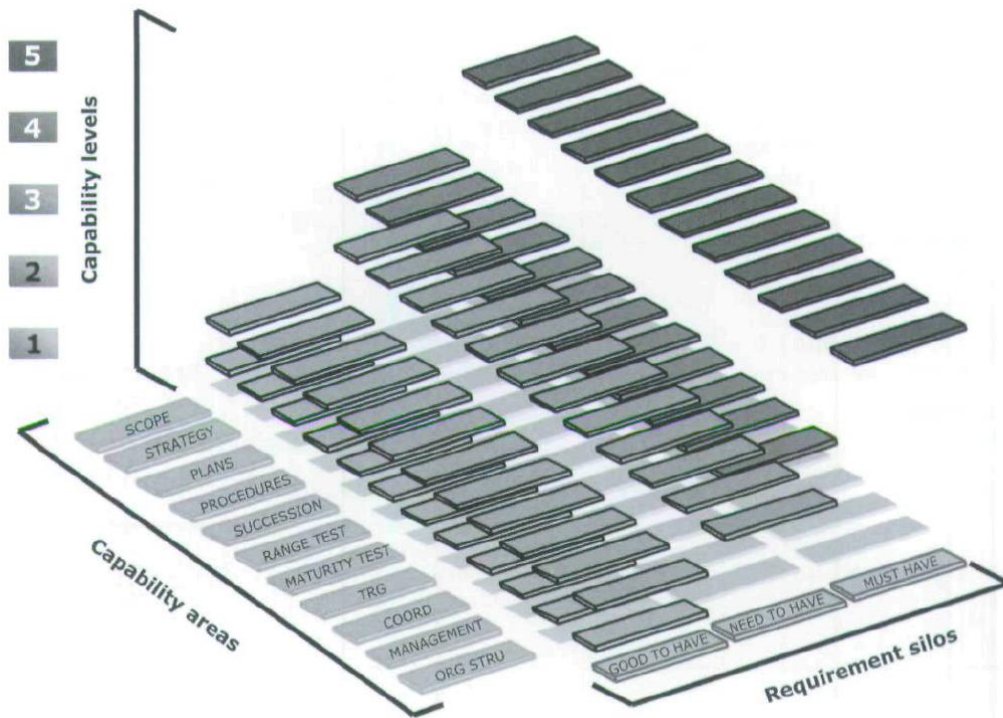


Figure 9 Overview of the BCMS Capability Model (Sheth et al. 2007, 228)

The effect of requirement silos on the final maturity level was not clearly stated in the model and the connection to the assessment results seemed a bit vague. Also the requirements for achieving a certain maturity level in some of the capability areas seemed improperly explained. For example rating the maturity of the plans according to the existence of some specific plans (Sheth et al. 2007, 231) without assessing the quality, comprehensiveness or timeliness of these plans seems inadequate. An example of assessing capability levels in the capability area “plans” can be seen in Figure 10.



Figure 10 Maturity levels for planning in BCMS Capability Model (Sheth et al. 2007, 231)

Each of the 11 capability areas are assigned a maturity level, resulting in 11 maturity level assessments. As many of the components in different capability areas are interrelated, a further mapping was made to the model to determine the linkages and determine which capability areas had to mature at the same pace. The resulting cross-capability correlations are shown in Figure 11.

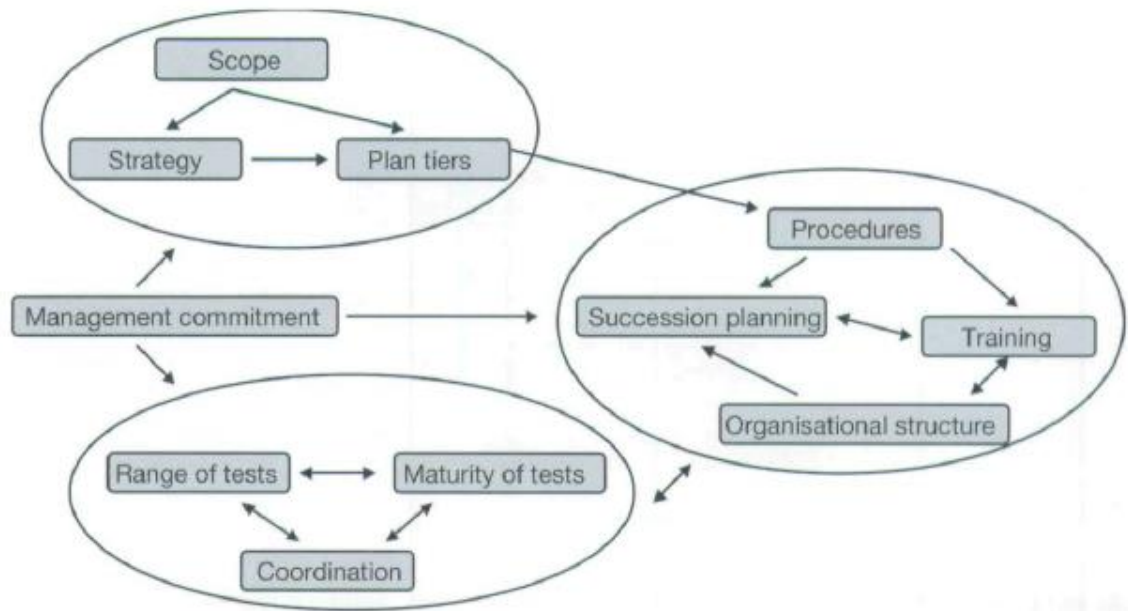


Figure 11 Cross-capability correlations (Sheth et al. 2007, 238)

The circles represent clusters in which each capability area must mature at the same pace. For example the maturity level of training could not advance before the next intended level of maturity is also achieved in organizational structure (Sheth et al. 2007, 238).

The model by Sheth et al. (2007) shares the same approach as BCMM in defining the essential BCM process areas, each of which is assessed a maturity level. However, in favor of the model by Sheth et al. (2007), the cross-capability correlations improve the model by extending its purpose from descriptive to prescriptive as they guide the model user in understanding the maturation path.

In terms of model content, the cross-capability correlations do not compensate for the lack of BCM coverage which becomes clear as the model is compared against the ISO 22301 key clauses. The model fully conforms only to the first clause by having a capability area for BCM scope, while there seems to be something missing from every other key clause. The conformity to ISO 22301 key clauses is described in Table 12, where the first column lists the key clauses, the second column lists the essential tasks for each clause and the third column describes the conformity as well as how it was embedded to the model.

Table 12 Conformity of BCMS capability model (Sheth et al. 2007) to ISO 22301

ISO 22301 Key Clauses	Essential tasks in each key clause:	Conformity of the model:
1 <b>Context of the organization</b>	Determining the scope	<i>Conformity</i> ; BCM scope is given its own capability area "scope"
2 <b>Leadership</b>	Leadership and commitment Management commitment Policy Organizational roles, responsibilities and authorities	<i>Partial conformity</i> ; management commitment included as a capability area, limited coverage of assigning responsibilities, establishin business continuity policy not part of the model
3 <b>Planning</b>	BC objectives and plans to achieve them	<i>Partial conformity</i> ; creating plans is included in the capability area "plans", but defining BC objectives is not addressed
4 <b>Support</b>	Resources Competence Awareness Communication Documented information	<i>Partial conformity</i> ; resources, competence and BCM awareness addressed in capability areas for "strategy", "training and awareness" and "succession planning", external communication addressed in "coordination with vendors and external agencies", internal communication is not addressed
5 <b>Operation</b>	BIA and risk assessment Establish and implement BC procedures BC strategy Exercising and testing	<i>Partial conformity</i> ; BIA and BC strategy addressed in capability area for "strategy", BC procedures in "procedures", exercises and testing in "range of testing", risk assessment not addressed
6 <b>Performance evaluation</b>	Monitoring, measurement, analysis and evaluation Internal audits Management reviews	<i>Partial conformity</i> ; Evaluating effectiveness and performance of BCMS included as the intended result of activities in "range of testing", management reviews included in "management commitment", internal audits not included in the model
7 <b>Improvement</b>	Continuous improvement	<i>Partial conformity</i> ; indirectly addressed in capability area for "training and awareness"

The key requirement related to the first key clause, setting the scope for BCM activities, is included in the model as “scope” capability area. Therefore the model conforms to the first key clause of ISO 22301.

The requirements for conforming to the second key clause “leadership” include management commitment, establishment of a business continuity policy and assignment of the responsibilities and authorities for relevant business continuity roles in the organization. Management commitment was specified as a capability area, fulfilling the corresponding requirement (Sheth et al. 2007, 235–236). Assigning the responsibilities and authorities is not explicitly stated in the model, but the description of organizational structure might suggest meeting this requirement (Sheth et al. 2007, 237). In addition, establishing business continuity policy is not included in the model, resulting in only a partial conformity to the second key clause.

A key requirement for the third key clause is for the model to include plans for implementing the BCMS and for evaluating the effectiveness of the implementation within the defined scope, and this requirement is met in the capability area for “plans” (Sheth et al. 2007, 230). Defining the business continuity objectives is however not included in the model, making the model only partially conform to this key clause.

The fourth key clause “support” requires the model to encompass resources, competence and documented information required for BCM as well as BCM awareness and communication. The requirements regarding resources, competence and BCM awareness are comprehensively addressed in the capability areas for “strategy”, “training and awareness” and “succession planning” (Sheth et al. 2007, 229, 232, 234–235). Documented information for BCM is emphasized on several capability areas, such as “planning” and “training and awareness” (Sheth et al. 2007, 230–231, 235), fulfilling the requirement. The only requirement which was only partially met was communication, as although the model addressed external communication in the capability area “coordination with vendors and external agencies” (Sheth et al. 2007, 235), it failed to address internal communication in any of the capability areas. Therefore it conforms only partially to the fourth key clause.

The fifth key clause “operation” requires the model to include BIA and risk assessment, business continuity strategy, business continuity procedures, exercises and testing in the model. Although BIA is considered a part of the capability area for “strategy”, risk assessment is not considered part of the model (Sheth et al. 2007, 229). Business continuity strategy however is addressed, as it forms one of the capability areas. Similarly business continuity procedures are included in the capability area “procedures”, while exercises and testing are addressed in the capability area “range of testing” (Sheth et al. 2007, 230, 232–233). As the requirement for including risk assessment in the model is not met, the model conforms only partially to the fifth key clause.

The sixth key clause “performance evaluation” requires the model to include monitoring, measuring, analyzing and evaluation of the effectiveness and performance of the BCMS and to conduct regular internal audits and management reviews. Measuring and evaluating the BCMS effectiveness and performance is intended to be the result of activities in capability area “range of testing” (Sheth et al. 2007, 226, 232–233) and the requirement for management reviews is addressed in the capability area for “management commitment” (Sheth et al. 2007, 235–237). However, internal audits are not addressed in the model, resulting in only partial conformity to the sixth key clause.

The seventh key clause “improvement” requires the model to include continuous improvement in order to improve the suitability, adequacy and effectiveness of the BCMS. This requirement was only partially met, as the only reference to improvement in the model was indirectly via the capability area for “training and awareness” (Sheth et al. 2007, 234–235).

#### 4.4.4 Maturity Model for BCM by Randeree et al. (2012)

The BCM maturity model by Randeree et al. assesses the organization's BCM maturity through five maturity levels in five dimensions called levels. According to Randeree et al. (2012, 478), these levels forming the BCM scope dimension represent 1) technology, 2) facilities management, 3) processes, 4) people and 5) organizational soft issues. The five maturity levels forming the BCM quality axis are called 1) ad hoc, 2) managed, 3) defined, 4) integrated and 5) optimized. The model is can be seen in Figure 12. The figure is the same as the original figure presented by Randeree et al. (2012, 481), but the levels on scope axis now have corresponding titles included.

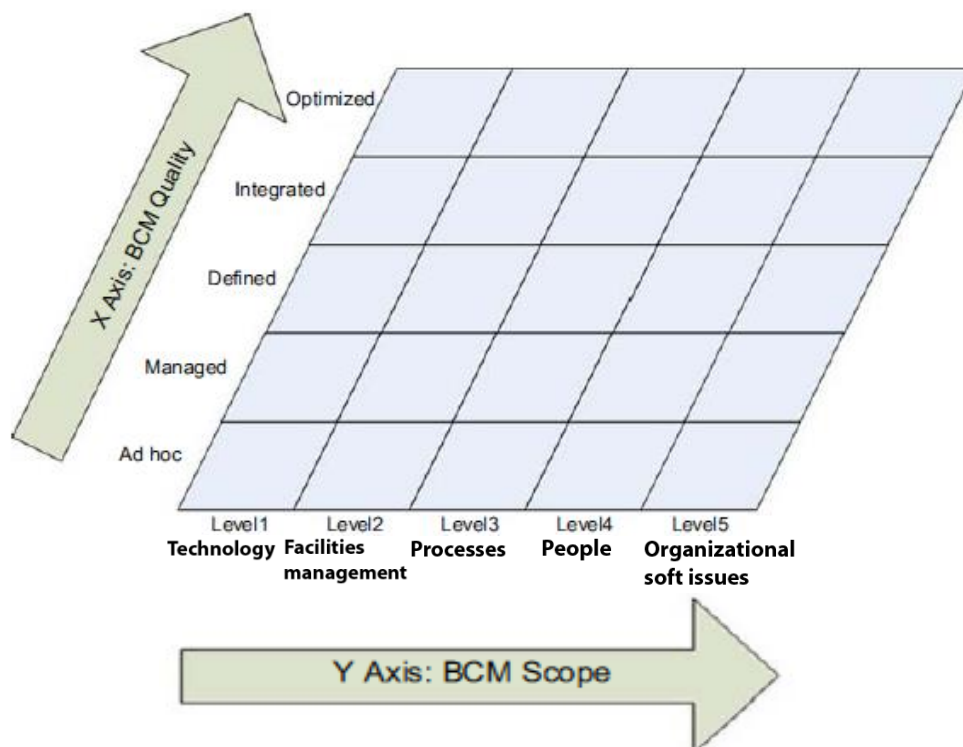


Figure 12 Maturity Model for BCM (adapted from Randeree et al. 2012, 481)

Although initially the model seems fairly simple and similar to the one by Smit (2005, 49), assessing the maturity levels is not done directly to the scope levels. On each scope level the assessment is made by assessing the maturity of five “areas” representing 1) BCM program management, 2) planning and analysis, 3) development of BCP, 4) implementation and 5) maintenance. The areas and their related maturity levels are shown in Figure 13.

