A Maturity Model for Management Control Systems

Five Evolutionary Steps to Guide Development

The 'right' configuration of Management Control Systems (MCSs) is still challenging. Aligning reporting, planning, and consolidation from a functional, organizational, and IT perspective needs systematic guidance. The empirically grounded MCS maturity model guides such a development by outlining an evolution from a basic, mandatory/external-driven MCS (level 1), to a balanced MCS (level 2), and a comprehensive MCS (level 3). Ultimately, MCSs show a strong strategic focus (level 4) and leverage the potentials of modern IT (level 5).

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1 Introduction

In today's global companies, corporate management has become increasingly complex. To cope with the growing challenges, sophisticated management control systems (MCSs) covering reporting, planning, and consolidation, have been deployed (Anthony and Govindarajan 2007, p. 17; Simons 1994, p. 170). Despite the long tradition in management research, the design of MCSs is still a challenging task and therefore a highly relevant design problem (Malmi and Brown 2008, p. 287). Management research offers different and even competing management concepts with different MCSs, e.g. MCSs for financial management, strategic management, and value-based management (Nilsson and Olve 2001, p. 347; Seal 2010, p. 99). Moreover, changes inside and outside a company demand evolutionary and sometimes revolutionary changes in MCSs (Davila and Foster 2005, p. 80; Moores and Yuen 2001, p. 351).

In the last decades, IT has become a strategic enabler for MCSs (Clark et al. 2007, p. 588; Davenport 2006, p. 98; Eckerson 2010). Especially business intelligence (BI) systems have become part of current CFO agendas (Capgemini 2008; Sheikh et al. 2010). IT is not only seen as a means to assure appropriate and high quality performance management but also to streamline MCS processes. Various studies report on the new role of management accountants as 'business partners' and on trends to build shared service centers for accounting on the basis of harmonized IT systems (Burns and Vaivio 2001, p. 390; Cooper and Dart 2009, p. 2; Daum 2008, p. 390).

In order to ensure a systematic MCS evolution, various aspects (e.g. organizational, technical, strategic) have to be addressed (Alter 2003, p. 368). Moreover, companies have to assess their as-is situation, determine a desired to-be situation and derive potential evolution paths (Becker et al. 2009, p. 213). Maturity models (MMs) are an established means to support these requirements. They consist of multiple, archetypal levels of maturity reflecting an evolution path of a certain domain (Fraser et al. 2002, p. 245; Rosemann and De Bruin 2005, p. 3). In doing so, MMs are regularly used for benchmarking and continuous improvement (Ahern et al. 2003; Paulk et al. 1993, p. 5). Despite the popularity of MMs in IS (information systems) research (Becker et al. 2010; Mettler et al. 2009), the concept has not gained much popularity in management research. Furthermore, existing MMs most often lack a sound theoretical foundation and/or are derived on the basis of an arbitrary design method (Biberoglu and Haddad 2002, p. 150; Lahrmann et al. 2010, p. 9). In order to provide a rigorous instrument for the design of MCSs, this paper aims at developing an empirically grounded and methodologically sound MM for MCSs. This MM allows organizations to assess their as-is situation as well as to determine a desired to-be situation on a set of predefined items.

The construction of MMs is part of design science research (Becker et al. 2009, p. 213). Aligned with existing reference processes (Becker et al. 2009; de Bruin et al. 2005; van Steenbergen et al. 2010),

this paper follows the basic research steps of 'identify a need', 'build', and 'evaluate' (Hevner et al. 2004; Hevner and Chatterjee 2010). Section 2 outlines the foundations of MMs and MCSs. Section 3 provides an overview of existing MMs for MCSs and identifies the research gaps. In Sect. 4, the construction of the MM is outlined. Section 5 covers the MCS MM in detail. A discussion, i.e. a first evaluation of the developed artifact is presented in Sect. 6. Finally, we summarize our findings and suggest future work.

2 Foundations

2.1 Maturity Models

In general, 'maturity' can be defined as "the state of being complete, perfect or ready" (Simpson and Weiner 1989). Maturity implies an evolutionary progress from an initial to a desired target or naturally existing end stage. In the IS discipline, 'maturity' is regarded as "a measure to evaluate the capabilities of an organization" (Rosemann and De Bruin 2005, p. 1).

MMs facilitate this evaluation by outlining anticipated, typical, logical, and desired evolution paths (Becker et al. 2009, p. 213). In response to criticism of missing methodical foundations (Biberoglu and Haddad 2002, p. 150) and non-sufficient comparability of MMs (Levie and Lichtenstein 2009, p. 10), MM research focuses among others on the foundations of MMs (Becker et al. 2010; Pöppelbuß and Röglinger 2011; Ahlemann et al. 2005), e.g. classification schemes, construction methods and design principles. In terms of model elements, key MM elements are maturity levels, dimensions, and an assessment instrument (de Bruin et al. 2005, p. 5), which are described in **Table 1**.

In order to analyze existing MMs and guide MM construction, classification schemes have been developed. This paper uses the classification scheme by Mettler et al. (2009, p. 3), refined by Lahrmann et al. (2010, p. 4) (see **Table 2**) for analyzing the state of the art of MCS MMs. This schema was chosen because of its focus on essential characteristics: It covers a small number of key aspects.

In terms of the applied methods, MMs can either be constructed in a top-down or bottom-up approach (de Bruin et al. 2005, p. 5). Following the first approach, a fixed number of maturity stages or levels is specified and further detailed with characteristics (typically in form of specific assessment items). Using the latter, distinct characteristics or assessment items are first determined and then clustered into maturity levels (van Steenbergen et al. 2010, p. 328). Typical research methods in this context are focus groups, delphi studies, creativity techniques, case studies, or literature reviews. Quantitative methods are less frequently used for MM construction. An example of a quantitative MM construction technique is the Rasch algorithm (RA) (Lahrmann et al. 2011; Rönkkö et al. 2008), which will be used for the MM construction within this paper.

2.2 Management Control Systems

MCSs are defined as those "formal systematically developed, organization wide, data handling systems designed to facilitate management control" (Machin 1995, p. 11). Including executives and accountants as key stakeholders (Anthony and Govindarajan 2007, p. 110), consisting of formal rules and processes (Friedl 2002, p. 54; Horváth 2006, p. 182), and facilitated by a set of IT systems (Rom and Rohde 2007, p. 40), MCSs are socio-technical systems (Alter 2003, p. 368; Bostrom and Heinen 1977). Therefore, they can be decomposed into an organizational (people, processes, organizational structures) and technical subsystem (information, software, hardware) providing products and services (Alter 2003, p. 368). In the following, we will

Table 1 Key elements of MMs

Element	Description
Dimension	Dimensions are specific capability areas, process areas, or design objects structuring the field of interest. They should be exhaustive and distinct. Each dimension is further specified by a number of measures (practices, objects, or activities) or by qualitative descriptions for each maturity level (de Bruin et al. 2005, p. 5).
Level	Levels are archetypal states of maturity of a certain dimension or domain. Each level should have a descriptor clearly providing the intent of the level and a detailed description of its characteristics. The characteristics of each level should be distinct and empirically testable and the relationship of each level to its predecessor and successor should be well defined (Fraser et al. 2002, p. 246; Nolan 1973).
Assessment instrument	The assessment instrument can either be qualitative or quantitative, e.g. using Likert-based questionnaires and scoring models (Fraser et al. 2002, p. 246).

