

Critical Success Factors of Corporate Performance Management (CPM)

Literature Study and Empirical Findings

Friedrich Hervé Lien Mbep
 University of Applied Sciences of Neu-
 Ulm (HNU)
 Neu-Ulm, Germany
 Friedrich.lien-mbep@hs-neu-ulm.de

Olaf Jacob
 University of Applied Sciences of
 Neu-Ulm (HNU)
 Neu-Ulm, Germany
 Olaf.jacob@hs-neu-ulm.de

Louis Fourie
 Cape Peninsula University of
 Technology
 Cape Town, South Africa
 fouriel@cput.ac.za

Abstract— While many studies put emphasis on the linkage between Business Intelligence (BI) and Corporate Performance Management (CPM), few analyze directly the critical success factors that characterize CPM. The aim of this study is twofold: First, the study investigates common practices regarding the factors that characterize CPM. Second, the study develops a reference process model for CPM which describes key processes for the design and implementation of BI and BI-related capabilities. Following this, we conducted a theoretical analysis using the current literature available and an empirical analysis by means of a survey. The objectives of this theoretical and empirical analysis are to assess to what extent privately listed organizations in Germany are aware of the existence of CPM factors. Using the principal factor analysis method with Promax as oblique rotation, the results delivered a consistent number of factor items for CPM, which were grouped into six main factors.

Keywords: *Corporate Performance Management; Business Intelligence; Critical Success Factors.*

I. INTRODUCTION

Due to the phenomenon of globalization, organizations today are facing the problem of high dynamic and very complex business environments. Thus, executives, managers and other decision makers have been looking for systems that are appropriate to support the execution of corporate strategy by monitoring and managing the performance of management and business processes [1].

Besides several other popular decision support systems that have been developed over several decades to support this goal, e.g., Decision Support Systems (DSS), Executive Information Systems (EIS), Data Warehouses (DW), or Business Intelligence systems (BI), Corporate Performance Management (CPM) has evolved as a new concept that describes a series of business processes designed to optimize both the development and execution of business strategy [2].

Despite several definitions, CPM is coined as “*an umbrella term that describes the methodologies, metrics, processes and systems used to monitor and manage the business performance of an enterprise*” [3].

However, both the development and execution of business strategy, and the monitoring and management of the organization’s performance require accurate, timely, consistent and reliable data [4]. Thus, organizations should look at other technological systems such as Business Intelligence (BI) that can consolidate and leverage the vast

masses of data to improve decision-making of management [5]. BI is coined by several academics as a broad category of applications that extract and transform data from source systems, facilitate data visualization and allow users to view subsets of data according to different dimensions [6]. Intelligence refers to the information that is valuable for an organization to manage a business. BI provides the infrastructure and technologies that help integrate business data, process data into actionable information to support meaningful decision making [7], and enable the organization to quickly adapt to their changing environment. BI is considered as a technological means to support and improve CPM at all levels of management, e.g., strategic or operative management. It provides executives, managers and other decision makers with actionable information when needed [8].

Following this, there is a link between CPM and BI. Building a strong link between CPM and BI has been highlighted by several academics, e.g., Melchert et al. [9]. This link is based upon business metrics and key performance indicators (KPIs) following a top-down approach [10], [11].

Before identifying the metrics and KPIs that define the link between CPM and BI, it is worthwhile to assess the factors that are critical to CPM. Unfortunately, there is a paucity of studies and little academic contributions that examine the success factors of CPM. To address this above-mentioned gap, the authors first completed a thorough literature review and conducted an empirical analysis of CPM factors using statistical factor analysis based on a sample of German companies.

The study is structured into eight sections including this introduction section. The second section briefly summarizes the meaning and role of CPM by reviewing and selecting appropriate literature. The third section describes in details the holistic reference process model developed for CPM. Section IV explains the research methodology conducted in this study, which is followed by the data collection in Section V. The sixth section summarizes the research results and the discussion of the results is provided in section VII. Finally, the last section includes the implications of the study for theory and practice, the research limitation and avenues for future research.