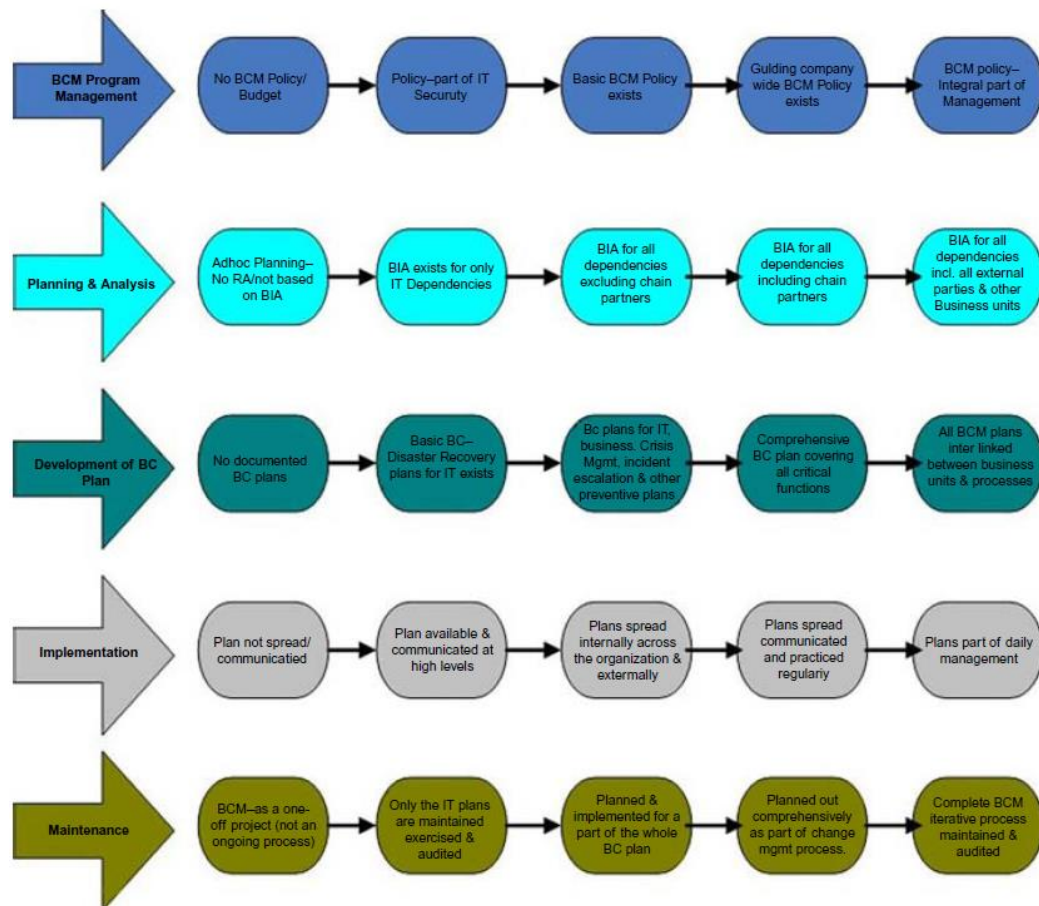


Figure 13 Maturity levels of the five areas (Randeree et al. 2012, 480)

Each of the areas contains 2–10 goals (Randeree et al. 2012, 484–486). As there are 27 goals in total, completing the maturity assessment on each scope level requires assessing the current state of BCM in the organization against a goal 135 times.

It is worth questioning the model's definition of BCM scope. As mentioned earlier, the levels represented technology, facilities management, processes, people and organizational soft issues. The authors have not elaborated further on what each of these levels encompass. For example assessing whether BCM awareness exists within the technology, facilities management, processes, people and organizational soft issues levels as the model suggests does not seem very applicable – one could argue BCM awareness refers only to the awareness of people, not for example the awareness of technology. At least some degree of redundancy has to exist in this type of assessment where the same areas are applied over each scope level, but one could even further argue the BCM scope levels combined with the “area approach” do not make much sense.

Although the maturity assessment proved to have some confusing elements, the BCM coverage of the model is more comprehensive as in the BCMS capability model by Sheth et al. (2007). While it still ranks behind BCMM (Virtual Corporation 2005) and the BCM maturity model by Smit (2005), it conformed fully to three of the key

clauses and partly to the remaining four. The conformity to the ISO 22301 clauses can be seen in Table 13, where the first column lists the key clauses, the second column lists the essential tasks for each clause and the third column describes the conformity as well as how it was embedded to the model.

Table 13 Conformity of the BCM maturity model by Randeree et al. (2012) to ISO 22301

ISO 22301 Key Clauses	Essential tasks in each key clause:	Conformity of the model:
<b>1 Context of the organization</b>	Determining the scope	<i>Conformity</i> ; Area 1 (BCM program management) assesses whether BCM has been integrated to other processes and the maturity assessment has a BCM scope dimension
<b>2 Leadership</b>	Leadership and commitment Management commitment Policy Organizational roles, responsibilities and authorities	<i>Conformity</i> ; Area 1 (BCM program management) conforms to all of the requirements
<b>3 Planning</b>	BC objectives and plans to achieve them	<i>Partial conformity</i> ; creating plans is included in area 3 (development of the BC plan), but defining BC objectives is not addressed
<b>4 Support</b>	Resources Competence Awareness Communication Documented information	<i>Partial conformity</i> ; resources and BCM awareness addressed in area 1 (BCM program management), communication and documented information in area 3 (development of BC plan), but competence is not addressed
<b>5 Operation</b>	BIA and risk assessment Establish and implement BC procedures BC strategy	<i>Conformity</i> ; BIA, risk assessment, BC strategy and BC procedures addressed in area 2 (planning and analysis), exercises and testing addressed in area 5 (maintenance)
<b>6 Performance evaluation</b>	Monitoring, measurement, analysis and evaluation Internal audits Management reviews	<i>Partial conformity</i> ; BCM audit addressed in area 5 (maintenance), other requirements are not addressed
<b>7 Improvement</b>	Continuous improvement	<i>Partial conformity</i> ; continuous improvement is not explicitly stated, but maintaining the plans to keep them up to date is encouraged in area 5 (maintenance)

The first key clause “context of the organization” sets the scope for the BCM activities. The model conforms to this clause as the area for BCM program management assesses whether BCM has been integrated to other processes and the other axis on the maturity model refers to the scope of BCM (Randeree et al. 2012, 478, 484).

Conforming to the second key clause “leadership” requires the model to include management commitment, establishment of a business continuity policy and assignment of the responsibilities and authorities for relevant business continuity roles in the organization. All of these requirements are met, as the area for BCM program management in the model assesses all of these topics (Randeree et al. 2012, 484).

The third key clause “planning” requires the model to include a planning aspect in which actions are planned to implement the BCMS within the defined scope and how to evaluate the effectiveness of the implementation. Furthermore, the business continuity objectives are defined during planning, which express the intent of the organization to treat the risks identified and to comply with requirements of organizational needs. Creating plans is included in area 3 (development of the BC plan) of the model, but the model lacks defining business continuity objectives and is therefore considered to only partially conform to this clause (Randeree et al. 2012, 485).

The fourth key clause “support” requires the model to encompass resources, competence and documented information required for BCM as well as BCM awareness and communication. Resources are addressed in area 1 where budgeting refers to the available resources (Randeree et al. 2012, 484), but the requirement for competence is not addressed in the model. The requirement for documented information and communication are met in the area 3 (development of the BC plan). In addition, the requirement for BCM awareness is addressed in area 1 (BCM program management) (Randeree et al. 2012, 484–485).

The fifth key clause “operation” requires the model to include BIA and risk assessment, business continuity strategy, business continuity procedures, exercises and testing in the model. The requirements for BIA, risk analysis, business continuity strategy and business continuity procedures are addressed in area 2 (planning and analysis) while exercises and testing are addressed in area 5 (maintenance) (Randeree et al. 2012, 485–486). Therefore the model conforms to all requirements of the clause.

The sixth key clause “performance evaluation” requires the model to include monitoring, measuring, analyzing and evaluation of the effectiveness and performance of the BCMS and to conduct regular internal audits and management reviews. BCM audit is addressed in area 5 (maintenance) (Randeree et al. 2012, 486), but the rest of the requirements are not met in the model, resulting in partial conformity to the clause.

The seventh key clause “improvement” requires the model to include continuous improvement in order to improve the suitability, adequacy and effectiveness of the BCMS. This requirement is partly met as the model encourages organizations to keep all the plans up to date (Randeree et al. 2012, 486), but does not address the topic of continuous improvement efforts to increase effectiveness. It is thus considered to partly conform to this clause.

## 4.5 Summary of the evaluation results

There were clear differences in the model design processes between models. While the models by Smit (2005) and Randeree et al. (2012) proved to be scientifically well-

founded in the light of maturity model development guidelines suggested by Becker et al. (2009), the model by Sheth et al. (2007) proved out to lack any tangible documentation of the model design process.

In addition to differences in the model design process, there were major differences in the form and function of the models. BCMM (Virtual Corporation 2005) and the BCMS capability model (Sheth et al. 2007) had defined 8–11 dimensions or process areas, each having a separate maturity level assessment. The models by Smit (2005) and Randeree et al. (2012) relied on two dimensions, the process quality representing comprehensiveness of the BCM program and scope representing extent to which BCM is practiced in the organization. There was also variation in the amount of maturity levels defined in each model, as the maturity models by Sheth et al. (2007) and Randeree et al. (2012) relied on five maturity levels, while Virtual Corporation (2005) and Smit (2005) had defined the maturation path through six maturity levels.

The evaluation results for BCM coverage of the models are summarized in Table 14. The ISO 22301 key clauses are shown on the left column, while each model's conformity to the clauses is assessed on the corresponding row. The conformity was assessed on a three step scale consisting of non-conformity (the key clause is not included in the model), partial conformity (the key clause is partially included in the model) and conformity (all main requirements defined by the key clause are included in the model). Further description of how the (non-)conformity occurred in the model was given in the previous chapters.

Table 14 Conformity of existing BCM maturity models to the ISO 22301 key clauses

ISO 22301 Key Clause		BCMM (Virtual Corporation 2005)	Maturity Model for BCM (Smit 2005)	BCMS Capability Model (Sheth et al. 2007)	Maturity Model for BCM (Randeree et al. 2012)
1	Context of the organization	+	+	+	+
2	Leadership	+	+	/	+
3	Planning	+	/	/	/
4	Support	+	/	/	/
5	Operation	+	+	/	+
6	Performance evaluation	/	/	/	/
7	Improvement	+	+	/	/

[ + ] conformity; [ / ] partial conformity; [ - ] non-conformity

The results indicate the BCMM by Virtual Corporation (2005) conformed most comprehensively to the ISO 22301 key clauses, as it conformed fully to six of the key clauses while partially conforming to one of the key clauses. The BCM maturity models by Smit (2005) and Randeree et al. (2012) also had good BCM coverage, while the Smit's model turned out to have slightly more extensive BCM coverage of the two. The BCMS

capability model by Sheth et al. (2007) was conforming only partially to six of the seven key clauses, while conforming satisfactorily only to the key clause “context of the organization” and leaving the model behind others in the evaluation.

From the evolutionary perspective, the model by Randeree et al. (2012) was partly built on Smit’s model (2005), which in turn was partly built on BCMM (Virtual Corporation 2005). However, judging from the evaluation results the BCM coverage of the models seems to have decreased in each of these iterations – a rather unexpected development.

Interestingly none of the models conformed exhaustively to all of the key clauses, suggesting there is still room for improvement in these models. Going back to the procedure model for developing maturity models as suggested by Becker et al. (2009, 218), the first two steps in the process have now been completed – defining the problem and making a comparison of existing maturity models in the application domain of BCM. Therefore the next step is to determine a development strategy and proceed to the iterative maturity model development phase.

## **5 DRAFTING THE ENHANCED BCM MATURITY MODEL**

### **5.1 Determining the development strategy**

As noted by Becker et al. (2009, 214), the new maturity model may also be an improvement of an already existing model. Constructing a completely new model from ground up does not seem to be reasonable, as several relatively comprehensive models already exist in the application domain of BCM. Therefore an attempt at creating a new model is made by improving the existing models with an aim at filling the identified gaps by creating an easily understandable, yet comprehensive, model which conforms to the ISO 22301 standard's requirements. Therefore enhancement of an existing model is chosen as the model development strategy (Becker et al. 2009, 218).

As discovered in the previous chapters, the existing BCM maturity models vary not only in their form, function and design processes, but also in their coverage of the BCM application domain. As a result for example while BCMM (Virtual Corporation 2005) almost fully conforms to the key clauses of ISO 22301 standard, it lacks in simplicity when compared to Smit's (2005) BCM maturity model, as it requires assessing maturity levels in eight separate components of BCM compared to the two-dimensional maturity level assessment provided by Smit's model.

Eventually the evaluation led to choosing Smit's BCM maturity model (2005) as the basis for the enhanced model. There were three reasons for selecting Smit's model; 1) the model was methodically well-founded when evaluated in the light of the maturity model development requirements defined by Becker et al. (2009), 2) the maturity assessment process felt intuitive and 3) the overall structure of the maturity model supported prescriptive purposes of maturity model use better than any of the other models. The model's shortcomings in terms of BCM content could be fixed in the enhanced model.

### **5.2 BCM process maturity levels**

There are six maturity levels in Smit's model (2005, 48) measuring BCM process quality, of which the first three represent BCM initiation, BCM blueprint and BCM as an implemented project. It is not before the fourth level, the embedded level, where BCM is considered a process. On the fifth level BCM is considered 'business as usual' and on the final level BCM is seen as a strategic instrument (Smit 2005, 49–50). BCMM has a similar approach, although there are several dimensions or process areas to apply the scale, where the first three maturity levels represent an organization which has not yet

completed the required program basics to establish a sustainable BCMS, while the latter three represent the evolutionary path to mature BCMS in an organization (Virtual Corporation 2005, 7).

A draft version of the BCM process maturity levels is shown in Figure 14. Instead of six maturity levels in Smit's model, the draft version has only five, each of which is assigned three key process areas.