Table 2 Classification scheme for MMs

Criteria	Key question	Characteristics		
Origin	Where does the MM stem from?	Academia	Practice	
Components	How is the MM specified?	Lightweight description of levels and dimensions, e.g. in plain text or as visual	Quantitative assessment instrument (questionnaire)	Well-defined MM architecture with link to assessment instrument
Application	Who applies the MM?	Self-assessment	Third-party professional	Certification body
Evaluation	Has the MM been evaluated?	Evaluated	Not evaluated	Not transparent

elaborate on MCS products and services, i.e. their management accounting (MA) perspective. Afterwards, we will briefly focus on IT support for MCSs.

Based on the decision process concept and cybernetic controls, MCSs are typically divided into the planning and the reporting system (Malmi and Brown 2008, p. 293; Otley 1999, p. 366). The planning system supports the definition of goals, which are captured as strategies and plans. Furthermore, planning is an integrative activity, as it sets aligned goals in order to coordinate a company's different activities (Hansen and Van der Stede 2003, p. 415; Horváth 2006, p. 171). Addressing those requirements, different planning subsystems have been developed: long-term/strategic planning, operational planning/budgeting, and forecasting (Gluck et al. 1980, p. 154; Hahn and Taylor 2006, p. XIII). The reporting system supports stakeholders in their periodic and continuous review of corporate performance and covers the internal management reporting and the legally required external reporting (Anthony and Govindarajan 2007, p. 425; van der Walt and du Troit 2007, p. 89). Both planning and reporting rely on an integrated information base mainly consisting of financial and management consolidation. Consolidation aggregates transactional data from financial and cost accounting systems along organizational structures by elimination of capital interests, internal transactions, and internal results (Ernstberger and Vogler 2008, p. 346). The MCSs and their major information flows are summarized in **Fig. 1** (adapted from Frezatti et al. 2009, p. 2; Horváth 2006, p. 117).

As mentioned above, current MCSs are facilitated by a set of different IT applications (Rom and Rohde 2007). First of all, transactional processing and reporting systems have been deployed as source applications for MCSs since the 1960s. Furthermore, decision support/analytical applications, e.g. executive information systems or planning applications, are leveraged in the context of MCSs (Clark et al. 2007, p. 588). Next to transactional and analytical applications, the corporate IT landscape also encompasses integration systems, e.g. data warehouses (DWHs), which enable information integration and information sharing between applications (Schelp and Winter 2007, p. 134). Based on current literature (Baars and Kemper 2008; Oehler 2006, p. 109; Schelp and Winter 2007; Wagner 2004), **Table 3** depicts the portfolio of available IT support for MCSs. This paper follows Baars and Kemper (2008, p. 140) and distinguishes between generic and concept-oriented analytical applications. In contrast to generic analytical applications, concept-oriented analytical applications provide domain-specific business logic (models and workflows). Examples of standard software are provided on the basis of Gartner (2010).

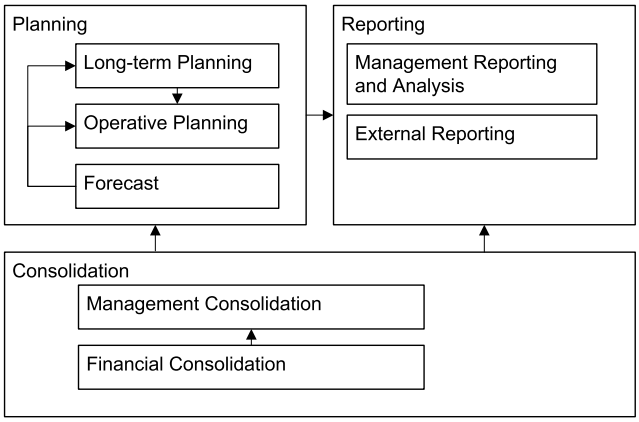

Fig. 1 MCS and its core domains

Generic and concept-oriented analytical applications are also discussed under the umbrella term business intelligence (BI). According to Wixom and Watson (2010, p. 14) BI "is a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions." It is important to notice the difference between BI and MCS. While BI facilitates MCSs, the perspectives of BI and MCS differ quite substantially. BI has a strong technology focus and is by nature not focused on one business domain. In contrast to BI, MCS is a management accounting discipline. Its roots are therefore in one specific business domain. Moreover, MCS are based on more than analytical information systems, e.g. ERP systems are also an important basis for MCSs.

Summing up, MCSs consist of three interrelated domains (planning, reporting, and consolidation). Furthermore, MCSs can be decomposed into services (products and services), organization (organizational subsystem) as well as technology (technical subsystem). **Figure 2** depicts the resulting conceptualization framework. Following Mettler and Rohner (2009, p. 5), the three MCS domains are 'domain (specific) dimensions', whereas services, organization, and technology are 'generic (maturity) dimensions'. The conceptualization will be the basis for the analysis of the existing MMs and the MM construction.

3 State of the Art

To review the state of the art, the paper follows the literature research approach described by Webster and Watson (2002) and vom Brocke et al. (2009). The search is based on six scholarly databases (Science Direct, Proquest, EBSCOhost, ACM, Wiley Inter Science, SpringerLink, and Google scholar), as they cover the most relevant MCS and MIS journals, books, conference proceedings, and practitioner sources. In addition, the standard Google search was used to cover most recent practitioner sources. In this case, the analysis of results was restricted to the 300 most important hits.

The search was conducted with the search string 'maturity model', 'stage model', and 'life cycle' and search terms for each dimension: In the field of planning, we used the search terms 'corporate planning', 'strategic planning', or 'strategic management'. In the field of reporting, we used the search terms 'financial reporting', 'management reporting', 'financial management', 'corporate management', 'corporate performance management', and 'management control system'. In the field of consolidation, we used the terms 'financial consolidation', 'external reporting', and 'financial close'.

