

# **Value Based Management –**

## **Empirical Evidence On Its Determinants And Performance Effects**

### **Inaugural Dissertation**

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**Dedicated to  
my parents**



## Foreword

When G. Bennett Stewart picked a title for his fundamental work on Value-based Management (VBM), he chose his words carefully. His book is not just about value, it is about “The *Quest* for Value”, implying that the approach matters just as much as the result. While this partly justifies writing a book on shareholder value in the midst of a world economic crisis, it also alludes to my process of drafting this dissertation. To me, this book is not an end in itself but the rewarding result of the interactions of many “value drivers” who fostered my understanding of the subject and supported me as a person. For this, I would like to give credit to all them.

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Rainer Lueg

## **Abstract**

The objective of this dissertation is to empirically examine the determinants and performance effects of Value-based Management (VBM). In a paper-based format, the dissertation firstly addresses the question if existing empirical studies consider the normative requirements brought forward by VBM-proponents. By providing a framework and comparing 120 papers from this field, I can show that meaningful hypothesis testing has yet been impaired by the narrow scope of data sets as well as methodological misspecifications. Cluster analysis is used to determine different research streams in the VBM-literature, which allows the identification of the most relevant performance studies. Across all 120 studies, the verdict if VBM improves performance is ambiguous. Quite contrary, the few best-practice studies express a rather favorable opinion. Yet, studies dealing with determinants of VBM are virtually nonexistent. Finally, this paper makes suggestions on how to close this research gap.

Building on these previous findings, the second research question concerns contextual factors determining the sophistication of VBM-systems. Using a selection-approach, this paper investigates associations between different VBM-sophistication and several organizational and environmental factors. Data was collected through questionnaires and interviews with top executives from companies of the German stock-index HDAX, as well as from commercial databases and audited financial statements. Regression models and multivariate analysis of variance (MANOVA) suggest that sophisticated VBM-systems are associated with the pursuit of a defender strategy, organizational interdependence, capital intensity, low environmental uncertainty, and past financial crises. This implies that companies may not deem a full implementation of VBM equally beneficial under certain circumstances.

Based again on the findings from the literature review, the third research question investigates whether organizations with relatively high VBM-sophistication outperform their peers. There are two major findings: First, the implementation of VBM does pay off: Companies extending their VBM-system experience significant abnormal returns. Among others, the most important success factors are value-oriented strategy, a sound understanding of value drivers, the introduction of variable salary for employees at all levels, and stock-based compensation. Nevertheless, these factors only have an effect if supported by well-developed investor relations. The second finding is that these results on VBM and company performance can easily be biased through poor theory and inappropriate statistical models. The most important pitfalls involve the use of perceptive performance measures, or the simplistic and statistic analysis of this complex and dynamic relationship.





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## List of abbreviations

ABC	Activity-based Costing
BSC	Balanced Scorecard
CAPM	Capital Asset Pricing Model
cf.	compare for
CFROI	Cash Flow Return On Investment
E	Effect strength
EMH	Efficient Market Hypothesis
EBIT	Earnings Before Interest and Taxes
EVA	Economic Value Added
e.g.	exempli gratia (for the sake of example)
i.e.	id est (that is)
KPI	Key Performance Indicator
MANOVA	Multivariate Analysis Of Variance
MAS	Management Accounting System
NPV	Net Present Value
PES	Partial Eta Squared
PLS	Partial Least Squares
VBM	Value-based Management
R&D	Research and Development
ROE	Return On Equity
ROI	Return On Investment
ROS	Return On Sales
SIC	Standard Industrial Classification
SPMS	Strategic Performance Measurement Systems
TSR / TRS	Total Shareholder Return / Total Return to Shareholders
VIF	Variance Inflation Factor



## **A Introduction**

### **1. Problems and objectives**

Value-based Management (VBM) is currently one of the most debated issues in management accounting. Some authors even depict VBM as the current, fourth evolutionary step of this academic discipline, i.e. as the very essence of most issues in management accounting today (IFAC 2002, 1998; Ittner & Larcker, 2001). The antecedents of VBM were simplistic financial control (first stage before 1950s), the supply of information (second stage, 1960s), and quality improvements and cost driver techniques (third stage, 1980s). In the 1990s, management accounting has evolved one step further from costs to overall value, i.e. to VBM. As a value driver technique, VBM encompasses a more strategic approach, and is alternatively referred to as Shareholder Value Management, or Strategic Performance Measurement Systems (SPMS). In more detail, VBM is defined as a management accounting system (MAS) linking strategic objectives to a coherent set of performance measures and compensation through cause-and-effect-chains (Chenhall, 2005; Ittner & Larcker 2001; Young & O'Byrne, 2001).