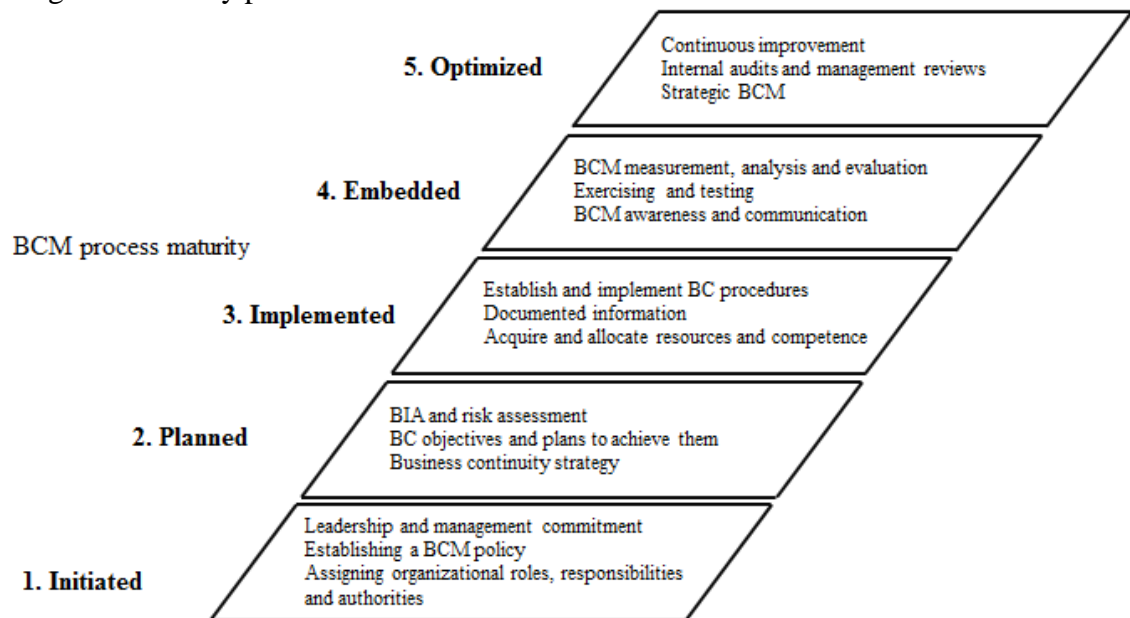


Figure 14 Draft of BCM process maturity dimension

The five levels from initiated to optimized form a maturation path and by following it the organization's BCM cumulatively develops into a mature process. The maturity levels are characterized as follows:

1. Initiated: An organization has initiated BCM by defining the scope, establishing a BCM policy and by assigning the organizational roles, responsibilities and authorities required by the initiative. Management demonstrates leadership and commitment with respect to the BCM program. The deliverable of this level is the BCM initiative.
2. Planned: An organization has performed BIA and risk assessment and by using the outputs from these analyses a business continuity strategy has been determined and selected. Furthermore, business continuity objectives have been determined based on the BCM policy and plans have been made to achieve these objectives. The deliverable of this level is a blueprint of BCM.
3. Implemented: An organization has established and implemented business continuity procedures, including incident response structure and business continuity plans. In addition, the plans are documented and adequately protected. Furthermore, the resources and competence required to implement the selected strategy

have been acquired and allocated. The deliverable of this level is BCM as a project.

4. **Embedded:** The actions performed on the lower maturity levels can still lead to a situation where BCM is considered a one-off project and the plans inevitably become obsolete. On the fourth maturity level BCM is finally considered a process instead of a project. An organization on this level measures, analyzes and evaluates its BCMS as well as conducts exercises and tests on its business continuity procedures to ensure they are consistent with the objectives. Furthermore, BCM awareness is promoted and exists among the employees and both internal and external communication related to BCM is addressed. The deliverable of this level is BCM as a process
5. **Optimized:** On the final maturity level the organization is optimizing its BCM by aiming at continually improving its suitability, adequacy and effectiveness. Internal audits and management reviews are performed at planned intervals to monitor need for changes or opportunities for improvement in BCMS. Furthermore, an organization at this level can utilize its BCM strategically, for example for gaining commercial advantage or to strive for operational excellence as a business strategy. The deliverable of this level is BCM as a mature process.

Gottschalk and Solli-Sæther (2009, 1268–1269) suggested four criteria for defining the required maturity levels; 1) they should be conceptualized and theoretically defined as significantly different from each other, 2) they should not overlap in content, 3) no level should be perceived as a subcategory of another and 4) each level should be transferable to an empirical setting. While keeping these guidelines in mind, it seemed difficult to find justification for six process maturity levels.

The first three levels were significantly different from each other; the initiative, blueprint and implemented project. However, the latter three levels could be argued to be less original. The difference between a project and a process seems clear, but when looking closer at the differences between the embedded level (BCM as a process) and the controlled level (BCM as business as usual), the content seemed to overlap. According to Smit (2005, 49–50), while an organization at the embedded level exercising BCM as a process has a BCM maintenance plan, only an organization on the controlled level exercising BCM as business as usual has a BCM maintenance process. This seems controversial. Furthermore, Smit's model (2005, 49–50) assumed an organization at the embedded level (BCM as a process) would not yet exercise its BCM plans. One could argue this assumption conflicts with the fourth criterion of transferability to empirical setting as suggested by Gottschalk and Solli-Sæther (2009, 1268–1269). This maturation path will be challenged by placing exercising already on the embedded level in the draft model. The changes to the key process areas are described in more detail in the following chapter.

As the amount of process maturity levels was changed, the descriptions for each process maturity level had to be adjusted as well. Furthermore, the descriptions were adjusted to better reflect the key process areas for each maturity level, as these were also partly changed.

### 5.3 Key process areas for each maturity level

The key process areas for each level had to be re-designed. This was not only because of the changed number of maturity levels but also due to more content being added and some of the concepts being merged. Furthermore, the changes in the key process areas were aimed to grasp better the concepts and terminology of the ISO 22301 standard's key clauses. To get an overview of the changes in the key process areas, a comparison of the key process areas in the draft model with the original model by Smit (2005, 49) is shown in Figure 15.

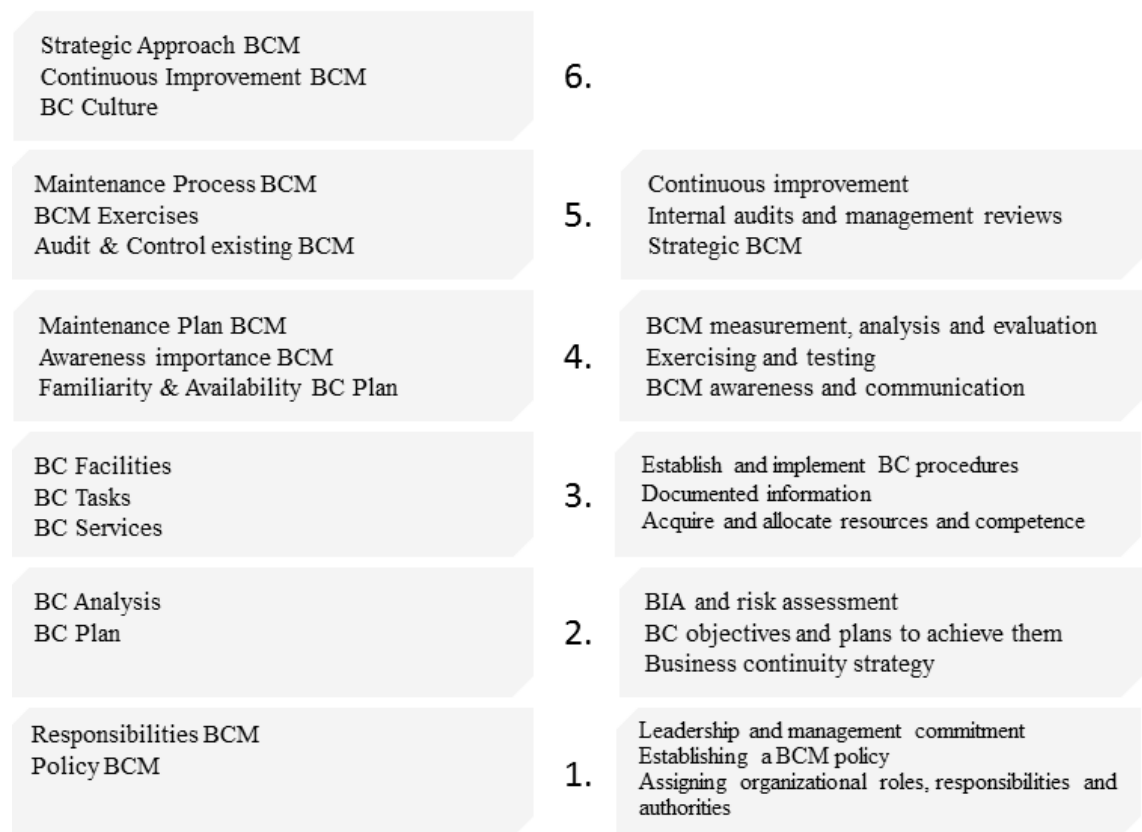


Figure 15 Comparison of key process areas between Smit's model (2005, 49) and the draft model

The key process areas for each process maturity level in Smit's model can be seen on the left side and the key process areas for each maturity level in the draft model are shown on the right side of the figure. The numbers in the middle represent the maturity

levels, one is the initiated level in Smit's model and six is the optimized level (which is the draft model is already level number five).

On the first level the changes are minor. Management commitment was mentioned already in the level description of Smit's model, but was now added as an explicit key process area for the draft model in combination with leadership, thus aligning with the second ISO 22301 key clause "leadership". Furthermore, the "responsibilities BCM" was clarified to better match the requirements set by the key clause "leadership" in the ISO 22301 as described in chapter 3.3.2.

On the second level the basic approach is the same on both models – an analysis is made and plans are created accordingly. However, to better reflect the terminology used in the ISO 22301 standard, the "BC analysis" was changed to "BIA and risk assessment" and "BC plan" was divided into defining BC objectives and plans to achieve them. Furthermore, business continuity strategy was added as a key process area for this level, as the requirements for crafting it had been defined through BIA and risk assessment on the same level and as it was considered an essential part of planning activities.

The idea behind the third process maturity level is the same – the BCM plans prepared on the second level are put into action and as a deliverable the BCM is considered an implemented project. However, the way Smit perceived the implementation differs slightly from the draft model.

Whereas Smit (2005, 49) described the implementation "means BCM facilities have to be realized, services have been contracted and BCM tasks have to be assigned to the right people", the implementation in the draft model is considered done when BC procedures (at least the incident response structure, an adequate warning and communication procedure for incidents, BC plans and recovery procedures) have been established and implemented, the required resources and competence have been acquired and allocated and all relevant BCM information has been documented in a way the confidentiality, integrity and availability of the information has been adequately ensured. These requirements are based on the requirements of BC procedures in ISO 22301 key clause "operation" as described in chapter 3.3.5.

On the fourth maturity level the differences are bigger due to the changes in the number of process maturity levels. The deliverable of this level is the same for both models – BCM as a process. In Smit's model this is accomplished by creating a BCM maintenance plan, ensuring the importance of BCM is recognized within the organization and by making the plans known and available within the organization. In the draft model the BCM is considered a process when it is measured, analyzed and evaluated on a regular basis. Further requirements include exercising and testing the plans in action, existence of BCM awareness within the personnel involved in core business processes – at this level everyone should know their role and duties in case of a business disruption.

In addition an internal and external communication protocol should be in place for communication during a crisis.

The key process areas from the two highest levels in Smit's model are merged to levels five and four in the draft model. The "maintenance process BCM" from sixth level and the "maintenance plan BCM" from the fifth level in Smit's model were combined and moved to the fourth level under "BCM measurement, analysis and evaluation", as it seemed sensible to combine these two. According to Gottschalk and Solli-Sæther (2009, 1268–1269) the maturity levels should not overlap in content and they should be transferable to an empirical setting. The assumption behind combining the "maintenance process BCM" and "maintenance plan BCM" is that planning is part of the maintenance process and it would not seem realistic to characterize an organization's BCM as being embedded while requiring it to have a maintenance plan which is not actually followed.

Furthermore, the "BCM exercises" was moved to the fourth maturity level, as it was assumed an organization with embedded level BCM should already exercise its plans in practice. The "Audit & Control existing BCM" was lifted to the fifth level under "Internal audits and management reviews" as it was felt to best reflect the continuous improvement of BCM – the main characteristic of the optimized level. This change was also supported by the definition of the purpose of audits and management reviews as described in chapter 3.3.6 covering ISO 22301 key clause "performance evaluation". BC culture was removed from the model, as it was not perceived as a key process area by the author and was perceived as highly challenging to define the requirements for achieving it.

## 5.4 BCM scope maturity levels

Smit's BCM maturity model had four levels describing the extent to which BCM is planned and implemented in the organization (Smit 2005, 50). These four levels were facility focus, organization focus, chain focus and integral focus. Similarly as with the BCM process quality dimension, the levels are considered cumulative.

On facility focus, the organization's BCM is focused on a single facility or facilities regarded as critical to operational continuity, but it fails encompassing all the assets on which they depend. On organizational focus the whole organization is included in the scope, but external stakeholders such as supply chain or outsourcing partners are not included. Logically, in the chain focus the organization also covers these external stakeholders in its BCM. The last level, integral focus, is not relevant for all organizations. This level is relevant for large organizations which have decided to include only specific business units in their BCM scope, and achieving this level requires not only for each

unit to consider the relevant external stakeholders in their BCM, but also integrating the BCM with other business units (Smit 2005, 51).

A draft version of the BCM scope maturity levels is shown in Figure 16. Instead of four levels in Smit's model the draft model has only three; 1) siloed, 2) organization-wide and 3) extended organization.

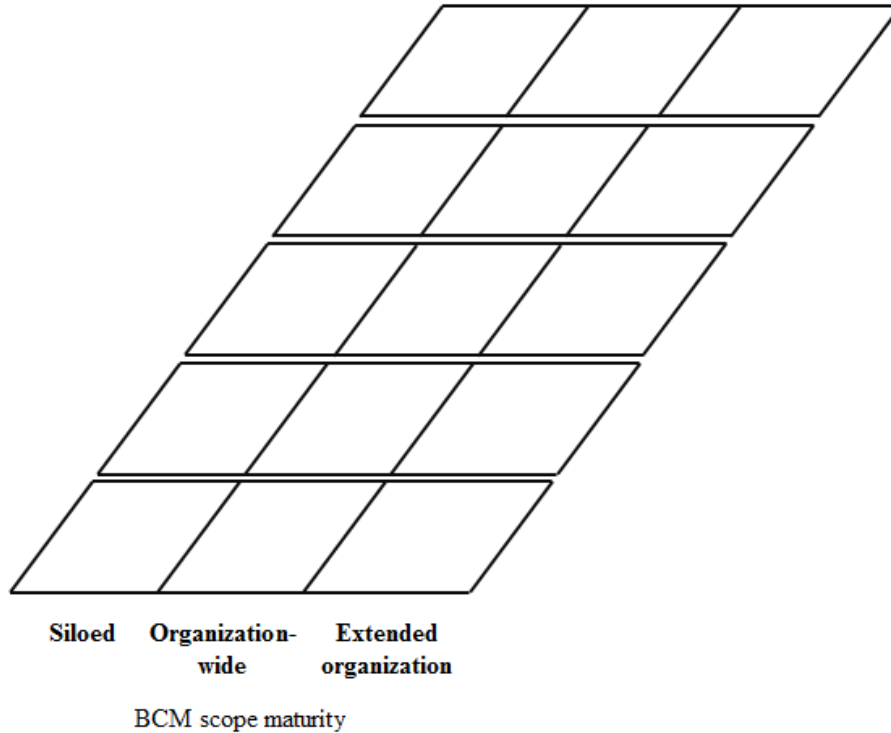


Figure 16 Draft of BCM scope maturity dimension

These three levels describe the extent of the BCMS applied in the organization. The three levels are characterized as follows:

1. Siloed: BCM in the organization is limited to a single or few internal business units or departments such as IT, but it does not cover all (internal) business units relevant to operational continuity.
2. Organization-wide: BCM covers all (internal) business units and departments on which the critical business processes depend on.
3. Extended organization: BCM expands beyond the internal business units and departments to the supply chain and outsourcing partners. BCM is recognized as a component to take into account in contract negotiations with external partners.