In order to identify further relevant articles, we conducted a backward search by reviewing citations found in the first step. As a last step, we conducted a forward search by identifying articles citing

Table 3 IS support of MCSs

Category	Type	Description	Vendor example
Concept oriented analytical application	Strategic planning application	Strategic planning solutions address strategy formulation and visualization as well as the subsequent definition and tracking of strategic initiatives. They build upon quantitative data and allow linking corporate strategy KPIs to divisional strategy KPIs and also to KPIs of strategic initiatives and projects. Often, they leverage BSC approaches for cascading strategic targets.	■ IBM Cognos Balanced Scorecard ■ Oracle PeopleSoft Scorecard ■ SAP Strategy Management
	Financial planning application	Financial planning applications provide tools for the flexible development of planning models and offer planning functionalities like allocation, distribution, simulations, and scenarios. Often, they are based on OLAP databases. Usually, these planning applications support the planning workflow from data loading up to reconciliation.	■ IBM Cognos Planning ■ IBM Cognos TM1 ■ Oracle PeopleSoft Planning and Budgeting ■ SAP Integrated planning ■ SAP BO Plannina and Consolidation
	Consolidation application	Consolidation applications are preliminarily designed for financial and management consolidation. Less often, consolidation applications are used for data loading and the aggregation of planning values.	■ IBM Cognos Controller ■ Oracle Hyperion ■ Oracle PeopleSoft Consolidation ■ SAP Business Consolidation
Generic analytical application	Spreadsheet application	Spreadsheet applications are intensively used in management control, for decentralized and centralized calculation of planning and reporting figures. Advantages of spreadsheet solutions are the high degree of modeling flexibility, the user-friendliness and the low initial costs.	■ Microsoft (MS) Excel
	OLAP application	The central feature of OLAP applications is multidimensional data modeling and analysis. OLAP is interesting for management control, as it allows aggregation and even some moderate levels of financial consolidation along organizational structures and product hierarchies as well as simple calculations (e.g. contribution margin).	■ IBM Cognos BI OLAP ■ Oracle OLAP ■ SAP Business Explorer Analyzer
	Report application	Reporting applications present data from underlying applications to users by combining text, numbers, and business graphics. Reporting applications can provide formatted standard reports, dashboards, and also interactive reports.	■ IBM Dashboard Accelerator ■ Oracle BI Discoverer ■ SAP Business Objects Explorer
Integration system	DWH	In terms of integration systems, the data warehouse centric architecture has been established. The DWH (and data marts, as a subset of the DWH) serves as a data integrator covering diverse source system and as a data provider and storage for analytical applications.	■ IBM DB2 ■ Oracle 11 g database ■ SAP BW (Business Warehouse)
Source system	ERP	Enterprise resource planning systems (ERP) are important data sources for corporate management. They are used to facilitate business transactions.	■ Oracle Enterprise One ■ SAP ERP

the article in the previous steps (Webster and Watson 2002). In all steps, we examined at least titles and abstracts in order to evaluate only relevant sources. We excluded results focusing on dedicated corporate management tasks, such as acquisition, compliance and risk management, but also generic process, project and BI MMs. Compared to other domains, e.g. BI (Becker et al. 2009; Lahrmann et al. 2010; Mettler et al. 2009), this has yielded a moderate number of 14 models. The MMs are described and briefly assessed in the online appendix.

For content analysis, the paper uses the conceptual MCS framework (**Fig. 2**), differentiating between specific domain dimensions and generic dimensions. The methodological analysis focuses on the origin, components, application, and evaluation of the MMs (**Table 2**). The results of the analysis are presented in **Table 4**.

In terms of content, the researched MMs address different domains. Four models are dedicated to planning (MMs 1–4). MMs 5 and 6 focus on management reporting. MMs 7–10 aim at addressing a complete corporate man-

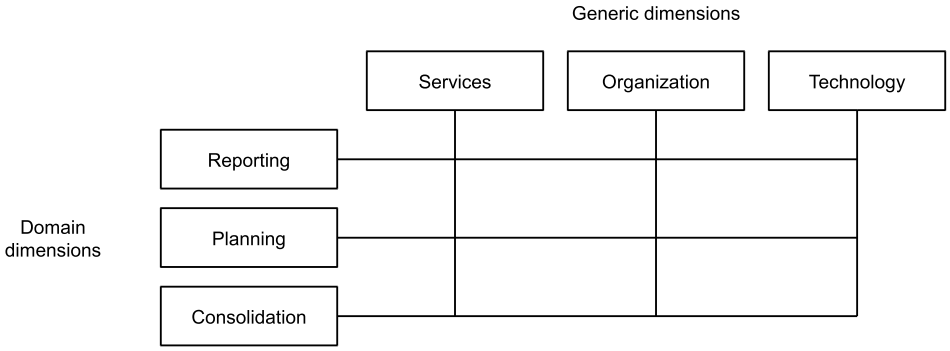

Fig. 2 Conceptual MCS framework

Table 4 MM analysis

#	Model	Content						Methodology									
		Domain dimensions			Generic dimensions			Origin		Components			Application			Evaluation	
		Planning	Reporting	Consolidation	Services	Organization	Technology	Academic	Practice	Lightweight descript.	Questionnaire	Architecture	Self-assessment	Third-party	Certification body	Evaluated	Not transparent
1	Gluck et al. (1980)	■			■			■	■	■			■				■
2	Ansoff (1980, p. 132)	■			■			■		■			■				■
3	Gleich et al. (2006)	■			■	■		■	■	■			■				■
4	Marx et al. (2010)	■			■		■	■		■			■			■	
5	Weisberg (2007)		■		■	■	■		■		■	■		■			■
6	Wettstein and Kueng (2002)		■		■	■	■	■		■			■				
7	Arveson et al. (2010)	■	■		■	■			■	■			■				■
8	Thiruvenkatachari and Kartick (2009)	■	■		■	■	■		■		■	■		■			■
9	National-Audit-Office (2010)	■	■		■	■	■		■	■			■				■
10	McRoberts and Sloan (1998)	■	■		■	■	■		■	■			■				■
11	Ribaudo et al. (2010)			■		■	■		■	■			■				■
12	Kaplan (1990)			■	■			■		■			■				■
13	Aho (2009)		■				■	■	■	■	■		■				■
14	Rayner and Schlegel (2008)		■				■		■	■			■				■
		8	8	2	11	8	9	7	10	12	3	2	12	2	0	1	12

agement approach, as they focus on planning and reporting. However, they neglect consolidation as a key domain of MCSs. The models 11 and 12 provide insight into consolidation. The models 13 and 14 are labeled as performance management MMs. However, they focus mainly on technology aspects and neglect the business perspective of MCSs.

An analysis of the generic dimensions shows that the planning models (1–2) do not provide detailed information and mainly focus on the service dimension. The other MMs (3–4) address additional aspects in the context of planning organization and IT support. The models for reporting (5–10) address basically all generic dimensions. Despite their comprehensiveness, however, they are only partially applicable, as they remain on a very abstract detail level. The same is true for the consolidation models (11–12).