II. THE MEANING AND ROLE OF CORPORATE PERFORMANCE MANAGEMENT

CPM is a synonym for several management and business concepts that systematically drive the strategy of organizations by leveraging their processes, methodologies and metrics. CPM is a holistic management approach that combines business strategy and technological infrastructure [9] and provides a common frame of closed-loop reference processes [12]. CPM consists of business strategy, planning, forecasting, and financial management. It also includes monitoring processes with several control or feedback loops [3]. The feedback loops in CPM facilitate communication between top and operational management. The communication directs the entire organization towards accomplishing common organizational objectives. CPM can be comprehended as a methodic approach that enables organizations to define, measure and manage their performance, guide organizations towards their strategic goals, and support management functions [12].

The current academic literature and the literature provided by BI vendors use different terms to describe the concept CPM [3], [12]. While some academics such as [2], refers to it as Enterprise Performance Management (EPM), others such as Baltaxe and Van Decker [13] and Brunner and Dinter [14] rather use the term Business Performance Management (BPM). Besides this, we observed that each BI vendor makes creative use of language and vocabulary, and uses its own unique vocabulary and associated definitions of the terms and acronyms. As such, BI vendors freely invent esoteric new acronyms, and stretch and bend commonly used terms to mean new or identical things.

SAP, for example, uses the term “Enterprise Information Management” (EIM) as an umbrella term to describe their BI products and other related applications, including SAP financial performance applications. Oracle, again, uses the term “Enterprise Performance Management” (EPM) as an umbrella term for a fairly comprehensive BI product line that features the Hyperion Performance Applications. IBM, the other major BI vendor prefers the simpler term “Performance Management” (PM) in a more contracted way. Consequently, the term CPM is actually confusing for decision makers when trying to understand and compare the options that best support the strategy for collecting, organizing, managing, analyzing and visualizing the massive amount of data that daily passes through the organization.

In an effort to provide clarity to the industry, the BPM Standard Group [15] defined BPM as a methodology focused on the optimization of the execution of business strategy. BPM consists of “*a set of integrated, closed-loop, analytical processes that are supported by technology and address both financial as well as operational needs. The core financial and operational processes of BPM include planning, consolidation, reporting, analysis and the deployment of linked key performance indicators (KPIs) throughout an organization*”. Biere [3] defines CPM as “*a*

set of processes that assist organizations to optimize their business performance by providing a framework for organizing, automating, and analyzing business technologies, processes, and systems that drive business performance”.

As CPM, EIM, EPM and BPM nearly shape the same discipline, e.g., strategy management, planning, budgeting and forecasting, financial management, consolidation and reporting, the acronyms can be used interchangeably and be considered synonyms. However, the authors avoid the use of the acronym BPM as it causes confusion with “Business Process Management”.

The role of CPM has been considerably described by a large number of academics. Aho [10] and Marx et al. [16] have underlined that CPM represents the strategic deployment of BI solutions. Miranda [17] and Olszak and Ziemba [18] have suggested the necessity to develop an integrated approach of CPM in order to build, implement and use Business Intelligence solutions effectively. The integrated approach, which consists of four basic dimensions: business, function, technology and organization, establishes a set of processes or several areas of action where BI systems can be deployed.

Biere [3] and Simmers [19] conclude that CPM is the biggest growth area in Business Intelligence Analysis. CPM is a strategic concept which tends to focus on the performance capabilities and functions of the C-suite, e.g., CEO, CFO etc. In addition, CPM refers to the basic operations of an organization and how they impact the bottom line towards the achievement of business strategy and strategic objectives. As such CPM helps organizations to find bottlenecks and efficiencies at the strategic, tactical and operational level. IT aligns Business Intelligence with strategic, business and functional processes. CPM relates to the implementation and evaluation of an organization’s vision, mission and strategic objectives by using Performance Indicators (Key Performance Indicators, metrics or variables).

III. THE HOLISTIC CPM REFERENCE PROCESS MODEL

Over the past years, only a few academics and industrial experts have attempted to develop reference process models for CPM, e.g., Ariyachandra [2], Melchert et al. [9], Oehler [12], Jetter [20], Becker et al. [21], Klaus [22], PriceWaterHouseCooper [23], van Roekel [24], and Rausch [25]. However, we assume that these reference process models were not proven to be standard for all organizations as they do not describe how an ideal and typical system for CPM should look like.