Reducing the BCM scope maturity levels by one was motivated by the vague description, arguments and use cases for the 'integral focus' level in Smit's model (2005, 51). As Smit (2005, 51) stated, the fourth level was not even intended as applicable to all organizations. Furthermore, Smit (2005, 51) argued the fourth level is "only relevant for organizations which direct their business continuity analysis and planning a level of analysis lower than the entire organization". This is a contradictory argument in the

sense that the scope maturity dimension was intended to be of cumulative nature (Smit 2005, 50) and the third scope maturity level already includes all internal and external assets on which the critical processes depend on as well as business-critical external stakeholders such as supply chain partners (Smit 2005, 51).

However, the main idea behind the fourth scope maturity level in Smit's model seems to be to indicate a high level of integration of BCM efforts between business units. The level of integration between business units in terms of BCM can be argued to reflect more of the maturity of internal communication as well as the given interdependencies between business units resulting from how the critical processes are designed and executed in the organization. Thus the integration of BCM efforts between business units can be arguably presented in the model by using only three scope maturity levels and by embedding the maturity of the BCM integration between business units to the requirements for key process areas instead of including an additional scope maturity level.

## 5.5 Combined grid

The complete draft model is achieved by combining the two dimensions on which the maturity is assessed, resulting in a grid with 15 cells. Each cell has their own requirements representing the 15 distinct states of BCM maturity. The draft model is shown in Figure 17.

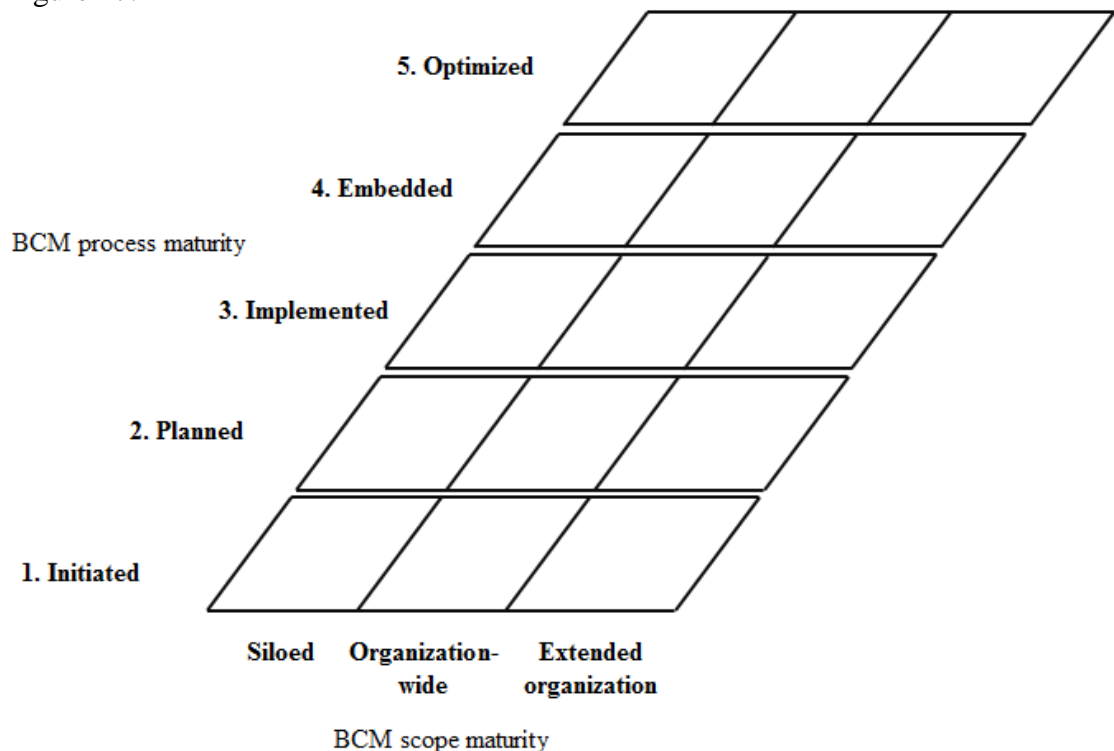


Figure 17 Draft of the enhanced BCM maturity model

The maturity assessment is done by determining maturity on both axes; the scope maturity and the process maturity. The resulting area of cells to which the organization complies with represents the organization's maturity. As both axes are of cumulative nature, it is not possible for an organization to comply with a cell but not with the one to the left or below it. To visualize the maturity, the cells which the organization complies with can be colored, creating a colored rectangle representing the level of maturity.

At this point of the model development no specific requirements were yet developed for each of the 15 cells in the grid. This was felt as unnecessary work at this point, as it was likely the model could rapidly change during the next development steps making the work on the requirements futile.

This draft model serves as the basis for the iterative model development. The next step in the maturity model development procedure suggested by Becker et al. (2009) is to iteratively develop the draft model. This will be done by gathering empirical data to support or challenge the draft.

## 6 RESEARCH METHODOLOGY

### 6.1 Research design

Design science research was chosen as the methodology to follow in this research. The design science is essentially a problem solving process, used for creating innovative and purposeful solutions, called artifacts, for a specified problem domain (Hevner et al. 2004, 82). As the research questions aim at evaluating and finding ways to improve the existing maturity models (artifacts) in the application domain of BCM (specific problem domain), design science research seems to be tailored for this type of research.

Although the design science research guidelines suggested by Hevner et al. (2004) as presented in Table 2 in chapter 2.6 provide a good starting point for guiding this research, they are not adequate in describing the research design. An evaluation of available maturity model evaluation and development frameworks was made during the literature review, which resulted in selecting the approach suggested by Becker et al. (2009) to guide in the model evaluation and development process. The process and the maturity model development guidelines were described in detail in chapter 2.6.

The first three steps of the process (problem definition, comparison of existing maturity models and determination of development strategy) were covered in the previous chapters and the fourth step, iterative maturity model development, was initiated in chapter 5. However, in order to iterate the conceptual model drafted in the previous chapter, validating the model based on input from external sources is required. This requires collecting and analyzing empirical data from carefully selected sources to guide the iterative development process.

The use of quantitative methods in maturity model development seems rare in the literature, although for example cluster analysis and Rasch algorithm have been used in some occasions for grouping requirements into a staged maturation path (Lahrmann, Marx, Mettler, Winter & Wortmann 2011). However, qualitative methods are more common in this context, especially the use of Delphi method, case studies, literature reviews, focus group discussions and expert interviews (Becker et al. 2009, 217; Wendler 2012, 1325).

Resulting from following the selected maturity model development framework, a conceptual maturity model has already been developed. Therefore the purpose of the empirical data to be collected is to validate the conceptual model or to reveal its shortcomings and assist in iterating the model to a more complete state. This knowledge of the nature of the data to be collected facilitates choosing the method for data collection – the method should not be too restricted to the contents of the existing conceptual model, but rather support possible new ideas emerging during the data collection.

Using observation as the data collection method would have been challenging, as it would have probably required observing several organizations maturing in their BCM from the initiated level to the optimized level and comparing the results with the conceptual model for iterative model development. Not only would this have required access to these organizations, but it would have probably required several years of observation to see the required progress in the organizations in order to evaluate and further develop the model.

For these reasons interviewing was selected as the method for data collection instead of observation. Instead of observing organizations directly, this approach enabled the researcher to utilize the experience and knowledge of BCM professionals, who had been working on BCM in several organizations.

Semi-structured interviews were selected as the method for the interviews. Unlike structured interviews with pre-fixed set of specific questions and possible answer options, the semi-structured interviews enable personal interaction with the respondents and give more flexibility, thus giving the respondents an opportunity to explain or clarify their answers – as well as giving the interviewer the opportunity to clarify the questions if necessary.

Furthermore, this approach facilitates exploring the topic in depth, yielding rich data. As the purpose of the interviews is to further iterate the conceptual maturity model, it is important the chosen approach enables the respondents to express their suggestions easily – as well as giving the interviewer the opportunity to steer the interview accordingly as new ideas are presented.

## **6.2 Selection criteria**

As the target was to evaluate the conceptual model and to develop it further, the aim was to look for respondents who would have experience from the BCM of several organizations. This was felt as a crucial requirement, as a possible respondent with experience from only one organization could not possibly compare the maturation paths of various organizations and thus would limit the answers to only what has been experienced in that specific organization.

The target was accomplished by searching for experienced BCM consultants, as consultants normally work for several clients and thus would probably have experience from various organizations' BCM. The actual search was made by utilizing web search engines and LinkedIn, a social networking website for people in professional occupations. In addition to BCM, knowledge of ISO 22301 or BS 25999 standard were seen as a benefit amongst the respondent candidates. This requirement was also reflected in the used search strings.

Eight suitable respondent candidates were found in total during the search process. The selected respondent candidates were sent an e-mail with the interview cover letter (see Appendix A) explaining the purpose of the research and that the planned interviews would require 45 to 60 minutes of their time. A file was attached to the e-mails containing the interview themes and a draft of the enhanced BCM maturity model (see Appendix B). Furthermore, the respondent candidates were given three business days to decide whether they wanted to participate, after which a follow-up call was made to schedule the interview and to give further details of the research as necessary. Eventually six respondents replied and all agreed to participate, of which five agreed to an in-person interview. The sixth interview was conducted as a phone interview.

The respondents had a varying track record in working on BCM topics, as one respondent reported having done his first continuity related assignment 25 years ago while another respondent reported having 2.5 years of experience in working on BCM topics. The average of all respondents was 8.3 years of experience in working on BCM. However, the number of years one has worked on BCM topics is not the whole truth, as all respondents come from the consulting industry, where the work is often done in projects and therefore there might be breaks during which there is less involvement in BCM.

To protect the anonymity of the respondents as promised and as requested by the respondents, only the titles and industries of their organization are shown when referring to the interviews. An overview of the respondents is shown in Table 15.

Table 15 An overview of the respondents

<b>Title</b>	<b>Industry</b>
Information Security Specialist	Consulting and advisory services
Manager	IT Consulting
Senior	Consulting and advisory services
Senior Consultant	Consulting and advisory services
Senior Information Security Consultant	IT Consulting
Senior Manager	Consulting and advisory services

Also the size of the respondents' organizations varied, as some organizations had nearly 800 employees in Finland while others had around 100. Interestingly, the amount of employees working on BCM was almost the same despite the size of the organization, varying from five to a few dozens.

The respondents were perceived to represent well the targeted BCM professionals in Finland as each had several years of experience of working on BCM in several public and private organizations. Furthermore, based on the initial search for respondents and the interviews, the pool of BCM professionals in Finland is relatively small – probably only a few hundred at maximum.

### 6.3 Data collection

Instead of a fixed list of questions, the interviews were divided into four themes, categorized according to the level of abstraction in the model. This approach enabled the respondents to review the overall concept of measuring BCM maturity in the concept model (the dimensions of scope maturity and process maturity) and to suggest possible changes before advancing to discuss the lower levels of abstraction (such as the key process areas). As any possible suggested changes by the respondents in the higher abstraction levels could have radically changed the course of the interview when covering the lower levels of abstraction, this approach seemed appropriate as it could cope with such scenarios. The selected themes were defined as follows:

1. Dimensions on which the BCM maturity is measured
2. Maturity levels and their descriptions
3. The key process areas for each maturity level
4. Requirements for each key process area.

The target was to conduct the interviews as in-person interviews if possible. This was achieved in all except one interview, which was conducted as a phone interview. The interviews were conducted in Finnish and as the data was analyzed and cited in the thesis, the answers of the respondents were translated as precisely as possible to English in order to maintain their original form and intent. The interviews were recorded with the consent of the respondents to facilitate the data analysis process and to reduce the probability of errors during the data analysis. Furthermore, upon conducting the interviews the respondents were assured of anonymity when publishing the interview results.

The interview length varied from 45 minutes to almost one hour. While conducting the interviews it became apparent the scheduled time was not enough to fully cover the fourth theme “requirements for each key process area” in detail as planned. As this theme was consistently proven to be too large to cover it in detail during the interview in the given timeframe, a decision was made to cover it only briefly on a conceptual level by discussing the idea of extending the model to lower levels of abstraction without going deep into the details.

The selected method for data collection was perceived to be successful, as several new ideas for improving or modifying the conceptual model emerged during the interviews. Furthermore, the semi-structured interview strategy with pre-defined themes facilitated steering the discussion according to the input of the respondents.

## 6.4 Data analysis

After collecting the data the next step was to analyze the data. According to de Casterlé, Gastmans, Bryon and Denier (2012, 361), a single right way of working with qualitative data does not exist – it is rather a process which is best learnt by doing.

In addition to the reasons mentioned in the previous chapter, the decision to divide the interview into themes by the level of model abstraction was partly done to facilitate the data analysis. In this way the interview data could be interpreted by layers of abstraction which resembled the ones used in the development of the initial draft model.

The used method of analysis was comprehensive and systematic but not strictly following any of the methods found in the literature. Each interview was at first transcribed based on the interview recordings, followed by the transcripts being further divided by the pre-defined themes. After the interviews had been transcribed, the transcripts were re-read and a summary was made of each interview phrasing the respondent's suggested contribution to the model development for each theme. A similar approach was suggested by de Casterlé et al. (2012, 363) in the *Qualitative Analysis Guide of Leuven (QUAGOL)* where a narrative interview report was suggested to be phrased by the researcher based on the interview transcripts. Based on these summaries the suggested modifications and related arguments were evaluated and applied to the conceptual model, resulting in the final model.

When analyzing the results and when assessing the reliability of the results, it has to be acknowledged that the data collected represents the subjective view of the respondents based on their practical experience of BCM, therefore probably resulting in different suggestions by each respondent. Furthermore, one has to keep in mind the backgrounds of the respondents can also influence the results – a respondent with a stronger risk management background might see the model in a different light than a respondent with a strong information security background.

## 7 RESULTS

### 7.1 Dimensions for measuring the maturity

The first interview theme revolved around the question of whether the two dimensions, namely process maturity and scope maturity, were adequate and meaningful for measuring the BCM maturity in an organization. The process maturity was expected to be accepted by the respondents, as it was expected to resemble their perception of maturity. However, the scope maturity was expected to be more vulnerable to criticism, as it was likely to differ from the models used by the respondents or the conception they had of the maturity.