In terms of methodical analysis and background, only four models are from academia. Another four can be assigned to both categories, as the authors are consultants, but the publication is done within academic outlets. Eight models originate purely from practice.

In terms of components, 12 MMs contain a textual description and/or simple maturity grid. Only three models provide an assessment questionnaire, and only two models are based on a well-defined architecture. Concerning application, 12 models are based on the idea of self-assessment. Two consultancy-based MMs require a third party assessment. No model serves for certification. With regard to evaluation, only two models are explicitly tested. For the remaining ones, the evaluation stays unclear. Thus, the paper supports previous statements that

existing MCS MMs build upon a weak methodological foundation.

Summing up, most MCSs focus on one dedicated domain, i.e. planning or reporting, and only two models address consolidation. In terms of generic dimensions, a broad range of MMs addresses two or three dimensions. This indicates that the maturity of MCSs is already understood as a multi-dimensional concept, which needs to be reflected in the MM to be constructed. The analysis of the methodology reveals gaps in terms of rigor and shows that the existing models are abstract, i.e. do not provide detailed information. No model fulfills the requirements as outlined in the introduction for a sound MM for MCSs, covering planning, reporting and consolidation.

4 Maturity Model Construction

4.1 Construction Process

The MCS MM model was constructed in three key steps: (1) questionnaire development and corresponding data collection, (2) development of domain specific MMs for reporting, planning and consolidation, and (3) aggregation of the domain specific MMs into an overall model. Each of the steps is briefly described below.

Well-designed MMs are based on a hierarchical structure of dimensions and sub-dimensions (de Bruin et al. 2005). Such a structure offers the possibility of an overall, but also specific maturity assessment for discrete areas in order to address the needs of several stakeholders. Following Mettler and Rohner (2009, p. 5) and leveraging the conceptional MCS framework (cp. **Fig. 2**), we first build our MM structure on the basis of the MCS domains planning, reporting, and consolidation. Each domain is then further decomposed according to the generic dimensions services, organization, and technology. This structure also sets the boundaries for the questionnaire, which contains one section for each MCS domain with assessment items for each generic dimension. Each section consists of about seven to nine questions (e.g. "How do you ensure quality and consistency of report content?") with two up to six assessment items (e.g. "change of reports in case of a specific request", "systematic life cycle management of KPIs, reports, processes"). The items are derived from the existing MMs (see online appendix) as well as from selected additional literature. All in all, the questionnaire contains 25 questions and 90 items for the MM construction. The questionnaire has been developed together with two focus groups. Moreover, a pretest was conducted before distributing the questionnaire.

Each individual MM (reporting, planning, consolidation) was derived on the basis of three steps. First, the RA was conducted on the basis of the completed questionnaires to calculate a 'difficulty' score for each item. Moreover, the quality of the resulting model was validated. Second, an initial MM was derived (items were assigned to levels), based on hierarchical cluster analysis. Third, the initial MM was analyzed and assessed together with a focus group on the basis of two principles: (1) The results of RA and cluster analysis should be respected as "empirical evidence", i.e. changes should only be made if strong reasons do exists; (2) the items of one level should complement each other and form one consistent level.

The MM should not only guide domain-specific development, but also provide an overall direction for the different MCS domains (Malmi and Brown 2008). This is in accordance with socio-technical theory, whose core message is that subsystems are interdependent and need to work in harmony in order to maximize performance (Alter 2003, p. 368; Bostrom and Heinen 1977). Therefore, the three domain models were finally analytically aggregated in one MCS MM, which has been assessed with a focus group. In the following sections, additional information about the Rasch algorithm, the focus groups, and the data collection are provided.

4.2 Rasch Algorithm

In order to address the methodical issues identified in Sect. 3, this paper builds upon an empirically grounded MM construction method based on the RA (Lahrmann et al. 2011, p. 176). The RA assumes that highly skilled organizations have a high probability of having successfully implemented easy items. Therefore, it calculates a score for the difficulty of items and the capability of participants. Both scores are measured on the same scale. With the so-called 'Infit' and 'Outfit' statistics, the RA also provides criteria for model quality assessment, recognizing if the items and the organization fit the underlying model assumptions (Dekleva and Drehmer 1997).

Our paper reflects the principle of economic efficiency (Samuelson 1983): fully implementing an item i at organization v is not per se the "best" solution in practice. Benefits have to be related to costs. Therefore, you seek an implementation level of D_{vt} providing the best "value for money".

On the basis of this argumentation, this paper uses a Likert scale based questionnaire, which differentiates between the actual and the desired situation of an MCS capability (item). On the basis of the actual and desired values, the RA yields a single ordinal scale that represents the logit measure of each item and organization (see online Appendix B for details), but no distinct maturity levels. In order to overcome subjectivity in defining maturity levels, the paper uses hierarchical cluster analysis (squared Euclidean distance, Ward's cluster method) to assign items to levels (Lahrmann et al. 2011, p. 183). As most MMs use five maturity levels (Becker et al. 2010, p. 2; Lahrmann et al. 2010, p. 9), the anticipated number of clusters is set to five.

4.3 Focus Group Approach

The RA approach was complemented by two focus groups. Focus groups are an established means to investigate new ideas and to check the applicability of a research object by practitioners (Tremblay et al. 2010). Focus group A, exclusively set up to discuss the development of the MCS MM, consisted of six MCS consultants. **Table 5** depicts the members of this group, which met three times for 4–8 hours to assess the MM.

Focus group B is a group of large international companies which met on a regular basis to discuss latest MCS developments. **Table 6** describes the companies and corresponding members of focus group B. The two focus groups were involved in the following steps: The questionnaire structure was derived on the basis of the conceptual framework depicted in Sect. 2.2. Afterwards, questionnaire items were derived on the basis of the existing MMs (cf. Sect. 4). Focus group A has been leveraged to discuss the applicability of the conceptual framework, several specific items, and the results of the RA (Sect. 4.4). Focus group B has been used to pretest the final questionnaire and to evaluate the final model.