One major issue attracting the interest of researchers and organizations is the claim of VBM-proponents that VBM causes improvement in corporate performance. Their theoretical argument is that the creation of value is inevitable if all corporate processes and resource allocations are connected to a set of shareholder-relevant performance measures. This line of reasoning seems quite compelling as VBM-performance-measures address most shortcomings of accounting or perceptible performance measures: The time-value of money is considered, value is expressed in investor-relevant cash-terms, risk and the cost of capital associated with returns is priced in, future expectations are incorporated into valuations without limiting management's view to a single period, and the tolerance for gaming accounting figures is diminished (Copleland, Koller & Murrin, 2000). Based on these theoretical conjectures, VBM-proponents pledge that companies with a full-fledged VBM-system will perform better than peers who comply with the principles of VBM either only partly or not at all. It may appear to be self-evident that those organizations directing all decision making processes and resources allocation towards the maximization of a shareholder-value-figure will create more value for their shareholders than peers adhering to different goals and principles.

Yet, empirical findings do not uniformly reinforce this common belief. While there are plenty examples of favorable effects of VBM on corporate performance, there is also serious evidence suggesting that there is no association. Some sources even report a significantly negative relationship. Hence, neither the theoretical superiority of VBM in terms of performance has been convincingly confirmed yet, nor has the context been analyzed in which VBM is most effective (Ittner & Larcker, 2001). This thesis will act upon these gaps by providing empirical evidence on the determinants and performance effects of VBM. The contribution shall be made based on three objectives:

*Objective 1:* Up to date, an overwhelming number of studies dealing with the performance effects and its associated contexts already exists. The opening objective of this dissertation is to understand their implications and identify critical issues in empirical research. VBM-studies will be reviewed using a framework containing the minimum requirements for a performance study on VBM. First, a categorization of different research streams will help to depict the most relevant VBM-performance-studies. Second, the literature's findings on the performance effects of VBM are evaluated. Third, the remaining gaps in research will be explained, and guidelines for improved hypotheses testing will be developed. These issues will be dealt with from a methodological- and statistical perspective.

*Objective 2:* The second objective is to shed light on the issue if the 'optimal' VBM-sophistication – i.e. as desired by the implementing company – is determined by contingencies surrounding the organization. First, the thesis will provide empirical measurement of VBM-sophistication within organizations. This improves the understanding whether there is one best solution in applying VBM across companies. Second, it will be tested if existing differences are arbitrary, or rather the result of context the organization is exposed to. The viewpoint chosen to investigate these issues is rather management-accounting-related.

*Objective 3:* The relationship between VBM and corporate performance shall be tested empirically. First, the thesis will juxtapose different measures of corporate performance. Second, and based on the prior VBM-measurement, the statistical fit for different definitions of VBM-sophistication (changes or absolute levels) will be tested. Third, a more complex model will be tested to understand indirect effects among the VBM-subsystems. In order to profit from a rather advanced academic field in terms of performance studies, the view on these problems is influenced by the discipline of corporate finance.

## 2. Organization of the thesis

This dissertation is quasi-cumulative and consists in its core of three related but self-contained papers (part B to D). The reader will notice slight differences in the basic literature, style, structure, terminology, and several other aspects, as different research questions demand different foci. Nevertheless, the cogent story line may guide the reader through this book. In detail, the thesis is organized as follows:

Part B is a literature review on VBM. It uses a framework derived from the *normative* performance-measurement-literature to assess the *empirical* VBM-literature. It has distinct foci on the determinants (part C) and performance effects (part D) of such systems (*objective 1*). Requirements for improved hypotheses testing are derived, which lay the foundation for the following investigations of part C and D.

Part C is a contingency analysis of VBM. It seizes the suggestions of part B to improve the understanding which contextual factors *explain* the sophistication of VBM across a set of companies (*objective 2*).

Part D is a performance analysis of VBM. It also builds on the guidelines of part B. This time, the sophistication of the VBM-systems is used as the *explanatory* variable for corporate performance (*objective 3*).

Part E concludes the thesis and indicates venues for future research.