As expected, the process maturity was accepted by all respondents as a meaningful and adequate dimension for measuring the maturity. Interestingly, also the scope maturity was accepted by all respondents. As one respondent put it:

*In my opinion these two axes are good. Perhaps in the past I have thought about it [maturity] only from the process maturity point of view, but this is also very true – if it [BCM] has been made at all, it has been quite siloed, maybe at the IT department, and the view has been that the systems need to have a continuity plan and not that the processes have a continuity plan and the systems are only supporting the processes. In this sense this is a reasonable approach. (Senior Manager, Consulting and advisory services)*

Although the scope maturity was expected to be likely a new concept when thinking about the maturity, it turned out to match with the perception of one of the respondents:

*Yes, this actually matches with the perception that I have and the model of thinking that I have had about this. On many occasions we have started from exactly there – that first you start from a smaller silo and when the continuity management practices and methods mature, it will enable one to mature in the scope. Therefore this pretty much matches with the perception that I have. (Senior Information Security Consultant, IT Consulting)*

As all respondents agreed to these dimensions of the draft model and no further suggestions were made to improve it, this part of the model was left unchanged.

## 7.2 Maturity levels and their descriptions

The second interview theme consisted of questions related to the maturity levels on both dimensions and the maturity level descriptions. The respondents were given additional materials at the beginning of the interview (see appendices C and D), including the descriptions of each process maturity level in the draft model and a visual overview of the model, to further clarify the idea of the draft model and to facilitate the discussion.

As the process and scope maturity levels were discussed separately during the interviews, the results will be presented in a similar way. Therefore the chapter is divided in two respective subchapters – one for each maturity dimension.

### 7.2.1 Process maturity

The opinions were divided regarding the process maturity levels. Defining the maturity by using five levels was challenged, as one of the respondents suggested adding a “zero maturity level” to the model:

*I would perhaps even take a zero level into this [model], where not even the management has become aware of this matter [BCM], you also see that often used, that it is an even lower level. The point in this whole thing is, after all, to get it sold to the management and get the management commitment and support for it – that is how the things start rolling. (Senior Manager, Consulting and advisory services)*

An opinion on adding a zero maturity level was also asked from the other respondents, but there was no clear consensus of its necessity. On one hand the requirements for the initiated level were perceived as quite strict, suggesting an additional level might make sense:

*If you have done something you are on the initiated level – then you have started it a little bit. But as you have the management commitment in here, you are jumping immediately quite high. In this sense I would say yes [to adding a zero maturity level]. (Information Security Specialist, Consulting and advisory services)*

Furthermore, a suggestion was made to include the recognition of core business processes as a requirement for the zero maturity level. On the other hand the zero level was questioned, as an organization which did not meet any measurable requirements was felt not belonging to any maturity level:

*The zero level is where you have just become conscious of the whole topic. It feels like that not all organizations are even at that level. But on the other hand, if you have not yet done anything, then can you even be on*

*any maturity level... If this model also requires one to prove the maturity in some way, it will not be possible to prove it without having something done already. (Senior Information Security Consultant, IT Consulting)*

The idea behind the zero maturity level was clear, but the need for including it in the model was not. As it seems unlikely that an organization which had only become conscious of the need for BCM would be assessing its BCM maturity, a decision was made to exclude this level from the model. Furthermore, in theory it is likely the organizations probably begin their BCM efforts by becoming aware of the need for BCM, but in practice it would be difficult to set measurable requirements for such a maturity level.

When asked whether the process maturity levels were clear and understandable in general, the consensus was that they were. However, one respondent questioned the understandability of the model for organizations which had not yet put much effort into governance or BCM:

*This [the process maturity levels] is a familiar division from COBIT and at least for me was easy to understand. Perhaps this might seem a little bit difficult to explain for organizations in which not much attention has been paid to governance topics and in which no effort has been put into continuity management – but these [the appendix C and D] open this up pretty nicely and the way you explained it matches precisely what this is about. I would show a green light for this. (Senior, Consulting and advisory services)*

This notion is clear – if one is not familiar with the BCM terminology, assessing the maturity using the model might seem difficult at first. However, it also suggests special attention should be paid when choosing the wording for the level descriptions in the final model.

As the process maturity level descriptions were mostly formed basing on the key process areas defined for each maturity level, most of the ideas for improving the descriptions involved moving the key process areas to different levels or modifying their content. For the sake of consistency and to improve the readability of the results, these results will be discussed in chapter 7.3 covering the key process areas.

### 7.2.2 *Scope maturity*

In general there was a consensus regarding the initial level describing the siloed approach for scope maturity dimension. The differences in opinions occurred when an organization should move from the siloed level to the organization-wide level and beyond. Furthermore, one of the respondents required more clarity in the level descriptions:

*It should be more clearly stated in the model which organizations belong to the siloed level and which organizations belong to the organization-wide level. (Senior Consultant, Consulting and advisory services)*

This demand could be explained by the fact that the respondents were not given similar written maturity level descriptions for the scope maturity dimension as was the case with process maturity dimension. The descriptions for scope maturity levels were only orally described to the respondents. However, this response indicates the descriptions for each scope maturity level have to be equally defined and communicated as the process maturity descriptions.

The transition from a siloed scope maturity level to the organization-wide scope maturity level reflected the experiences of most of the respondents. As one of the respondents replied:

*When we begin helping our customers we pretty much start from the fact that something has been done and then we start to change the thinking to the organization point of view, we determine which are the main processes why the organization exists. (Senior Manager, Consulting and advisory services)*

Although the maturation path might seem straightforward at first, there might be situations where the maturation path suggested by the model becomes questioned. An example could be a situation where a single department (such as IT) is planning the continuity of a single critical process, which has dependencies extending outside of the organization and those dependencies are already taken into account in the planning:

*Of course in some parts if you are working on one of the most critical processes you could already work on the extended organization side because you can already take into account the requirements of the service providers and you can require recovery plans etc. from them. At that point you can jump from siloed to extended organization and skip the organization wide. (Senior Information Security Consultant, IT Consulting)*

In this kind of situation the organization might not yet be at the organization-wide level, as the only department working on the continuity is the IT – perhaps seeing the continuity from a systems point of view. However, the actions taken for this single process meet the requirements of the extended organization level. After carefully considering the options on how this would influence the final model, a decision was made to clarify the level descriptions to demand an organization to first expand its BCM to organization-wide level before it could declare achieving the extended organization level – despite the fact that a single process could already meet the requirements for extended organization level.

The decision to leave out the fourth scope level presented in Smit's model (2005, 51), the integral focus, offered an opportunity to ask whether this decision made sense

or not. One argument supporting the decision was made by a respondent who pointed out that eventually there should be only a single plan for the whole organization and the recovery plans from single departments should supplement this plan:

*My initial assumption is that usually there is a continuity plan and the existing recovery plans are related to that – these recovery plans are exactly the plans made by single departments. If we speak for example about the ISO 22301, the starting point is that there is a single plan and the necessary attachments to it – in this sense I see no point in describing it separately. (Information Security Specialist, Consulting and advisory services)*

Another supporting argument pointed out the leadership and management commitment on the organization-wide level should reflect this holistic approach:

*In my opinion the siloed matches with one department and if we go to the organization-wide the leadership and management commitment comes from having a continuity plan for the whole organization – in this sense there is no need to add pieces to this puzzle and these levels are adequate. (Information Security Specialist, Consulting and advisory services)*

Despite the support for the three scope levels, one of the respondents asked how a big concern would be treated in the model. Would it be placed on the organization-wide level when all of its subsidiaries were in scope? This partly touches the same issue Smit tried to solve by adding the integral focus level to her model. It is clear the focus has to be on the critical processes defined in the BIA and risk assessment. If the critical process requires cooperation between two subsidiaries, then both of these subsidiaries have to be aligned during the planning. The same issue was commented on by another respondent:

*If they are independent businesses it is ok, because their business model is siloed. But if they are using the same systems and even if they are using them in a separate way, if they have resources that they could exchange – for example employees could switch to another unit from continuity point of view, if you need manpower when something has happened – well then they are siloed because they are not cooperating as required by the needs of the organization to function. (Manager, IT Consulting)*

Addressing this issue does not require adding scope levels but rather clarifying the interpretation. An organization is on the siloed level if the plans by single departments are not aligned in a way that the critical processes are adequately protected throughout the organization.

### 7.3 Key process areas for each maturity level

The third interview theme concentrated on the question whether the key process areas for each process maturity level were appropriate and appropriately placed in the model. As the process maturity level descriptions were also heavily depending on these key process areas, much of the feedback on these descriptions involved modifying the key process areas. Therefore the results for these two parts of the interviews are both presented in this chapter.

The process maturity level “initiated” was seen as appropriately structured by most of the respondents. However, one respondent pointed out the ownership should be more clearly emphasized:

*I have run very often to the situation that the management gives the impression that this (BCM) is very important matter and has to be done, perhaps having some certification in mind, but despite all this no owner is found for the planning or the owner does not have enough power and influence to allocate the right people and the owner is not able to pull it off in a way that the project is prioritized high enough with the daily tasks. I would highlight the ownership in the sense that it has to be a senior level person who has enough power and influence to get it properly done. (Senior, Consulting and advisory services)*

After considering how this aspect should be emphasized in the model, this requirement was decided to be included in the initiated process maturity level description. One could argue the key process area of “assigning organizational roles, responsibilities and authorities” already includes this aspect, but stating it explicitly in the level description emphasizes its importance.

Another modification to the initiated level description was to include the recognition of core business processes. As one of the respondents commented on how he sees the initiated level:

*On the initiated level the continuity is in the CEOs head but not yet on paper – it has been given some thought, the critical processes have been identified, risks are more or less known but there is no formal assessment yet. (Senior Consultant, Consulting and advisory services)*

More support for this modification was given by another respondent, who reflected the draft model with their internal processes and noted the identification of critical processes occurs before BIA or risk assessment.

On the planned process maturity level there was generally a consensus on the key process areas. However, several respondents raised the question whether the plans were documented already on the planned level, as would seem logical, because the key pro-

cess area “documented information” was not present until the implemented level. As one of the respondents expressed it:

*Documented information could belong here on the planned level – then it would be really black on white that this is how we proceed. (Senior, Consulting and advisory services)*

As a result a decision was made to relocate the documented information to the planned level. Furthermore, the level description was modified to emphasize the requirement that the documents created during this phase should be adequately handled to ensure confidentiality, integrity and availability.

On the implemented process maturity level there were several suggestions to modify the model. Several respondents expressed their concerns on testing and exercising being absent on the implemented level. Furthermore, one of the respondents questioned whether the BCP could be considered implemented without testing the plans:

*In order for the BCP to work it has to be tested – in this sense it would belong to the implemented level, because it is not implemented before it really works. The way you measure it, for example if you have some KPIs, could belong to the fourth level – the things that determine that you have to update the BCP or if there are some big organizational changes that drive the need for changes. (Senior, Consulting and advisory services)*

Relocating the whole key process area of exercising and testing to the implemented level would have conflicted with the main ideal difference between implemented and embedded process maturity levels; whether BCM was considered as a project or a process. Exercising and testing should definitely occur also at the embedded level and should be done on a more regular basis, but requiring testing already on the implemented level gained support from the respondents:

*Initial testing would be here [on the third level] and on the fourth level it would be more continuous and there would be more different kind of tests. What I have seen in practice is that initial testing would be good... Every time there will be a lot of changes made [as a result of the initial tests] and then you actually get a lot of commitment – as they realize they were not able to do what they were supposed to. (Senior Information Security Consultant, IT Consulting)*

*Testing and exercising could belong to the third level, perhaps the test plans on the third level, but in order to really be embedded and integrated to the daily activities continuous testing and exercising would be required. Usually what we have done is that as a result of the implemented phase some sort of test scenarios and test plans already exist. (Senior Manager, Consulting and advisory services)*

Based on this input, a new key process area of “initial exercises and testing” for the implemented process maturity level was introduced. Furthermore, on the embedded level the key process area was renamed to “regular exercises and testing”. This was made to clarify the difference between these two activities. The changes also supported a notion from one of the respondents to include the components of the PDCA-cycle already to the implemented level:

*The PDCA [Plan-Do-Check-Act] cycle should be visible already on the implemented level. On this level the organization should already try to lightly conform to the standard [ISO 22301]. (Senior Consultant, Consulting and advisory services)*

Another key process area which created much discussion was the BCM awareness and communication – especially the communication part. Many respondents felt the communication processes have to be included already on the implemented level, and several respondents suggested or agreed it could be split to internal and external communication:

*In order to fulfill the requirements for the implemented level, one should have the internal communication, but on the embedded level it has to be also externally communicated... If the actions required during a crisis situation have been planned on the implemented level and they are put into practice, also the recovery plans and the required actions for those have to be described and the people need to be aware of all that. (Senior, Consulting and advisory services)*

Based on the suggestions, the key process area of “BCM awareness and communication” was renamed to “external communication”. In this context the communication refers to only the plans and procedures for communicating with external stakeholders during the crisis. Furthermore, a new key process area “BCM awareness and internal communication” was added to the implemented level. In this context the communication refers to the internal communication plans and procedures within the organization during a crisis. The BCM awareness refers to the awareness of the plans within the organization – each employee who has a role in the plans has to be aware of one’s responsibilities.

The activities on the embedded and optimized level were also seen as challenging to divide between the two. The following statement from one of the respondents describes well the challenge:

*The way I see the optimized level is that it develops itself all the time and there is practically no issues with the activities from the lower levels. In order to get to that level all these activities have to be in shipshape condition. In that sense I would drop the management reviews to the embedded level. (Senior, Consulting and advisory services)*

Similar concerns were raised by some of the other respondents regarding what should belong to the optimized level. After carefully considering the options a decision was made to relocate the management reviews from the optimized level to the embedded level under a new key process area “management reviews”.

Another change to the optimized level was to introduce external audits along with the internal audits. In the draft model these were excluded, as they were not mentioned in the ISO 22301 standard. One of the respondents gave a reasonable argument which supports mentioning also the external audits explicitly:

*If we think of the auditing part, I would say it is obvious that it belongs to the optimized level. It supports the strategic use of BCM, as usually it is specifically the audits which give you the certifications that you need to be able to boast to the customers. (Information Security Specialist, Consulting and advisory services)*

Furthermore, the “Strategic BCM” was renamed to “Strategic use of BCM excellence”, as some of the respondents found the original naming confusing. The reason for confusion was that BC strategy was mentioned on the planned level, and by quickly looking at the key process areas one could not perhaps understand what was the difference with “Strategic BCM”. The new naming also better describes the idea that an organization could utilize its BCM excellence in gaining competitive advantage by indicating this excellence to its stakeholders.

## 7.4 Requirements for each key process area

The original plan for the interviews was to cover the requirements for each key process area in detail as the fourth interview theme. This would have included discussing the requirements for each of the fifteen cells in the maturity grid formed by five process maturity levels and three scope maturity levels. However, in practice it turned out to be a difficult and time consuming task, as the key process areas were still changing and moving in the model. Furthermore, it was not clear whether there would be changes on the higher levels of abstraction in the model – such as the amount of maturity levels or even the dimensions. Due to these challenges it was decided to only ask the respondents whether this level of abstraction was necessary for the model and how it should be constructed.