Table 5 Characteristics of focus group A

#	Consultant
1	Senior partner within a large consulting and audit company, 20 years expertise in MCSs
2	Junior partner within a large consulting and audit company, 20 years expertise in BI
3	Project manager within a large consulting and audit company, 10 years expertise in MCSs
4	Senior consultant within a large consulting and audit company, 6 years expertise in MCSs
5	Junior consultant within a large consulting and audit company, 3 years expertise in BI

Table 6 Characteristics of focus group B

#	Company	Participant
1	Leading software company with about 50,000 employees	Head of Management Reporting
2	Large international chemical company with about 160,000 employees	Head of Management Reporting
3	Large manufacturing company with about 120,000 employees	Head of Management Reporting
4	Leading telecom provider with about 260,000 employees	Head of Management Reporting
5	Large manufacturing company with about 20,000 employees	Head of Management Reporting
6	Large manufacturing company with about 140,000 employees	Head of Management Reporting

Table 7 Sample characteristics

(A) Position	No.	%	(B) Country	No.	%
CFO	18	24	Germany	38	50
Director Corporate Controlling	3	4	Austria	16	21
Team Leader Corp. Controlling	27	35	Switzerland	20	26
Group Controller	15	20	Others	2	3
CFO Business Unit	13	17			
Sum	*76*	*100*	*Sum*	*76*	*100*
(C) Revenue in Mio €	No.	%	(D) Number of employees	No.	%
<500	19	26	<500	12	16
500–1000	7	9	500–1000	7	9
1000–5000	27	36	1000–5000	15	20
5000–10000	8	11	5000–10000	8	11
>10000	13	18	10000–50000	21	28
			>50000	11	14
Sum	*74*	*100*	*Sum*	*74*	*100*

4.4 Data Collection

331 CFOs and management accountants at large enterprises in Europe were selected as the target group for the MM construction. For data collection, the questionnaire was sent in paper form, but we also used an online survey tool. This yielded in 76 returned and completed questionnaires (response rate 23 %). This number is comparable to other CFO and MA studies (e.g. Moores and Yuen (2001) $n = 49$ and Davila and Foster (2005) $n = 78$, and Seeley and Targett (1999) $n = 85$). **Table 7** shows that the sample is characterized by a majority of responses by CFOs and leading management accountants. Furthermore, the sample is well balanced in terms of country, revenue, and size. Two respondents did not provide information regarding revenue and size.

5 Maturity Model

5.1 Reporting MM

For reporting, the questionnaire encompassed 9 questions and 33 items. The items are described and shown in **Table 8** with the corresponding RA values. The MM construction followed three steps as described in Sect. 4.1. The quality of the Reporting MM is assured, as no more than 5 percent of the items have Infit and Outfit values greater than two (model fit quality criteria) (Dekleva and Drehmer 1997, p. 99). Focus group A identified two items (a – reporting and analysis factory and b – mobile devices) and repositioned them from level 2 to level 5. They only reach a moderate logit, but are clearly very advanced items. Two reasons were identified for this modifica-

Table 8 Reporting MM

L	D	Logit	Item	Reference	Infit	Outfit
5	O	−0.31	Management accounting is service provider for reporting and analysis (reporting und analysis factory with internal rates) (a)	Daum (2008, p. 389)	1.13	1.17
	I	0.97	Usage of interactive corporate dashboard, which provides predefined reports with drill-downs within a single user-interface	Mayer and Stock (2011, p. 7)	1.58	1.49
		−0.11	Standard reports are provided on mobile devices (e.g. Blackberry, iPhone, iPad) (b)	Wright (2010, p. 66)	0.36	0.38
4	S	0.66	Provision of benchmarks / market intelligence analysis	Kaplan and Norton (2004, p. 45)	0.99	0.99
		0.52	Performance measures for strategic initiatives and/or top-projects	Kaplan and Norton (2004, p. 45)	0.93	0.93
	O	0.65	Management accounting is critical business partner (challenges decisions and supports the definition of actions)	Cooper and Dart (2009, p. 3)	0.54	0.54
3	S	0.37	Performance measures for risk management and scenarios	Woods (2007, p. 1080)	0.75	0.75
		0.34	Use of value-driver trees and cause-effect analysis	Kaplan and Norton (2004, p. 42)	0.72	0.74
	O	0.51	Automated generation of financial measures and standard reports	Wettstein and Kueng (2002, p. 8)	0.73	0.73
		0.31	Automated generation of most important measures and standard reports	Wettstein and Kueng (2002, p. 8)	1.37	1.36
	I	0.45	Standard reports are provided within an information portal (self-service)	Shilakes and Tylman (1998)	1.24	1.23
		0.35	Usage of main memory technologies for flexible and ad-hoc data analysis	Plattner (2009)	0.63	0.61
		0.34	Usage of data warehouse with professional BI analysis frontend	Aho (2009, p. 15)	0.54	0.54
		0.3	Standard reports are adjusted to specific user groups and individual executives	Mayer and Stock (2011, p. 7)	1.45	1.43
2	S	0.05	Important KPIs are analyzable along the relevant management dimensions (e.g. products, regions, sales channels)	Mayer and Stock (2011, p. 7)	1.73	1.73
		−0.04	Value-based measures	Stern and Shiely (2001)	0.93	0.92
		−0.04	Non-financial, business and industry-specific performance measures	Kaplan and Norton (1996)	1.05	1.04
		−0.06	Standard reports are adjusted to the specific need of each business unit	Mayer and Stock (2011, p. 7)	1.48	1.52
	O	0.11	Lifecycle management of measures, reports and processes	Wettstein and Kueng (2002, p. 8)	0.57	0.56
		−0.35	Management accounting acts as analyst (researches causes of deviations)	Cooper and Dart (2009, p. 3)	0.35	0.36
	I	0.14	Usage of data warehouse with MS Office frontend for analysis	Aho (2009, p. 15)	1.10	1.12
1	S	−0.35	Primarily financial performance measures (P&L, Balance Sheet)	Wettstein and Kueng (2002, p. 8)	0.36	0.38
		−0.51	Deviations are identified and commented, corrective actions are proposed	Schäffer (2007, p. 101)	0.99	0.99
		−0.56	Standard reports offer same content for each business unit	Mayer and Stock (2011, p. 7)	0.75	0.75
	O	−0.41	Adjustments of reports only reactive, e.g. occurring inconsistencies	Schäffer (2007, p. 16)	0.93	0.93
		−0.65	Management accountants act as data aggregators and information providers	Cooper and Dart (2009, p. 3)	0.54	0.54
		−1.3	High manual efforts for generation and maintenance of standard reports	Wettstein and Kueng (2002, p. 8)	0.63	0.61
	I	−0.74	Executives receive standard reports based on paper or in form of electronic documents, e.g. ppt., pdf. (push-principle)	Aho (2009, p. 15)	1.37	1.36
		−1.27	Manual data preparation using MS Office tools (e.g. MS Excel)	Wettstein and Kueng (2002, p. 8)	1.24	1.23

tion. First of all, item (a) and its implications were not understood by the respondents because of bad wording. Item (b) was repositioned, because the focus group had a strong feeling that mobility has a strong potential, but is not yet well understood in practice.