Based on the necessity suggested by [17] and [18] towards developing an integrated approach of CPM, the first efforts of this research primarily consist in developing a holistic reference process model for CPM that is generic enough and suitable to apply in any kind of organization. The holistic reference model supports to build, implement and use Business Intelligence Solutions directly in a

particular CPM related business process, e.g., the strategy planning process or financial management process.

The CPM reference process model in Figure 1 was developed from relevant literature and from observations and experience of the authors. It can serve as a usefully broad tool and provides an overview of the major CPM processes within the organizations upon which BI can be designed and implemented successfully.

process execution at the level of the value chain, and can be described by three different architectonic connotations: First, the holistic reference process model is balanced, i.e. it puts in relationship several separate processes which can be independently supported by BI technology and related BI-resources. Second, it is arranged vertically by process areas and horizontally by business units, business departments and profit or cost centers. The reference process model is strictly hierarchical presenting five distinct closed-loops

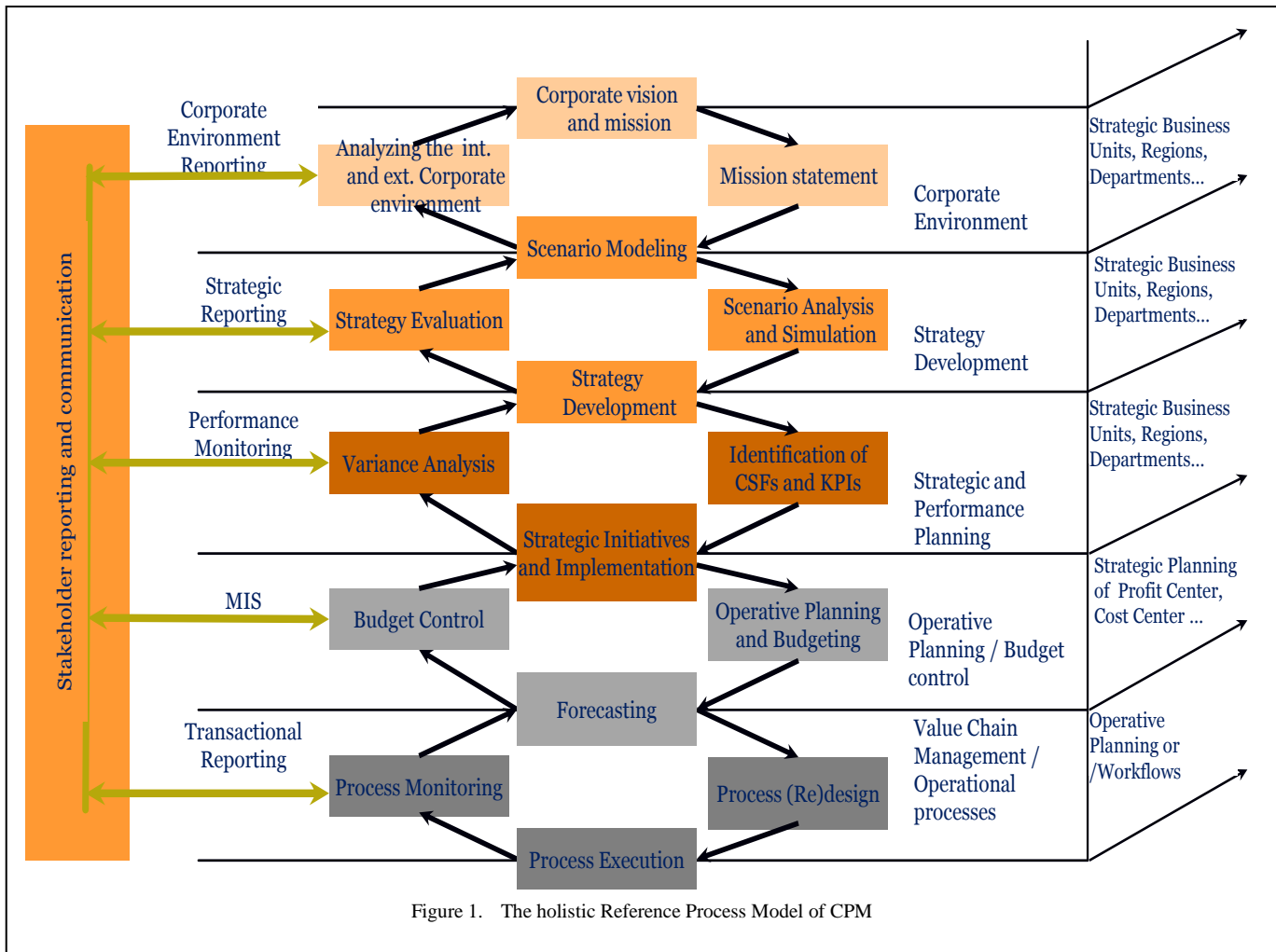


Figure 1. The holistic Reference Process Model of CPM

The reference process model is in the form of several structural hierarchical levels describing the sociotechnical system, and depicts a complete picture of the CPM-related processes of an organization. Each level is closely linked to the next and completed with a closed loop or feedback loop to ensure a continual monitoring of the process performance [12]. Few processes of the model have already been covered by existing related approaches, e.g., Ariyachandra [2], Melchert et al. [9], Oehler [12], Jetter [20].

The CPM reference process model in Figure 1 integrates strategic planning at the top level of management with the

regarding the levels of aggregation: the corporate environment level at the top, followed by the strategy development level, the performance planning level, the operative planning level and the value chain management level which constitutes the bottom line or basic operational processes, e.g., the procurement or distribution processes.

A. The corporate environment level

This level refers to the level at which executives, managers and other decision makers formulate the corporate strategy, e.g., the vision and mission of the organization while analyzing the internal and external forces that can

impact the success of the organization, e.g., the changing market conditions. To analyze the entire organization's environment, top executives and the board of directors can use the business methodology known as STEP analysis. STEP is an acronym for Sociological changes, Technological changes, Economical changes and Political changes. The output of the analysis is a list of strategic objectives and organizational critical success factors (CSFs).

B. *The strategy development level*