A matrix defining briefly the requirements for achieving each of the 15 “states of maturity” in the model was felt necessary in general, as it would open up the key process areas and help in determining whether an organization meets a certain requirement. A similar matrix was also provided in the original BCM maturity model by Smit (2005, 115–117). Furthermore, one of the respondents suggested this matrix would serve as an

audit checklist and suggested to create a question list in addition to the matrix – the question list would determine which requirements in the matrix are met and thus help determining to which cell an organization belongs.

Another interesting idea emerged during the interviews; the key process areas could be introduced on the level on which they are mentioned, but the requirements for each key process area could increase as the process maturity level increases. This would enable for example the management reviews to occur more randomly on the embedded level, but on the optimized level they could occur regularly according to a determined schedule. For the scope maturity this was already planned to be implemented to the model, as it was obvious the requirements for certain key process areas such as the management commitment would be different for example on the siloed level than on the organization-wide level.

Developing a requirement matrix for each of the 15 cells was accepted as a good idea in general, but some of the respondents raised concerns that it should not be too detailed to keep it applicable to all organizations equally:

*This current model probably applies to all organizations, but if you start to drill down to the details you will run into industrial versus office; there will be differences – and then you have to think client by client how to develop it from there. (Senior, Consulting and advisory services)*

Furthermore, some of the respondents questioned whether the development of such a matrix would be too much considering the scope of a master's thesis. Despite these concerns a clear need for such a requirements matrix was seen by the author and eventually the matrix was developed to aid in interpreting the final model. This was now possible, as the draft model had now been evaluated and it had iterated to its final form based on the empirical data. The requirements matrix can be seen in appendix E.

The requirements matrix is based on the final version of the model, the ISO 22301 standard and the suggestions emerged during the interviews. It aims at clarifying the requirements for achieving each of the 15 combinations of scope and process maturity by briefly defining the requirements for each key process area in the respective maturity levels on both dimensions. It is worth noting that, although based on an interpretation of the collected empirical data for the final model and the ISO 22301 standard, the requirements matrix can be argued to still be a conceptual draft as it has not been validated empirically like the draft version of the maturity model itself.

During one of the interviews an interesting suggestion was made to include a monetary aspect to the maturity levels; in this approach each maturity level would gain a monetary value representing the cost of achieving that level and the cost of the risk in case this level is not reached and an incident threatening the business continuity occurs. Investigating the possibility for implementing such aspect to the model falls outside of

the scope of this thesis, but is definitely worth considering from further research point of view.

## 7.5 The enhanced BCM maturity model

The final version of the enhanced BCM maturity model is based on the input from the interviews, which was analyzed in the previous subchapters. This subchapter wraps up the results by presenting the final version of the model.

Similar to the draft model, the final model consists of two dimensions for measuring the BCM maturity; the process maturity dimension and the scope maturity dimension. The amount of maturity levels on both dimensions was kept intact from the draft model. However, the descriptions for each maturity level were modified. The scope maturity level descriptions compared with the draft model descriptions can be seen in Table 16.

Table 16 Scope maturity level descriptions comparison of draft and final model

Scope Maturity Level	Draft Model	Final Model
<b>1. Siloed</b>	BCM in the organization is limited to a single or few internal business units or departments such as IT, but it does not cover all (internal) business units relevant to operational continuity.	BCM in the organization is limited to a single or few internal business units or departments, a usual case would be the IT department. Not every business unit or department relevant to the core business processes is yet in the scope of BCM. Furthermore, instead of seeing the continuity through the business processes, the focus might be narrower – for example on the continuity of specific information systems.
<b>2. Organization-wide</b>	BCM covers all (internal) business units and departments on which the critical business processes depend on.	BCM covers all (internal) business units and departments on which the core business processes depend on. At this level it is not yet required in contracts to require external stakeholders such as supply chain or outsourcing partners to exercise BCM. Furthermore, an organization is still on the siloed level if the plans by single business units or departments are not aligned in a way that the core processes are adequately protected throughout the organization.
<b>3. Extended organization</b>	BCM expands beyond the internal business units and departments to the supply chain and outsourcing partners. BCM is recognized as a component to take into account in contract negotiations with external partners.	BCM expands beyond the internal business units and departments to supply chain and outsourcing partners, based on the dependency of these stakeholders to the core business processes. Furthermore, BCM is a recognized topic when negotiating new contracts with external stakeholders.

Together these levels of the scope maturity dimension represent the ISO 22301 key clause “context of the organization”. When using the model for an assessment it should be noted that an organization should first extend the scope to the organization-wide before declaring it has achieved the extended organization level. If an organization has included external stakeholders in their BCM in some areas, such as in relation to a contract to externally host a certain information system, this is not yet considered to fulfill the requirements for extended organization level. The inclusion of the external stake-

holders has to be systematic and comprehensive to consider an organization belonging to the third scope maturity level.

For the process maturity dimension, the changes in the level descriptions mostly reflect the changes to the key process areas. The process maturity level descriptions can be seen in Table 17 compared with the draft model descriptions.

Table 17 Process maturity level descriptions comparison of draft and final model

Process Maturity Level	Draft Model	Final Model
<b>1. Initiated</b>	An organization has initiated BCM by defining the scope, establishing a BCM policy and by assigning the organizational roles, responsibilities and authorities required by the initiative. Management demonstrates leadership and commitment with respect to the BCM program. The deliverable of this level is the BCM initiative.	An organization has initiated BCM by defining the scope, establishing a BCM policy and by having assigned the organizational roles, responsibilities and authorities required by the initiative. Furthermore, the core business processes have been recognized. Management demonstrates leadership and commitment with respect to the BCM program. A clear owner has been defined for BCM, who has the necessary power and influence to fulfill the tasks. The deliverable of this level is the BCM initiative.
<b>2. Planned</b>	An organization has performed BIA and risk assessment and by using the outputs from these analyses a business continuity strategy has been determined and selected. Furthermore, business continuity objectives have been determined based on the BCM policy and plans have been made to achieve these objectives. The deliverable of this level is a blueprint of BCM.	BIA and risk assessment have been performed and by using the outputs from these analyses a business continuity strategy has been determined and selected. Furthermore, business continuity objectives have been determined based on the BCM policy and plans have been made to achieve these objectives. All created documents are treated in a way the confidentiality, integrity and availability of these documents are adequately ensured. The deliverable of this level is a blueprint of BCM.
<b>3. Implemented</b>	An organization has established and implemented business continuity procedures, including incident response structure and business continuity plans. In addition, the plans are documented and adequately protected. Furthermore, the resources and competence required to implement the selected strategy have been acquired and allocated. The deliverable of this level is BCM as a project.	An organization has established and implemented business continuity procedures, including incident response structure and business continuity plans. The resources and competence required to implement the selected strategy have been acquired and allocated. BCM awareness is promoted and exists among the employees – everyone knows their role in respect to the BCM related plans. Internal communication plans and procedures for crisis situations exist. Furthermore, initial tests and exercises have been planned and conducted ensuring the validity of the plans. The deliverable of this level is BCM as a project – it is not yet a continuous process.
<b>4. Embedded</b>	The actions performed on the lower maturity levels can still lead to a situation where BCM is considered a one-off project and the plans inevitably become obsolete. On the fourth maturity level BCM is finally considered a process instead of a project. An organization on this level measures, analyzes and evaluates its BCMS as well as conducts exercises and tests on its business continuity procedures to ensure they are consistent with the objectives. Furthermore, BCM awareness is promoted and exists among the employees and both internal and external communication related to BCM is addressed. The deliverable of this level is BCM as a process	The actions performed on the lower maturity levels can still lead to a situation where BCM is considered a one-off project and the plans inevitably become obsolete. On the fourth maturity level BCM is finally considered a process instead of a project. An organization on this level measures, analyzes and evaluates its BCMS as well as conducts exercises and tests on a regular basis on its business continuity procedures to ensure they are consistent with the objectives. External communication plans and procedures for the times of crisis exist. Furthermore, the BCM is reviewed by the management. The deliverable of this level is BCM as a process
<b>5. Optimized</b>	On the final maturity level the organization is optimizing its BCM by aiming at continually improving its suitability, adequacy and effectiveness. Internal audits and management reviews are performed at planned intervals to monitor need for changes or opportunities for improvement in BCMS. Furthermore, an organization at this level can utilize its BCM strategically, for example for gaining commercial advantage or to strive for operational excellence as a business strategy. The deliverable of this level is BCM as a mature process.	On the final maturity level the organization is optimizing its BCM by aiming at continually improving its suitability, adequacy and effectiveness. Internal and external audits are performed at planned intervals to monitor need for changes or opportunities for improvement in BCMS. Furthermore, management reviews are conducted on a regular schedule at this level. An organization at this level utilizes its BCM excellence strategically, for example for gaining commercial advantage or to strive for operational excellence as a business strategy. The deliverable of this level is BCM as a mature process.

The BCM maturity of an organization is determined by assessing the maturity on both maturity dimensions. Together these dimensions form a grid consisting of 15 cells. An example of an organization belonging to the organization-wide scope maturity level and the implemented process maturity level can be seen in Figure 18.

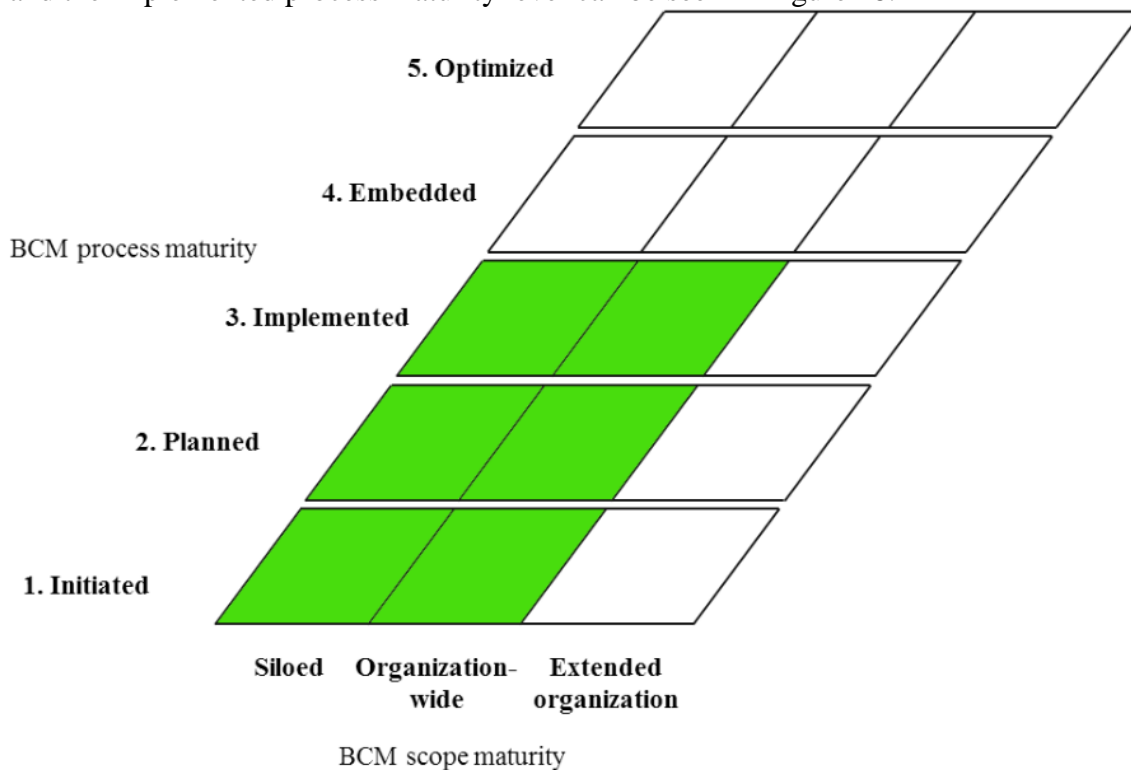


Figure 18 An example of the BCM maturity assessment

The maturity assessment result is visualized as the cumulative amount of cells the organization meets the requirements of. The more cells are colored, the more mature the organization's BCM is. The requirements matrix presented in appendix E facilitates the assessment process.

Each process maturity level has a set of key process areas representing the key requirements for achieving that level. These key process areas represent all essential parts of BCM, conforming to the key clauses found in the ISO 22301 standard. The key process areas for each process maturity level can be seen in Figure 19.

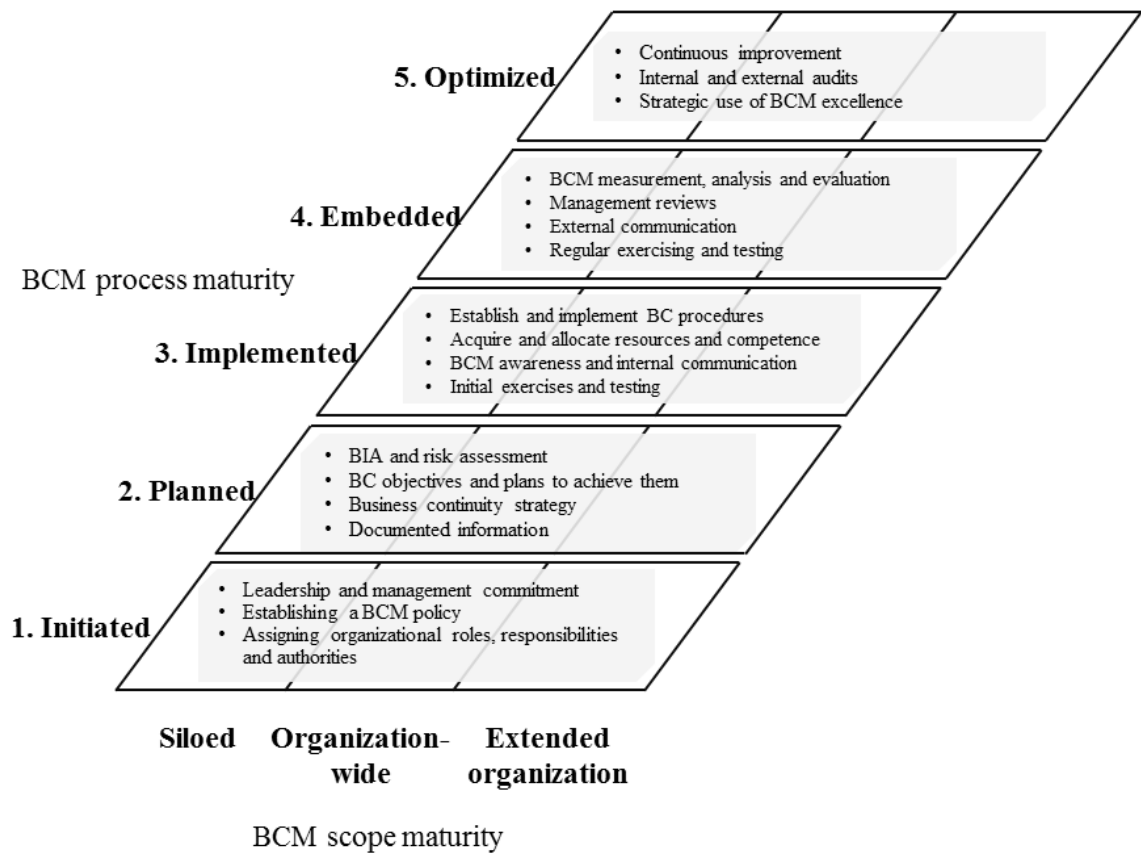


Figure 19 Key process areas for the final model version

New key process areas are introduced on each level as an organization matures in its BCM. As the key process areas have been already extensively covered in the previous chapters and the specific requirements for each key process area in each cell of the maturity grid are explained in the appendix E, the key process areas will not be described in more detail in this chapter.