The final reporting MM is depicted in **Table 8**, showing the maturity level (L), the domain (D), i.e. services (S), organization (O), information technology (I), the RA score values (logit), relevant references, and the fit statistics (Infit and Outfit) of the items. The items are sorted in a descending order according to maturity level, domain and logit. The interpretation of the model depicts the following evolution path:

- Level 1 depicts a reporting stage which is characterized by a strong focus on financial measures and mandatory shareholder requirements. Reporting processes are highly manual and result in paper-based standard reports.
- Level 2 describes an extended management approach focusing on internal management and addressing more advanced shareholder requirements, i.e. first analysis are enabled and value-based measures are put into place. The internal focus leads to reporting and analysis services for corporate and business units. Consequently, management accountants act as analysts. A first data warehouse serves as a platform to provide such services at the corporate center.
- Level 3 enhances the service dimension with risk measures and advanced analysis to provide additional insights and dedicated services for specific user groups. The services are based on well-designed and automated reporting processes, advanced analysis tools and information portals. Level 3 reflects a well-organized and comprehensive, but still financially oriented corporate reporting.
- Level 4 is driven by strategic aspects, as strategic measures and analyses get implemented. Management accountants are able to comply with the strategic orientation: Due to process automation they can act as 'business partners' rather than focusing on pure information provisioning.
- Level 5 aims at levering the potentials of modern BI environments for the information consumers ('self-empowerment' with mobile devices and dashboards). Furthermore, shared service center approaches are implemented as a basis for reporting and analysis factories.

Overall, the derived model reveals that the levels are not exclusive, but consecutive, i.e. the MCS capabilities of the stages build upon each other. Some levels do not comprise items for all dimensions. This is common practice in maturity model construction, as not every evolutionary step is holistic in respect to the dimensions at hand (Ahern et al. 2003).

5.2 Planning MM

For planning, the questionnaire encompassed 9 questions and 35 items. The construction followed the same three steps as described in Sect. 4.1. The initial planning MM was analyzed with focus group A. This time, no item was replaced, so we maintained the initial MM. The levels, generic dimensions, logits and items are depicted in **Table 9**. The Infit and Outfit statistics are satisfying ensuring adequate model quality. The results for planning show the following evolution path:

- Level 1 describes a financially and operationally oriented short-term planning and a separate forecast. Planning data is prepared manually by accountants using spreadsheets.
- Level 2 adds a financially oriented long-term planning, completing the triad of planning systems from a service perspective for the first time (see Sect. 2.2). Planning quality is moderate, as planning data is mainly extrapolated from the previous year. First planning processes are in place supported by an application mainly for aggregation, not planning.
- Level 3 is characterized by a comprehensive, but still financially oriented planning system. In comparison to level 2, the planning subsystems are much more integrated and aligned. They are based on well-defined planning processes. Planning templates ensure planning efficiency. For the first time, a concept-oriented planning application is used.
- Level 4 is characterized by a paradigm shift from a financial to a more holistic planning, i.e. strategies, business plans, and corresponding adjusted planning subsystems are deployed. In turn, the role of corporate management accounting and planning applications facilitate the strategic orientation. Best practices and the usage of advanced planning applications aim at ensuring the holistic planning.
- Level 5 is concerned with streamlining the grown planning system by means of part plan integration and strong IT/BI support. Additionally, potentials of enhanced planning applications are leveraged.

5.3 Consolidation MM

For financial consolidation, the questionnaire encompassed 7 questions and 22 items. The construction followed the same three steps as described in Sect. 4.1. Within the initial MM, the focus group A identified two items in the field of intercompany (IC) reconciliation (a – support of IC with electronic data interchange and b – support of IC with a data base solution) as very advanced items and agreed to shift them on level 5. The items and the result of the RA are depicted in **Table 10**. The Infit and Outfit statistics are satisfying. The results show the following evolutionary path:

- Level 1 consists of a legally required financial consolidation. Consolidation runs are done with high manual efforts and basic IT support.
- Level 2 adds a comprehensive internal perspective, as it provides a full consolidation for internal management reporting, i.e. consolidation for products, regions, business units etc. As the two perspectives (internal and external) are separated, corporate finance has to invest significant resources in order to ensure data quality and comparability of both data sets. Still, no sophisticated consolidation application is used.
- Level 3 is characterized by a professionalization of the financial consolidation function. Legal, management, and plan data is consolidated using a single and integrated data base and is processed within a standard consolidation application. The data loading processes are professionally set up and enabled by IT. Responsibility for data quality is shifted to decentralized entities.
- Level 4 further focuses on streamlining the consolidation process and en-

Table 9 Planning MM

L	D	Logit	Item	Reference	Infit	Outfit
5	S	0.5	Part-plans of operative planning (e.g. sales, production, HR and financial) are aligned and integrated	Rickards (2008, p. 576)	0.80	0.81
		0.44	The breadth and depth of long-term planning are adequate	Gleich et al. (2006, p. 29)	0.58	0.63
	I	0.99	IT-based planning workflow	Rickards (2008, p. 578)	1.18	1.18
		0.6	Central planning application supports linkage of long-term and operative planning	Marx et al. (2010, p. 9)	1.28	1.24
		0.51	Central planning app supports simulation and scenarios	Marx et al. (2010, p. 9)	0.91	1.09
		0.43	Central planning application supports linkage of part-plans of operative planning	Oehler (2006, p. 114)	1.42	1.39
4	S	0.32	Integration of long-term and operative planning (e.g. using value-driver or BSCs)	Wagner (2004, p. 111)	0.68	0.69
		0.26	The forecast is a rolling forecast	Gleich et al. (2006, p. 30)	1.32	1.32
		0.2	Long-term planning is strategically oriented: Focus on BSCs, value-driver trees, market and competitor analysis	Gluck et al. (1980, p. 157)	0.94	0.97
		0.17	Planning is focused on business-specific measures and/or value drivers	Kaplan and Norton (1996)	0.95	0.93
	O	0.35	Management accounting is critical business partner	Cooper and Dart (2009, p. 3)	0.77	0.77
		0.24	Planning methods and best practices are well specified	Daum (2008, p. 389)	0.55	0.57
	I	0.33	Central planning application supports value-driver trees	Bange et al. (2008, p. 9)	0.75	0.77
3	S	−0.12	Year-end forecast as foundation for next year planning	Rieg (2008, p. 144)	1.35	1.35
		−0.13	Planning is focused on balance sheet, P&L and cash flow according to IFRS	Marx et al. (2010, p. 9)	1.49	1.5
		−0.2	Operational planning is derived from financial targets out of long-term planning	Gluck et al. (1980, p. 157)	0.92	0.92
		−0.21	A process-oriented planning calendar is specified	Gleich et al. (2006, p. 28)	0.43	0.40
	O	0.12	Management accounting sets guidelines in the corporate planning process	Daum (2008, p. 389)	0.70	0.72
		−0.22	Management accounting is supporting planning activities as competence center	Daum (2008, p. 389)	0.91	0.91
		−0.24	Planning templates and deadlines are specified	Rickards (2008, p. 578)	0.52	0.50
	I	0.12	Central planning application supports linkage between balance sheet, P&L and cash flow	Oehler (2006, p. 114)	1.57	1.54
2	S	−0.4	Operational planning is extrapolated from previous years	Gluck et al. (1980, p. 157)	1.25	1.37
		−0.49	Operational planning is derived top-down from strategic targets	Gluck et al. (1980, p. 157)	0.62	0.66
		−0.72	Long-term planning is primarily financially oriented and extrapolated from previous years	Gluck et al. (1980, p. 157)	1.32	1.3
	I	−0.85	Decentralized planning on MS Excel, aggregation with central planning or consolidation application	Marx et al. (2010, p. 9)	1.52	1.58
1	S	−0.87	Forecast is independent and isolated instrument	Marx et al. (2010, p. 6)	1.12	1.27
		−1.04	Operational planning is oriented towards financial results and P&L	Gluck et al. (1980, p. 157)	1.44	1.46
	O	−0.88	Management accountants act as data aggregators and information providers	Cooper and Dart (2009, p. 3)	1.31	1.33
	I	−1.02	Manuel data delivery and aggregation using Office tools	Marx et al. (2010, p. 9)	1.20	1.38