This level is the most significant level in the CPM reference process model. It includes sub-processes such as scenario modelling, scenario analysis and simulation, and strategy evaluation. The organization's strategy, which constitutes the output of this level, must be distinctive enough to ensure long-term profitability and a competitive advantage. The organization's strategy must be depicted in the form of a strategy map as suggested by Kaplan and Norton in the Balanced Scorecard (BSC) methodology which structures different perspectives, (e.g., customer perspective, financial perspective, employee perspective, process perspective) in a cause-effect-relationship. All subsequent analysis and decision making are based upon the quality of the relationship values.

C. *The performance planning level*

This is the level where a strategy plan should be transformed in one or many action plans in order to implement the corporate and business strategy. Moreover, appropriate performance indicators, (e.g., of quantity, quality, cost effectiveness, or timeliness) must be assigned to each strategic objective or goal where applicable and to each functional area which achieves the strategic business objectives. The performance planning does not only refer to the planning of employee responsibility and accountability. Other critical performance planning elements include performance resources, e.g., processes, Information Technology Infrastructures and applications. The output of the performance planning process includes performance metrics and key performance indicators (KPIs), as well as defined initiatives. Metrics and KPIs are used to measure the effectiveness of the strategic objectives and initiatives [12].

D. *The operative planning level*

This level consists of planning several business or functional areas, e.g., profit centers or cost centers, identifying their respective performance indicators capable of determining their position towards the strategic objectives, and calculating their performance. The operative planning level encompasses sub-processes like forecasting, budgeting and budget controlling. This level assures the compatibility of performance indicators used in all functional areas, as well as their consistency with strategic objectives. Operative planning uses the performance measurement system to identify competitive position, locate problem areas, assist the firm in updating strategic objectives and making tactical decisions to achieve these objectives, and supply feedback after the decisions have been implemented.

E. *The value chain management level*

This level constitutes the lowest hierarchy level in the CPM reference process model with sub-processes like process (re)design, process execution and process monitoring. Communication and value reporting accompany each loop in the holistic reference process model.

Although the term CPM is popular amongst IT consultants, practitioners and BI Software providers, there are little academic studies examining the factors that are critical for the value of CPM. Thus, Ayo [10] stresses the necessity to provide a deeper understanding of what CPM means and highlights its potential value to the organization.

IV. RESEARCH METHODOLOGY

This section explains the research methodology used in this study. Before testing the factors empirically by adopting the survey methodology, we first considered the extensive literature as basis of the research to obtain meaningful factors for CPM.