## **B Assessing empirical research on Value-based Management: Guidelines for improved hypothesis testing**

### **1. Introduction**

There are many open issues in research on Value-based Management (VBM). One of the most fundamental questions is whether VBM can keep its main promise of increasing corporate performance. Ittner & Larcker (2001, p. 375) conclude for VBM:

“Finally, the performance effects of the balanced scorecard and other value driver techniques remain open issues. Despite widespread adoption of these practices, we still have little hard evidence that company performance improves with their use. Additional research on the performance effects of these practices can make a significant contribution to the managerial accounting literature.”

Contrary to other Management Accounting Systems (MAS), VBM promises earning at least or above the market return (Stern & Shiely, 2001; Ameels, Bruggeman & Scheipers, 2003; Knight, 1998; McTaggart, Kontes & Mankins, 1994). This highlights why the question brought forward by Ittner & Larcker (2001) requires special attention, and gives reason to conduct a literature review on the performance effects of VBM. Existing reviews on VBM already make significant contributions to this field of research:

The review conducted by Ittner & Larcker (2001) assesses the empirical findings on VBM. The authors draft a framework which is consistent with economic-based and contingency-based theory: The implementation of a VBM-system is broken down into an overall objective and five sequential steps. The authors then conceptualize findings from the abundant literature on this topic. Their discussion of numerous sources from VBM-related fields highlights consistencies in findings. It also shows concise opportunities for future research on the remaining gaps. Future reviews could further contribute to this field by explicitly expanding this framework: Due to the broad scope of their paper, Ittner & Larcker (2001) can only deal detached from their framework with contingency factors and the measurement of corporate performance. In addition to that, ideas could be elaborated how these variables need to be matched statistically with the variables from their VBM-framework.

The review of Ameels, Bruggeman & Scheipers (2003) takes a different approach and compares normative papers on VBM. A major finding is their acknowledgement of

VBM being a holistic system, which goes beyond key financial ratios. The authors suggest that the most important concepts in the prevailing literature are unanimous in their basic views. They also discuss remaining differences in the calculation of key financial ratios, systems and processes, the view on strategy development, and the offered training and education programs. Future works on the theory of VBM could contribute by deriving standardized and empirically testable hypotheses on the diverse normative concepts of VBM.

The review of Davies (2000) again takes another point of view. He bases his framework on Yin (1994) and investigates the validity and reliability of data in VBM-studies. A major strength of this approach is its comparability to other fields of research since the adherence to validity and reliability is a generally accepted standard in any empirical science. The main finding of Davies (2000) is that descriptive evidence on VBM is weak, and explanatory evidence is almost non-existent due to poor sampling methods and a lack of independent academic researchers. Future research can contribute to this field by contextualizing and aligning this framework with existing VBM-concepts, e.g. the explicit VBM-framework of Ittner & Larcker (2001).

The purpose of this review is to understand the literature's findings on the performance effects of VBM. Understanding these findings does not just mean to summarize *what* the numerous VBM-studies conclude on average. The purpose is rather to understand *how* the results were achieved. E.g. the majority of studies may advance one view while a small minority advances the opposite. Yet, the methodology employed by the minority may be clearly superior to the one of the majority. In that case, a literature review should argue in favor of the minority's opinion. Hence, this review first tries to identify a number of such notable studies before analyzing their results and making suggestions for future research. For this sake, I propose three research questions to (1) structure, (2) analyze, and (3) improve this stream of research:

**RQ1:** Is it possible to detect research clusters in the VBM-literature which are helpful to categorize findings?

**RQ2:** What can be concluded from the existing empirical literature about the relationship between corporate performance and VBM?

**RQ3:** How can tests on the performance-hypothesis of VBM be improved?

I approach these three research questions by assessing relevant VBM-studies with a methodological framework. The framework contains the minimum requirements put forward by the normative literature on performance measurement and VBM.



This review is distinct from prior reviews because it focuses explicitly on performance effects. Moreover, it empirically investigates existing qualitative conjectures with quantitative methods like cluster analysis: Ameels, Bruggeman & Scheipers (2003) have dealt with normative publications on VBM while this review examines empirical studies. Davies (2000) judges selected empirical studies by their validity and reliability. This generic approach is most useful in later stages of research as it does not regard the content of the variables employed. Which variables have necessarily to be measured is yet subject to considerable debate among VBM-researchers. This review will take a less abstract approach and delve more deeply into the methodology itself instead of judging its quality. Additionally, the range of reviewed studies in this paper is clearly larger.