hancing data quality. Quality-ensuring mechanisms are established on transactional level and data is automatically loaded from local accounting applications. Corporate finance is able to focus on monitoring the process.

- Level 5 puts a special focus on IC reconciliation. However, standard consolidation software is also replaced by state of the art solutions supporting workflow and integrated planning capabilities.

Table 10 Consolidation MM

L	D	Logit	Item	Reference	Infit	Outfit
5	O	0.94	The reporting process is supported by an IT-based workflow	Esch et al. (2008, p. 17)	1.01	0.93
		0.7	IC reconciliation is done within consolidation software	Fuchs and Bange (2010, p. 130)	0.97	0.94
		0.53	IC reconciliation is done on operational level within the ERP systems	Pfitzmayer (2005, p. 82)	0.52	0.51
		−0.03	IC reconciliation uses EDI (Electronic Data Interchange) (a)	Pfitzmayer (2005, p. 82)	0.42	0.48
		−0.91	IC reconciliation is done on operation level and supported by a data base solution (b)	Pfitzmayer (2005, p. 82)	0.34	0.40
	I	0.83	Consolidation is done within an integrated planning and consolidation application	Fuchs and Bange (2010, p. 133)	1.37	1.28
4	S	0.47	Consolidation application is used for simulation and scenarios	Krönke and Marx (2008)	0.53	0.54
	O	0.6	Reporting data is provided automatically by ERP systems	Ribaudo et al. (2010, p. 9)	1.18	1.19
		0.58	Data preparation (e.g. validation and reclassification) is supported by an application	Esch et al. (2008, p. 17)	0.98	0.97
		0.41	Corporate finance monitors the whole reporting process, e.g. within closing cockpit	Fuchs and Bange (2010, p. 131)	1.2	1.19
3	S	0.32	Consolidation processes integrate actual and plan values	Fuchs and Bange (2010, p. 125)	1.34	1.34
		0.19	Consolidation application processes qualitative information, e.g. notes	Kammer (2005)	0.90	0.93
		0.12	Legal and management consolidation are integrated into one data base and consolidation application	Kaplan (1990, p. 23)	1.53	1.57
	O	0.32	Reporting data is provided via upload functionalities	Fuchs and Bange (2010, p. 125)	1.18	1.15
		0.09	Corporate finance evaluates data upload, corrections are done by legal and management entities	Ribaudo et al. (2010, p. 9)	1.37	1.4
	I	0.46	Consolidation is done within a standard consolidation application	Esch et al. (2008, p. 4)	1.03	1.03
2	S	−0.93	Legal and comprehensive management consolidation are separated	Kaplan (1990, p. 23)	0.4	0.48
	O	−0.65	Corporate finance evaluates data quality and corrects reporting data	Ribaudo et al. (2010, p. 9)	1.11	1.22
1	S	−0.94	Legal and simplified management consolidation are separated	Kaplan (1990, p. 23)	0.49	0.56
	O	−0.99	Reporting data is provided by manual data entry	Wettstein and Kueng (2002, p. 8)	1.12	1.22
		−1.26	IC reconciliation is done manually and in a decentralized way	Pfitzmayer (2005, p. 82)	0.68	0.76
	I	−0.95	Consolidation is done manually, e.g. within MS Excel	Kaplan (1990, p. 23)	0.5	0.54

5.4 MCS MM

In the following, the partial models are analytically aggregated in one MCS MM (**Table 11**), which has been assessed with focus group A. Thereby, dependencies and inter-domain relationships between the core domains reporting, planning, and consolidation are reflected, i.e. the commonalities between and driving forces behind the three domains are extracted.

The interpretation shows that the domain models are consistent with each other (similar aspects are addressed on the same level) and also lead to a consistent overall MCS MM. While we understand that the aggregation only provides limited insights into cross-domain relationships, we thrive for an easy to understand executive summary-like presentation to also enable management-oriented audiences to reflect and apply our research (cp. Hevner et al. 2004, "Guideline 7: Communication of Research"):

- Basic, external-driven MCS: The first level is strongly influenced by legal requirements of financial accounting and consolidation. Furthermore, this level is also characterized by high manual efforts and very low IT support.
- Balanced MCS: Level 2 strengthens internal management reporting (external and internal reporting are now balanced), providing additional information and analysis, as well as additional

Table 11 The MCS MM

	Level 1	Level 2	Level 3	Level 4	Level 5
Reporting	Reporting oriented towards financial measures and external requirements. The focus is on executives within the corporate center. Processes are highly manual and results are paper based standard reports.	Extended management approach with focus on internal management requirements. Reporting and analysis services for corporate and business units. A first data warehouse serves as information platform.	Comprehensive reporting approach with risk measures, advanced analysis and dedicated services for specific user groups. Well designed and automated reporting processes, advanced analysis tools and information portals do exist.	Reporting approach emphasizes strategic measures, analysis and instruments. Standard reporting is streamlined and optimized so that management accounting can focus on supporting the business as a 'business partner'.	Reporting levers the potentials of modern BI environments: executive are 'self-empowered', e.g. with mobile devices and dashboards. Management accounting implements a 'reporting and analysis factory'.
Planning	Financially oriented short-term planning, which is cunducted manually on the basis of spreadsheets.	First triad of planning systems by adding long-term planning – but no integration into operational planning. Planning quality is moderate as planning methods and IT support are basic.	Comprehensive financially oriented and integrated planning system, based on well organized planning processes and templates. For the first time, a concept-oriented planning application is used.	Integrated long- and short-term planning with strategic orientation, based on quality ensuring methods. First advanced IT enablement relieves management accounting and enables new role as business partner.	Corporate planning uses the potentials of modern IT for process optimization as well as planning quality assurance.
Consolidation	Legally required consolidation, based on consolidation runs with high manual effort and basic IT support.	Separated management consolidation complements legal consolidation. Corporate finance has to invest significant resources in order to ensure data quality. Still no state of the art consolidation application is used.	Comprehensive consolidation with legal, management, and plan consolidation. One single and integrated data base exists. Processing of data using a standard consolidation application and well-defined processes. Responsibility for data quality is shifted to decentralized entities.	Enhanced usage of consolidation capabilities: quality-ensuring mechanisms are established on transactional level, data is automatically populated from local accounting applications. Corporate finance is able to focus on monitoring the process.	Optimization of IC reconciliation with dedicated application support as well as advanced consolidation software and workflow support.
Label	Basic, external-driven MCS	Balanced MCS	Comprehensive MCS	Strategic MCS	IT-enabled MCS

planning and consolidation capabilities. Management accountants evolve into the role of analysts. IT support increases and first DWHs are deployed.