A. *Research Method*

By conducting a literature review according to the well established methodology by [26], we pursued two major objectives: First, an exploration of the research landscape of CPM and second, the localization of the terra incognita for further research. In order to conceptualize the topic and to identify relevant search terms for literature selection, an explorative search with common literature databases (Google Scholar, ScienceDirect, ACM Digital Library, MS Academic search, Computer science bibliography etc.) led to a first collection of several CPM related terms, such as "Enterprise Performance Management", "Business Performance Management", "Advanced Performance Management". Unfortunately, no results were found while using diverse combinations of CPM and "Critical Success Factors for CPM", "Drivers for CPM", or "Determinants" of CPM". Intentionally, we omitted the keyword "Strategic Management" as it refers to the entire scope of strategic-decision making activity in an organization. The keywords have been iteratively refined and extended during the literature analysis process. We selected highly ranked and/or domain specific journals and leading conferences of the last ten years (2004–2014):

a) Journals of the AIS Senior Scholars` Basket of Journals, i.e. European Journal of Information Systems (EJIS), Information Systems Journal (ISJ), Information Systems Research (ISR), Journal of AIS (JAIS), Journal of MIS (JMIS), and MIS Quarterly (MISQ)

b) BI and social media specific journals: Decision Support Systems (DSS), International Journal of Business Intelligence Research (IJBIR), and Business Intelligence Journal for the BI domain and suitable ACM and IEEE journals

c) Leading conferences: International Conference on Information Systems (ICIS), Americas Conference on Information Systems (AMCIS), European Conference on

Information Systems (ECIS), Hawaii International Conference on System Sciences (HICSS), Conference on Information Systems and Technology (CIST), and Workshop on Information Technologies and Systems (WITS)

d) TDWI’s Business Intelligence Journal

Whereas the basket and CPM specific journals include a manageable amount of issues and articles that enables a complete scan of titles and abstracts as suggested by [26], we had to preselect conference papers by tracks related to CPM and BI. For ACM and IEEE journals, we conducted a keyword search on the whole digital library as no journals focus in particular on the CPM-related domain. We scanned for the hits (resulting from keyword searches) titles, abstracts, and keywords to assess the suitability of an article. Since we could identify only few articles by this method, we subsequently conducted a keyword search on literature databases (EBSCOhost, Scholar, ProQuest and ScienceDirect) by using the aforementioned search terms. We completed the literature pool via a backward search.

B. Analysis of the results

The literature review resulted in 17 adequate articles which analyze the Critical Success Factors for CPM. Due to the rather young research topic, this relatively small amount of articles is not surprising. Also, in most articles that appeared in conference proceedings and domain specific journals, only a very small number discussed Critical Success Factors that describe CPM. Most studies focused on the Critical Success Factors for the implementation of CPM, e.g., champion, management support or management resistance [27]. We consider the wider interest in BI and the stronger focus on the efficient implementation of CPM as reasons for the underrepresentation of such Critical Success Factors within our literature data pool.

Overall, we identified fewer articles than expected that explicitly address the Critical Success Factors of CPM.

A thorough analysis of the Critical Success Factors of CPM in the available literature, only 28 were found relevant to our study. The relevant Critical Success Factors for CPM and the corresponding references are listed in Table 1.

TABLE I. IDENTIFIED CRITICAL SUCCESS FACTORS OF CPM

Factors items	Related studies
Operationalization of business strategy across all business functions	[2], [10], [27]
Operationalization of business strategy across all business units	[10], [28]
Overall Process synchronization	[2], [28]
Process harmonization	[10], [29]
Aligning operational processes with strategy planning	[30], [31], [32], [33]
Strategy-conformed process alignment	[2], [29], [30], [33], [34]