## 8 CONCLUSIONS AND DISCUSSION

### 8.1 Conclusions

The main research question of this thesis was how the existing BCM maturity models could be improved (RQ1). This problem was divided in two sub-questions; whether the existing BCM maturity models are compliant with the ISO 22301 standard (RQ2) and how the quality of a maturity model can be measured (RQ3).

Three key aspects for measuring the quality of a maturity model (RQ3) were recognized during the research. Firstly, the design process of a model was evaluated by utilizing the eight maturity model development requirements defined by Becker et al. (2009). This method would reveal whether a maturity model was developed in a scientifically rigorous fashion. Secondly, the form and function of a model was evaluated to reveal the usability and complexity of the model. Thirdly, the coverage of the relevant application domain was measured to reveal whether the model was exhaustive in covering all key aspects of its application domain. In this research the application domain was BCM, which resulted in using the ISO 22301 key clauses for measuring the coverage. This decision was made after an extensive literature review of the regulations and standards related to BCM, indicating the ISO 22301 as the latest and most suitable point of comparison. Furthermore, this literature review gave further support for the justification of the second research question (RQ2) and the followed evaluation provided the answer to this question.

The evaluation of the existing BCM maturity models proved there was room for improvement (RQ1). None of the evaluated models conformed fully to the ISO 22301 key clauses, suggesting something was missing. Furthermore, there were shortcomings in the design processes as well as in the form and function of these models. A decision was made to attempt to improve the existing models by developing a new BCM maturity model based on the best of the existing models.

After a careful evaluation of the maturity model development and evaluation frameworks, the procedure model for maturity model development as suggested by Becker et al. (2009) was chosen as the framework for the model development. This facilitated following the seven design-science research guidelines introduced by Hevner et al. (2004). The procedure model by Becker et al. (2009) was the most comprehensive of the evaluated frameworks and it was perceived as easy to implement it to the application domain of BCM.

A draft model was developed based on the BCM maturity model by Smit (2005). This conceptual model was then iterated by interviewing BCM experts and gathering

input for the final version of the model. Eventually a final model was developed, conforming fully to all of the key clauses in the ISO 22301 – unlike its predecessors.

## **8.2 Limitations**

The model has been developed following the maturity model development procedure as suggested by Becker et al. (2009), but the scope of the research excluded the evaluation phase. Although the model has been iteratively developed and the development process has involved experts in its application domain, it can be still argued to be conceptual as it has not been used for a maturity assessment in an organization.

Furthermore, although the appendix E includes the requirements matrix for each key process area for each maturity level, it can be argued to be conceptual as it has not been validated by gathering empirical data. Although the matrix has been made based on the final version of the model, it still represents merely the views of the author. Furthermore, the questionnaire for facilitating the assessment process is not included in this thesis. Assessing the maturity with the tools provided in this thesis is possible, but creating a questionnaire based on the maturity requirements matrix is recommended in order to facilitate the assessment process.

## **8.3 Implications for further research**

Further research on BCM maturity models has several interesting topics to explore. The process step “implementation of transfer media” as presented in the maturity model development procedure model by Becker et al. (2009) could be implemented by developing an interactive online tool for assessing the BCM maturity. This would facilitate the comparative purpose of use of the model, as it would enable collecting data and comparing organizations within an industry or even geographically.

Another possibility for further research would be to conduct an evaluation of the model by using it in a maturity assessment for an organization or preferably several organizations representing various industries. This would enable developing further iterations of the model as its applicability would be challenged in practice. Furthermore, the questionnaire for facilitating the assessment process could be developed at the same time as it could be also tested in practice.

Third possibility for future research would be to explore the possibility of adding the monetary and risk aspects to the model as was suggested by one of the respondents. This would enable the management to see in a concrete way an estimate of the cost of

achieving a certain BCM maturity level and at the same time the possible risks involved in staying at the current state of maturity.

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## APPENDICES

### APPENDIX A Interview cover letter

Hyvä xx xx,

Olen tietojärjestelmätieteen opiskelija Turun Kauppakorkeakoulussa ja teen pro gradu – tutkielmaa liiketoiminnan jatkuvuudenhallinnan maturiteettimallista, joka olisi yhteensopiva liiketoiminnan jatkuvuudenhallintaa käsittelevän ISO 22301 –standardin kanssa. Tutkielman ohjaajana toimii erikoistutkija ja KTT Jonna Järveläinen.

Aiempien tutkimusten ja kirjallisuuden pohjalta olen kehittänyt maturiteettimallin, jota pyrin arvioimaan ja kehittämään teemahaastattelujen avulla. Mallin tarkoitus on mahdollistaa organisaation jatkuvuudenhallinnan nykytilan määrittäminen, antaa suosituksia maturiteetin kehittämiseen ja mahdollistaa vertailu toisiin organisaatioihin sekä ISO 22301 –standardiin.

Haastateltaviksi on tarkoin harkiten valittu joukko alan asiantuntijoita. Teidän osallistumisenne olisi erittäin tärkeää, jotta mallin kehitystyössä saadaan asianmukaisesti huomioitua myös alan asiantuntijoiden näkemykset. Tämän haastattelupyynnön liitteenä saatte etukäteen tutustuttavaksi haastattelussa käsiteltävät teema-alueet sekä maturiteettimallin konseptiversion. Haastattelun tavoitteellinen kesto on 45 minuutista yhteen tuntiin. Kaikkea haastattelumateriaalia käsitellään luottamuksellisesti ja tutkimustulokset tullaan julkaisemaan sellaisessa muodossa, ettei yritystänne voi yksilöidä.

Otan Teihin yhteyttä puhelimitse alkuviikosta keskustellakseni projektista. Mikäli Teillä on aiheesta sitä ennen kysyttävää, vastaan mielelläni mahdollisiin kysymyksiin sähköpostitse tai puhelimitse.

Kiittäen ajastanne ja vaivannäöstänne,

Juho Junttila

Tutkielmantekijä

Tietojärjestelmätiede, Johtamisen ja yrittäjyyden laitos

Turun Kauppakorkeakoulu

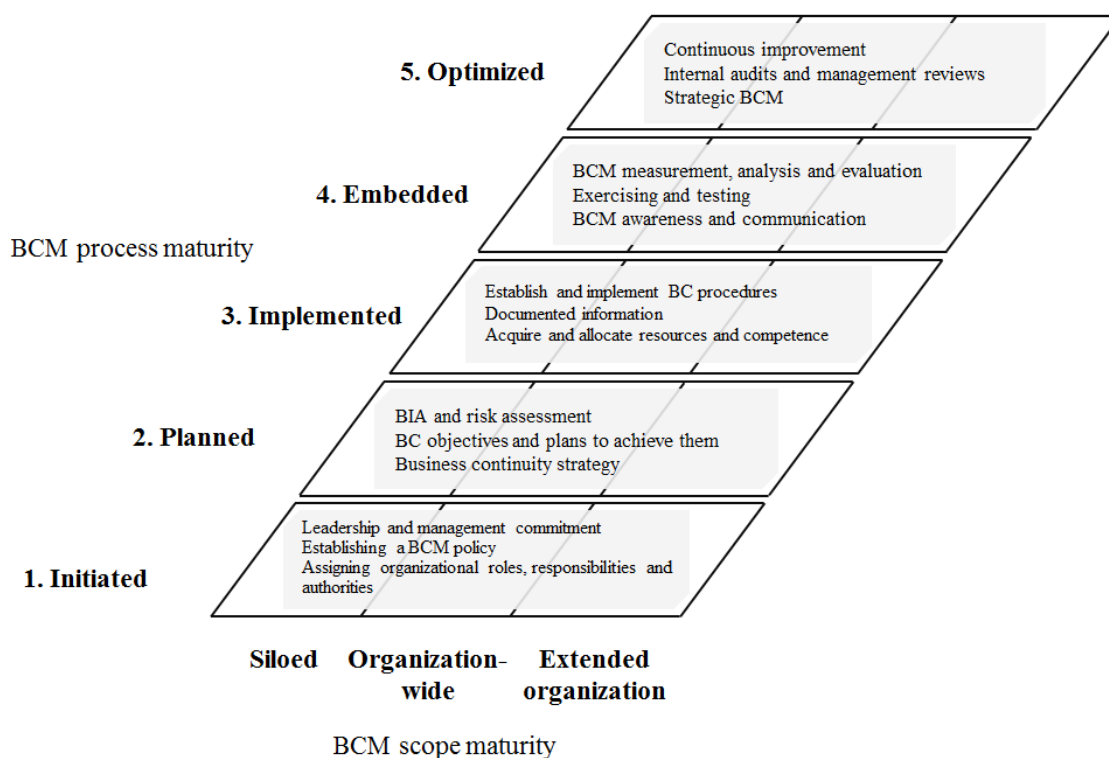
Yhteystiedot: xx xx xx

## APPENDIX B Interview themes and the draft model

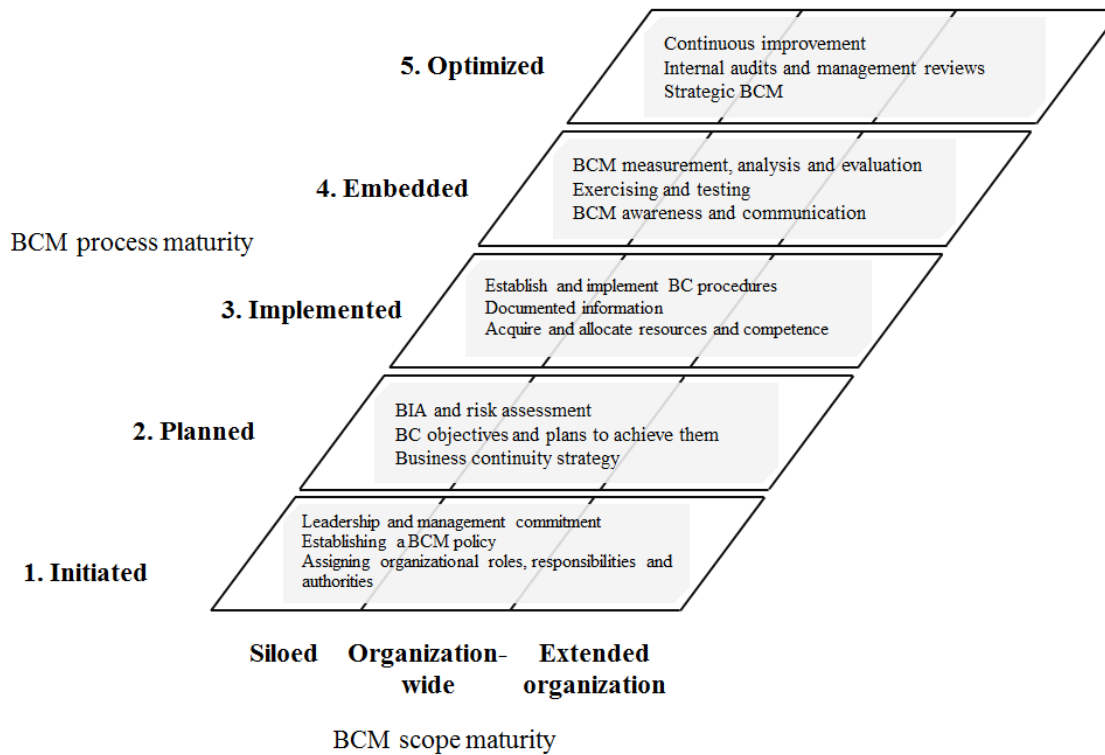
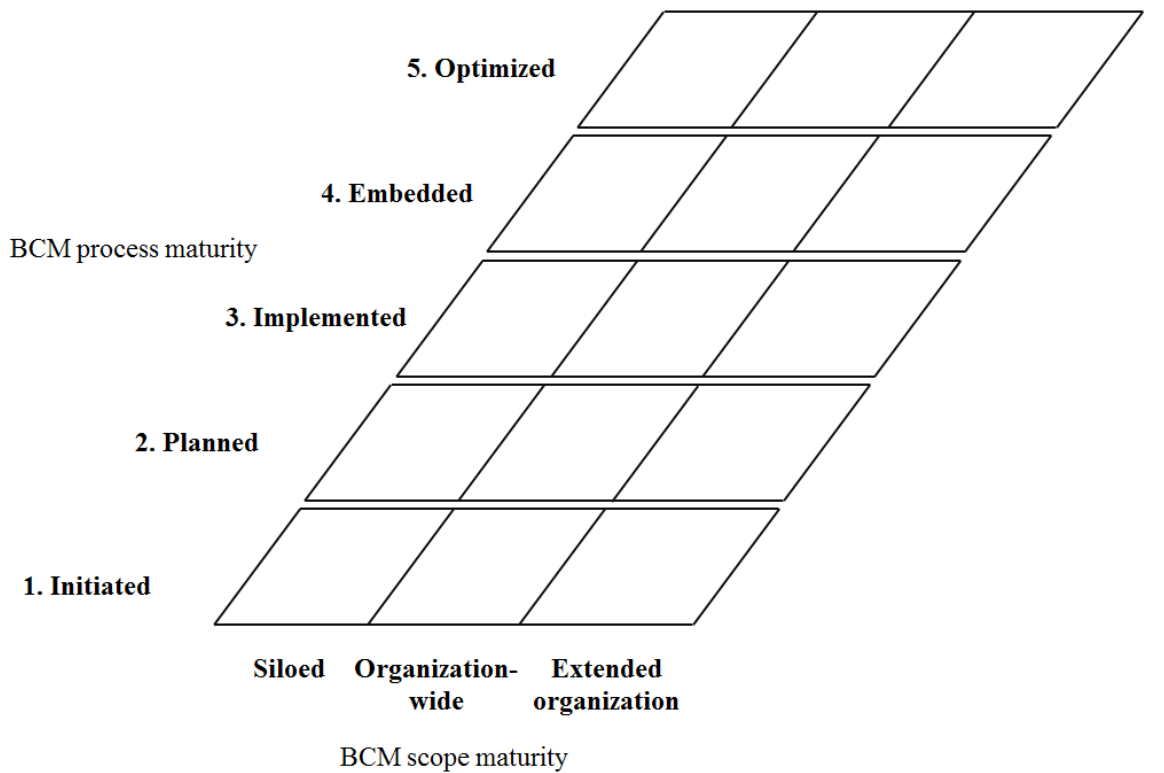
### Haastatteluteemat:

1. Ulottuvuudet, joilla liiketoiminnan jatkuvuudenhallinnan maturiteettia mitataan
2. Maturiteettitasot ja niiden kuvaukset
3. Liiketoiminnan jatkuvuudenhallinnan prosessin keskeiset vaiheet ja niiden keskinäinen suorituserjestys
4. Vaatimukset liiketoiminnan jatkuvuudenhallinnan prosessin keskeisten vaiheiden suorittamiselle

### Maturiteettimallin konseptiversio:



## APPENDIX C Overview of the conceptual model



## **APPENDIX D    Maturity level descriptions in the conceptual model**

1. Initiated: An organization has initiated BCM by defining the scope, establishing a BCM policy and by assigning the organizational roles, responsibilities and authorities required by the initiative. Management demonstrates leadership and commitment with respect to the BCM program. The deliverable of this level is the BCM initiative.
  