- Comprehensive MCS: Level 3 captures a broad range of well-aligned MCS capabilities. Processes are partially automated and a broad suite of analytical IT applications is available. Management accountants act as supervisors and organizers of the reporting and planning processes.
- Strategic MCS: Level 4 is dominated by the concept of strategic management. Correspondingly, reporting and planning are focused on strategic topics, and management accountants act as 'business partners'. Furthermore, first advanced IT applications for analysis are used. Moreover, data quality is ensured by implementing corresponding mechanisms on transactional level.
- IT-enabled MCS: The fifth and final level is strongly driven by the usage of modern IT capabilities, both on a transactional and analytical level. State of the art reporting applications are deployed for information consumers. Planning and consolidation leverage the potentials of latest technology.

6 Discussion

For discussion, the paper reflects the results on the basis of the key design science criteria 'rigor' and 'relevance' (Hevner et al. 2004, pp. 87–88). Rigor requests that the design process and the design results are traceable, transparent, reliable, and valid (Frank 2000, p. 44). Relevance is defined as the ability to solve the outlined problem (March and Smith 1995, p. 254).

As missing methodical rigor of existing MMs has been a central motivation of this paper, the selected research method (RA algorithm and cluster analysis) aims at reducing subjectivity in MM construction. The validity of the items has been ensured by using the existing knowledge base as well as pretesting the designed questionnaire with focus groups A and B. From a content perspective, the applica-

tion of items and method results in a consistent and reasonable MCS MM, which is in line with and enhances existing academic-based models (e.g. to Wettstein and Kueng (2002) for reporting, to Gluck et al. (1980) for planning, and Kaplan (1990) for consolidation).

To evaluate the relevance of the MCS MM, the model has been presented to focus group B, which appreciated the model as a valid and useful benchmark and orientation for their MCS development. From a design perspective, the MCS MM and the corresponding questionnaire support the outlined requirement to assess the as-is situation in order to understand possible evolution directions and to determine a desired target configuration. The applicability has been demonstrated within a session of focus group B: Being confronted with their individual and best of class results, the participants recognized gaps, which they assessed as valuable inputs for improving their existing MCS approaches. Four of the six participants of focus group B mentioned that they would use the individual gaps and the model as a trigger to set up new improvement projects. Criticism occurred regarding the fact that the sub-models do not contain items in all dimensions on all maturity levels. In addition, several special topics have been mentioned, which should be incorporated in the model's next iteration, such as accounting master data and the overall accounting IT architecture.

To sum up, the MCS MM has demonstrated to be a useful means for MCS design. As demanded by several researchers (Malmi and Brown 2008; Otley 1999), the MCS MM provides a comprehensive and integrated view: It enhances existing MMs by addressing more than one single MCS domain and by reflecting latest developments, e.g. new BI capabilities. Therefore, the MCS MM can be seen as a contribution to the knowledge base.

7 Summary and Outlook

In today's companies, corporate management relies on formal and IT-based MCSs. Despite their long tradition in research, the configuration of MCSs is still a challenging question. MMs are an established means to identify strengths and weaknesses of certain domains of an organization. The analysis within this paper shows that existing MMs often do not address a holistic view on MCSs: They focus on single MCS domains and neglect the IS perspective. Moreover, existing MMs are lacking a sound theoretical foundation and/or are derived on the basis of an arbitrary design method. Therefore, this paper aims at developing a sound and rigorous MCS MM, based on empirical data and the RA. As a result, the paper outlines three partial MMs for reporting, planning, and consolidation, which are integrated into one holistic MCS MM. The five maturity levels of this MCS MM guide MCS evolution from a basic, external-driven MCS (level 1), to a balanced (level 2), and comprehensive MCS (level 3), serving the whole corporation with advanced reporting, planning, and consolidation services. Ultimately, MCSs show a strong strategic focus (level 4) and leverage the potentials of modern IT (level 5).

The empirical-based MM construction ensures the rigor of the MCS MM and is an innovative example of deriving MMs. Thereby, it contributes to the knowledge base of our research community (theoretical implication). Considering managerial implications, the proposed MM provides a valuable artifact for assessing the maturity of MCSs and guiding future development. Incorporating reporting, planning, and consolidation as well as modern BI applications, the MCS MM advances its predecessors and reflects current developments.

Like every empirical research, our work comes with limitations. First of all, the MM construction process is based on the personal judgment of the individuals who completed the survey. Moreover, the value of the MM has been discussed but not deeply analyzed or proven. Therefore, future research should focus on a more comprehensive and sophisticated evaluation. Additionally, more insights should be given on how to apply the MM effectively. Future research should also be directed towards enhancing the MM with more fundamental information management topics, such as master data management, data quality management and IT architecture management. Another research direction should be focusing on situational MM design. The RA method enables the development of dedicated MMs for specific sub-samples. As the development of MCSs is continuing, a MM evolution should be anticipated and an iterative survey execution should update the model in regular research cycles.

Abstract

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A Maturity Model for Management Control Systems

Five Evolutionary Steps to Guide Development

Corporate management in today's international companies has become increasingly complex. To cope with the growing challenges, information technology (IT)-based management control systems (MCSs) covering reporting, planning, and consolidation have been deployed. Despite their tradition in management research, the 'right' setup of MCSs is still challenging. Maturity models (MMs) are an established instrument to identify strengths and weaknesses of certain domains. As existing MMs rather focus on single MCS domains, neglect an IT perspective and miss a sound methodical foundation, this paper outlines an empirically and algorithmically constructed MCS MM. The model consists of three partial MMs for reporting, planning, and consolidation, which are integrated into one holistic MCS MM. The five levels of the MCS MM guide MCS evolution from a basic, mandatory/external-driven MCS (level 1) to a balanced MCS (level 2), and a comprehensive MCS (level 3). Ultimately, MCSs show a strong strategic focus (level 4) and leverage the potentials of modern IT (level 5).

Keywords: Corporate management, Management accounting, Management control systems, Business intelligence, Maturity models, Design science

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