Alignment of strategic planning over all business units and all business functions (horizontal alignment)	[30], [32], [34], [35]
Corporate environment feedback loop	[10]
Strategy development feedback loop	[28]
Strategic planning feedback loop	[36]
Operational planning feedback loop	[1], [34], [37]
Process monitoring	[1], [10], [28], [37]
Data integration	[2], [10], [34]
Method integration	[2], [10]
Process flexibility and dynamic availability	[35], [38]
Common process standards for data changes	[10], [39]
No arbitrary data changes	[10], [40]
Data consistency	[2], [10], [36]
Data completeness	[10], [36], [41]
Data relevance	[10], [41]
Data currency	[28], [29], [41]
Process documentation	[10], [28]
Process transparency	[10], [28], [36] [42]
Communication of processes throughout the organization	[10], [28], [32], [43], 44]
Continual process deployment	[10]
Process traceability	[45]
Standardized rules and Terminologies	[27], 34]
External process compliance	[2], 32]

In the second stage, a questionnaire was developed. Based on the assumption that CPM is the strategic deployment of the BI resources [10], and considering that CPM and BI are two existing heterogeneous management approaches (based on the factors which address CPM illustrated in Table 1), it was considered necessary to statistically test those factors. Thus, the questionnaire was to be exclusively completed by business senior executives and managers.

V. DATA COLLECTION

In order to obtain the information needed, a purposive stratified sample comprising of well-known firms throughout Germany was selected. The enterprises selected for the survey all have a BI infrastructure deployment in at least one business unit. Accordingly, Business Senior Executive Group Members comprising the Vice President,

C-suite members (CEO, CFO), and Managing Directors were asked to filled out 36 questions. The CIOs were not considered. With the aid of an external database, a total of 156 members were reached. Only fully completed questionnaires were included, resulting in a total of 86 usable cases.

An analysis of respondent demographics shows an unexpected high frequency of responses from Business Senior Executives, as well as a high frequency of responses from manufacturing companies. Fewer responses were obtained from the transport sector. From this analysis, it can be assumed that the findings may to some extent be affected by the overrepresentation of the industrial sector, although it may also indicate that CPM is more widely implemented in the manufacturing sector.

The basic structure of the questionnaire was that each identified item was measured through a number of questions to be answered by checking the appropriate value on a 7-point Likert scale. Questions like “Our company uses measurable indicators (Key Performance Indicators and metrics) based on Business Strategy” or “All process/data changes in our corporate performance management are traceable” were asked. To operationalize CPM and to ensure the correct understanding of the CPM concept, a definition of the term was given.

VI. STATISTICAL ANALYSIS

Two different statistical analysis methods were applied to analyze the data sets. These were Principal Components Analysis (PCA) and Principal Factor Analysis (PFA). The analysis was performed upon a combination of different oblique rotations techniques for the data set as recommended by Kaiser and Rice [46] and Ford et al. [47]. Both the PCA and the PFA were used on different basic types of analytical rotations including Promax, Quartimax, Equamax and Oblimin. Such a combination of different methods is useful because no single technique has been shown to be highly accurate over a wide range of conditions in pinpointing the number of factors [46], [47]. Based on numerous tests and evidence, the factor analysis method finally used in this study is the principal factor analysis with Promax as oblique rotation.

The result of this research demonstrates that CPM can be described by distinct factors that correlate with those factors identified previously in the literature review. The six factors for CPM in Table 2 explain 74,975 % of the variance. The factors are based on intrinsic value (eigenvalue), sometimes with a value which exceeds 1. The eigenvalues explains the variances of the factors [46]. Accordingly, the number of factors of the completed questionnaires for CPM was reduced on the basis of explorative factor analysis (EFA) [48]. Different measures were used to identify the appropriateness of the statistical results. First, a Kaiser-Meyer-Olkin (KMO) measure was performed as a formal test to check whether the variables selected have enough in common overall to warrant a PCA and PFA analysis.

In addition, the Bartlett Test of Homogeneity of variances and the Anti-Image-Covariance Matrices were conducted. The findings for the CPM questionnaire were positive. The overall KMO value was 0,860. According to Kaiser and Rice [46], values above 0.6 are high enough to warrant a PCA or PFA analysis.

The results of the Bartlett Test of Homogeneity of variances showed that all the variables are highly correlated. According to the statistical analysis, the value of the Anti-Image-Covariance-Matrices was under 25%. This means that the data set was appropriate for further statistical analysis [49].