2. Planned: An organization has performed BIA and risk assessment and by using the outputs from these analyses a business continuity strategy has been determined and selected. Furthermore, business continuity objectives have been determined based on the BCM policy and plans have been made to achieve these objectives. The deliverable of this level is a blueprint of BCM.
  
3. Implemented: An organization has established and implemented business continuity procedures, including incident response structure and business continuity plans. In addition, the plans are documented and adequately protected. Furthermore, the resources and competence required to implement the selected strategy have been acquired and allocated. The deliverable of this level is BCM as a project.
  
4. Embedded: The actions performed on the lower maturity levels can still lead to a situation where BCM is considered a one-off project and the plans inevitably become obsolete. On the fourth maturity level BCM is finally considered a process instead of a project. An organization on this level measures, analyzes and evaluates its BCMS as well as conducts exercises and tests on its business continuity procedures to ensure they are consistent with the objectives. Furthermore, BCM awareness is promoted and exists among the employees and both internal and external communication related to BCM is addressed. The deliverable of this level is BCM as a process
  
5. Optimized: On the final maturity level the organization is optimizing its BCM by aiming at continually improving its suitability, adequacy and effectiveness. Internal audits and management reviews are performed at planned intervals to monitor need for changes or opportunities for improvement in BCMS. Furthermore, an organization at this level can utilize its BCM strategically, for example for gaining commercial advantage or to strive for operational excellence as a business strategy. The deliverable of this level is BCM as a mature process.

## APPENDIX E Maturity requirements matrix

**Process maturity level:** (1) Initiated

**Scope maturity level:** (1) Siloed

**Leadership and management commitment:** The management is committed to the BCM in the departments or business units where BCM is practiced. On this level the management involved might be the heads of the departments or business units, but not necessarily the top management of the organization. A clear owner has been defined for BCM, who has the necessary power and influence to fulfill the tasks.

**Establishing a BCM policy:** A BCM policy has been created, providing a framework for setting the BC objectives. On this level the policy might not yet be applicable to the whole organization, as it can be written for example from the IT point of view.

**Assigning organizational roles, responsibilities and authorities:** The roles, responsibilities and authorities relevant to BCM have been assigned to the employees.

**Process maturity level:** (1) Initiated

**Scope maturity level:** (2) Organization-wide

**Leadership and management commitment:** The top management is committed to support the BCM process. Furthermore, this is supported by having defined a clear owner for the BCM, who has the necessary power and influence to fulfill the tasks.

**Establishing a BCM policy:** A BCM policy has been created, providing a framework for setting the BC objectives. Furthermore, the policy aligns with the purpose of the organization.

**Assigning organizational roles, responsibilities and authorities:** The roles, responsibilities and authorities relevant to BCM have been assigned to the employees.

**Process maturity level:** (1) Initiated

**Scope maturity level: (3) Extended organization**

**Leadership and management commitment:** The top management is committed to support the BCM process. Furthermore, this is supported by having defined a clear owner for the BCM, who has the necessary power and influence to fulfill the tasks.

**Establishing a BCM policy:** A BCM policy has been created, providing a framework for setting the BC objectives. Furthermore, the policy aligns with the purpose of the organization.

**Assigning organizational roles, responsibilities and authorities:** The roles, responsibilities and authorities relevant to BCM have been assigned to the employees.

**Process maturity level: (2) Planned**

**Scope maturity level: (1) Siloed**

**BIA and risk assessment:** BIA and risk assessment has been made, but the methodology used lacks a holistic view of the core business processes or the results have been ignored by implementing BCM only in a single or few departments or business units.

**BC objectives and plans to achieve them:** BC objectives have been defined, aligning with the BCM policy. The objectives take account of the minimum level of products and services acceptable to the organization to achieve its objectives. Furthermore, plans have been made as to how these objectives are to be achieved.

**Business continuity strategy:** A business continuity strategy has been developed based on the requirements defined by BIA and risk assessment results. It should include how to protect the prioritized activities during normal operation, how to mitigate, respond and manage impacts during a disruptive event and how to stabilize, recover and resume the activities after a disruptive event.

**Documented information:** All BCM related documents and plans are documented and stored in a way their confidentiality, integrity and availability is properly ensured.

**Process maturity level: (2) Planned**

**Scope maturity level: (2) Organization-wide**

**BIA and risk assessment:** A business impact analysis has been made, identifying the activities supporting the provision of products and services and assess the impacts over time for not performing these activities. Based on this information, prioritized timeframes for resuming these activities at a specified minimum acceptable level have been set, taking into consideration the time within which the impacts of not resuming them would become unacceptable. Also the dependencies and supporting resources within the organization for these activities have been identified. Also a risk assessment has been made, identifying and systematically analyzing the risks of disruption to the prioritized processes, systems, information, people and assets.

**BC objectives and plans to achieve them:** BC objectives have been defined, aligning with the BCM policy. The objectives take account of the minimum level of products and services acceptable to the organization to achieve its objectives. Furthermore, plans have been made as to how these objectives are to be achieved.

**Business continuity strategy:** A business continuity strategy has been developed based on the requirements defined by BIA and risk assessment results. It should include how to protect the prioritized activities during normal operation, how to mitigate, respond and manage impacts during a disruptive event and how to stabilize, recover and resume the activities after a disruptive event.

**Documented information:** All BCM related documents and plans are documented and stored in a way their confidentiality, integrity and availability is properly ensured.

**Process maturity level: (2) Planned****Scope maturity level: (3) Extended organization**

**BIA and risk assessment:** A business impact analysis has been made, identifying the activities supporting the provision of products and services and assess the impacts over time for not performing these activities. Based on this information, prioritized timeframes for resuming these activities at a specified minimum acceptable level have been set, taking into consideration the time within which the impacts of not resuming them would become unacceptable. Also the dependencies and supporting resources for these activities have been identified, including suppliers and outsourcing partners. Also a risk assessment has been made, identifying and systemati-

cally analyzing the risks of disruption to the prioritized processes, systems, information, people, assets, outsource partners and other supporting resources.

**BC objectives and plans to achieve them:** BC objectives have been defined, aligning with the BCM policy. The objectives take account of the minimum level of products and services acceptable to the organization to achieve its objectives. Furthermore, plans have been made as to how these objectives are to be achieved.

**Business continuity strategy:** A business continuity strategy has been developed based on the requirements defined by BIA and risk assessment results. It should include how to protect the prioritized activities during normal operation, how to mitigate, respond and manage impacts during a disruptive event and how to stabilize, recover and resume the activities after a disruptive event. In addition, it should include an approval of the prioritized time frames for the resumption of activities as well as means to evaluate the business continuity capabilities of suppliers and outsourcing partners.

**Documented information:** All BCM related documents and plans are documented and stored in a way their confidentiality, integrity and availability is properly ensured.

**Process maturity level:** (3) Implemented

**Scope maturity level:** (1) Siloed

**Establish and implement BC procedures:** BC procedures including incident response structure, warning and communication procedures, business continuity plans and recovery procedures have been established and implemented.

**Acquire and allocate resources and competence:** Required resources for managing the BCMS have been acquired and allocated as well as adequately competent staff to accomplish the required tasks.

**BCM awareness and internal communication:** BCM awareness is promoted and acknowledged within the departments or business units in the scope of BCM. All relevant personnel are aware of their role in the plans. Furthermore, the internal communications protocol has been defined, specifically determining the immediate steps following a disruption.

**Initial exercises and testing:** Initial exercises and testing has been conducted to ensure the adequacy of the plans, but a schedule for subsequent tests and exercises has not necessarily been yet created.

**Process maturity level:** (3) Implemented

**Scope maturity level:** (2) Organization-wide

**Establish and implement BC procedures:** BC procedures including incident response structure, warning and communication procedures, business continuity plans and recovery procedures have been established and implemented.

**Acquire and allocate resources and competence:** Required resources for managing the BCMS have been acquired and allocated as well as adequately competent staff to accomplish the required tasks.

**BCM awareness and internal communication:** BCM awareness is promoted and acknowledged within the whole organization. All relevant personnel are aware of their role in the plans. Furthermore, the internal communications protocol has been defined, specifically determining the immediate steps following a disruption.

**Initial exercises and testing:** Initial exercises and testing has been conducted to ensure the adequacy of the plans, but a schedule for subsequent tests and exercises has not necessarily been yet created.

**Process maturity level:** (3) Implemented

**Scope maturity level:** (3) Extended organization

**Establish and implement BC procedures:** BC procedures including incident response structure, warning and communication procedures, business continuity plans and recovery procedures have been established and implemented.

**Acquire and allocate resources and competence:** Required resources for managing the BCMS have been acquired and allocated as well as adequately competent staff to accomplish the required tasks.

**BCM awareness and internal communication:** BCM awareness is promoted and acknowledged within the whole organization. All relevant personnel are aware of

their role in the plans. Furthermore, the internal communications protocol has been defined, specifically determining the immediate steps following a disruption.

**Initial exercises and testing:** Initial exercises and testing has been conducted to ensure the adequacy of the plans, but a schedule for subsequent tests and exercises has not necessarily been yet created.

**Process maturity level:** (4) Embedded

**Scope maturity level:** (1) Siloed

**BCM measurement, analysis and evaluation:** The effectiveness and performance of the BC procedures is constantly measured, analyzed and evaluated to ensure their adequacy, suitability and effectiveness.

**Management reviews:** Management reviews are conducted to monitor for possible changes in internal and external issues relevant to the BCMS. Furthermore, as the conditions change, necessary changes are made to the policy and objectives.

**External communication:** External communication protocol has been defined, determining how the communication to external stakeholders such as suppliers, outsourcing partners and customers is handled following a disruption.

**Regular exercising and testing:** Testing and exercising of the plans is conducted on a regular and extensive basis within the affected business units or departments, ensuring the plans can be executed in practice if a disruptive event occurs.

**Process maturity level:** (4) Embedded

**Scope maturity level:** (2) Organization-wide

**BCM measurement, analysis and evaluation:** The effectiveness and performance of the BC procedures is constantly measured, analyzed and evaluated to ensure their adequacy, suitability and effectiveness.

**Management reviews:** Management reviews are conducted to monitor for possible changes in internal and external issues relevant to the BCMS. Furthermore, as the conditions change, necessary changes are made to the policy and objectives.

**External communication:** External communication protocol has been defined, determining how the communication to external stakeholders such as suppliers, outsourcing partners and customers is handled following a disruption.

**Regular exercising and testing:** Testing and exercising of the plans is conducted on a regular and extensive basis throughout the organization, ensuring the plans can be executed in practice if a disruptive event occurs.

**Process maturity level:** (4) Embedded

**Scope maturity level:** (3) Extended organization

**BCM measurement, analysis and evaluation:** The effectiveness and performance of the BC procedures is constantly measured, analyzed and evaluated to ensure their adequacy, suitability and effectiveness.

**Management reviews:** Management reviews are conducted to monitor for possible changes in internal and external issues relevant to the BCMS. Furthermore, as the conditions change, necessary changes are made to the policy and objectives.

**External communication:** External communication protocol has been defined, determining how the communication to external stakeholders such as suppliers, outsourcing partners and customers is handled following a disruption.

**Regular exercising and testing:** Testing and exercising of the plans is conducted on a regular and extensive basis throughout the organization and also with the affected external stakeholders such as suppliers and outsourcing partners, ensuring the plans can be executed in practice if a disruptive event occurs.

**Process maturity level:** (5) Optimized

**Scope maturity level:** (1) Siloed

**Continuous improvement:** The desire for continuous improvement of BCM is embedded into the organizational culture in the affected business units or departments. This is supported by operational excellence at all key process areas on each process maturity level.

**Internal and external audits:** Internal audits are used to assess whether the BCMS conforms to the organization's BCMS requirements and whether it is effectively implemented and maintained. External audits are used to acquire relevant certifications. The trends revealed in the internal and external audits are discussed in the management reviews and changes to the BCMS are made as necessary. Furthermore, the management reviews on the optimized level are scheduled to occur regularly.

**Strategic use of BCM excellence:** The excellence in BCM is utilized strategically, for example for gaining commercial advantage over the competitors or for striving for operational excellence as a business strategy.

**Process maturity level:** (5) Optimized

**Scope maturity level:** (2) Organization-wide

**Continuous improvement:** The desire for continuous improvement of BCM is embedded into the organizational culture throughout the organization. This is supported by operational excellence at all key process areas on each process maturity level.

**Internal and external audits:** Internal audits are used to assess whether the BCMS conforms to the organization's BCMS requirements and whether it is effectively implemented and maintained. External audits are used to acquire relevant certifications. The trends revealed in the internal and external audits are discussed in the management reviews and changes to the BCMS are made as necessary. Furthermore, the management reviews on the optimized level are scheduled to occur regularly.

**Strategic use of BCM excellence:** The excellence in BCM is utilized strategically, for example for gaining commercial advantage over the competitors or for striving for operational excellence as a business strategy.

**Process maturity level:** (5) Optimized

**Scope maturity level:** (3) Extended organization

**Continuous improvement:** The desire for continuous improvement of BCM is embedded into the organizational culture throughout the organization. This is supported by operational excellence at all key process areas on each process maturity level.

**Internal and external audits:** Internal audits are used to assess whether the BCMS conforms to the organization's BCMS requirements and whether it is effectively im-

plemented and maintained. External audits are used to acquire relevant certifications. The trends revealed in the internal and external audits are discussed in the management reviews and changes to the BCMS are made as necessary. Furthermore, the management reviews on the optimized level are scheduled to occur regularly.

**Strategic use of BCM excellence:** The excellence in BCM is utilized strategically, for example for gaining commercial advantage over the competitors or for striving for operational excellence as a business strategy.