TABLE II. RESULTS OF THE FACTORS ANALYSIS

Factors and related items	Load
Factor 1: Process Knowledge	
Communication of processes throughout the organization	,968
Process documentation	,945
Process transparency	,891
Methods integration	,519
Factor 2: Data and Method Integration	
Data integration	,920
Automatic seamless exchange of data	,773
Data consistency	,749
Data maintenance effort	,638
Process traceability	,618
Common process standards for data changes	,542
Data completeness	,525
Factor 3: Data Usefulness	
Data relevance	,966
Data currency	,939
Operational planning feedback loop	,591
Factor 4: Organizational Alignment	
Alignment of strategic planning across all business units.	,938
Alignment of strategic planning across all business functions	,716
Aligning between operational processes and strategy planning	,658
Factor 5: Business Strategy Operationalization	
Operationalization of business strategy across all business units	1,008
Operationalization of business strategy across all business functions	,871
Factor 6: Feedback Loop Based Process Management	
Strategy development feedback loop	,759
Corporate environment feedback loop	,730
Strategic planning feedback loop	,574

Table II represents the factors describing CPM. Those factor items have been grouped in six different factors: process knowledge, data and method integration, data usefulness, organizational alignment, business strategy operationalization, and feedback loop based process management.

VII. DISCUSSION

As illustrated in Table 2, 22 factor items have been validated as describing CPM.

The CPM factor “*Process Knowledge*” emphasizes the important role documentation and transparency play in communicating CPM processes throughout the organization.

The CPM factor “*Data and Method Integration*” shows that the integration of management methods such as the Balanced Scorecard is based upon the integration and consistency of data.

The CPM factor “*Data Usefulness*” stresses that to be actionable for decision making, data must be relevant and current.

The CPM factor “*Organizational Alignment*” illustrates the importance of a strategic linkage between different organizational units or business functions.

The CPM factor “*Business Strategy Operationalization*” refers to the task of executives and other decision makers to identify meaningful KPI’s that are appropriate to evaluate whether or not a business strategy has been successfully implemented.

The CPM factor “*Feedback Loop Based Process Management*” shows that CPM is a continuous flow of processes that must be revised and any required change must be communicated throughout the organization.

Most of the CPM factors encompass 3 to 4 factor items, except the factor “Data and Method Integration” which consists of seven items. This indicates the importance of this factor for CPM. With a loading of up to ,920 data integration is an important criterium for CPM. Data integration enables not only the integration and exchange of data between disparate BI tools but also the integration of management methods such as the Balanced Scorecard and decision support processes like budgeting and forecasting.

We observed that factor items like overall process synchronization, process harmonization, strategy-conformed process alignment, process monitoring, process flexibility and dynamic availability, no arbitrary data changes, external process compliance (,499) and standardized rules and terminologies (,477) have a loading level less than 0,5. Although they were part of the literature review, they were not validated by the empirical study and statistics.

VIII. IMPLICATIONS AND CONCLUSION

The results delivered an extended reference process model for CPM and a consistent number of factor items which were grouped into 6 main factors describing CPM.

The benefit of the presented study for academic and the industrial landscapes is that both the holistic reference process model and the identified and empirically tested CPM factors provide a deeper and clear understanding of the meaning of the concept of CPM.

However, the study was focused only on the empirical analysis of the critical success factors for CPM. Hence, an empirical validation whether or not these collected factors contribute to success has not yet been performed. Further studies are needed to establish the missing relationship of the collected factors with the reference process model. Especially, each collected factor needs to be linked with any process in the CPM reference model, e.g., the factor “Data and Method Integration” with the processes “Forecasting” or “Budgeting”. The objective of the linkage is to see whether a factor is useful to the interrelated process, or not.

In addition, further studies are needed which operationalize the reference process model for CPM, e.g., by assessing efficient and less efficient processes. Accordingly, such studies could analyze the impact that BI and BI-related capabilities can have regarding the optimization of the CPM processes. By doing this, a maturity model of CPM processes and meaningful metrics or Key Performance Indicators (KPIs) need to be designed. Especially, metrics and KPIs can be used as tool to measure the efficiency of each process or key area in the holistic reference process model, and assess the impact of BI and BI-related capabilities within the organization.

The operationalization of both the reference process model for CPM and the identified factors using metrics or Key Performance Indicators (KPIs) will help establish their influence on success.

CPM processes so become the subject of performance management itself, as they support the management of corporate performance within organizations.

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