This paper substantially extends the prior review of Ittner & Larcker (2001). First, it reviews a complete different set of papers. Ittner & Larcker (2001) present best practice studies from management accounting and relate them to VBM research. Nevertheless, their studies mostly deal with topics the original authors have not set into a VBM context. Concerning e.g. organizational design, Ittner & Larcker (2001) discuss literature from the late 1970s. Yet, most authors agree that the origin of VBM was the work of Rappaport (1981). As this paper exclusively reviews the works of authors who claim by *themselves* to contribute to VBM research, the earliest paper is Finegan (1991). Additionally, most of the studies discussed are published after Ittner & Larcker's (2001) paper was accepted for publication. Hence, one could expect that the authors of the studies in this review have already significantly profited from their comprehensive review. Moreover, the inclusion of studies from the German-speaking area is also a novelty to this field.

Second, this paper offers a more detailed view on the performance variables used in empirical research. This issue was beyond the scope of the already long review of Ittner & Larcker (2001).

Third, this paper takes a more abstract approach by dealing not just with the content, but with the methodology of the studies. It has a distinct focus on the relationship between VBM and performance, while Ittner & Larcker (2001) focus on the way VBM is implemented. They extensively assess the studies in respect of content. However, methodological issues are only dealt with alongside. Yet, since they point out that the poor quality of VBM-research is rooted in methodological misspecifications, these issues entail detailed investigation.

Furthermore, Ittner & Larcker (2001) present a substantial amount of VBM-related studies, which may be overwhelming to readers new to this field. It is also the intent of this paper to narrow down the number of studies that are most relevant for future research and hypotheses testing. This is done by explaining how any VBM-study can be assessed, and by consequently clustering existing research into different schools of thought. Again, this is a novelty to this field of research. This review is therefore also beneficial to academics for identifying minimum requirements for future VBM-studies. In summary, this methodology-focused paper constitutes an important link between assessing the content of VBM-studies (Ittner & Larcker, 2001) and the quality of that research (Davies, 2000).

The remainder of this paper is organized into five sections: Chapter 2 outlines the literature search method. Chapter 3 develops the framework based on existing literature and theoretically anchored criteria. Chapter 4 evaluates the variables employed in prior research. Chapter 5 discusses the three research questions: Clusters are formed, an answer on the performance effects of VBM is offered, and guidelines for improved hypothesis testing are given. The last chapter concludes the findings, and highlights limitations and implications of this research.

## **2. Literature search method**

The literature search targets studies empirically examining variables related to VBM. Moreover, to be eligible for inclusion, studies have to meet the following two criteria:

- (1) The study has to be empirical in the sense that the analysis and interpretation is based on primary or secondary data (Birnberg, Shields & Young, 1990). This leads to the exclusion of both ‘success-stories’ about single corporations where no distinct data sets are gathered, as well as of analytical evidence, e.g. (Stewart, 1991) or (Rappaport, 1981).
- (2) The study has to claim either that it deals with the general topic of value orientation (active criterion), or with an MAS explicitly developed to pursue the goal of shareholder value maximization (passive criterion), e.g. ‘Economic Value Added’ (EVA) or ‘investor relations’. It is important to note what this definition excludes: Firstly, it leaves out studies on single instruments like Activity-based Costing (ABC), incentive systems, budgeting, or the Balanced Scorecard (BSC) unless it is stated in title or abstract that the results are interpreted from a VBM-perspective. Even though these MAS can of course be part of a VBM system, they either existed well before the ad-

vent of VBM (e.g. budgeting) or have not been explicitly developed to maximize the wealth of shareholders (e.g. BSC). Including them would eventually bear the risk of re-labeling anything as VBM that is claimed to be ‘good’ management. Such an act of academic imperialism would blur the profile of any specific MAS and prevent meaningful interpretation. Second, the definition excludes studies relating to *general* performance measurement, since the term ‘performance’ does not necessarily mean the unilateral maximization of shareholder value.

The bibliometric search intends to cover most empirical evidence on VBM in English- and German-speaking areas published from the inception of this stream of research in 1979 up to 2006. In a first step, I scanned the abstracts of 20 English-speaking academic and practitioner journals that Zimmerman (2001) – based on Ittner & Larcker (2001) – identified as the most important ones for VBM.<sup>1</sup> The search also included German-speaking research due to the large market capitalization (i.e. its inherent shareholder value orientation) of corporations in Germany, Switzerland and Austria in comparison to the non-English-speaking rest of the world.<sup>2</sup> In their German-speaking journal-ranking, Hennig-Thurau, Walsh & Schrader (2004) and Schrader & Henning-Thurau (2008) identify the most relevant journals for VBM.<sup>3</sup> In a second step, I followed any footnote referring to other empirical VBM-studies, which led to the inclusion of books, working papers or corporate publications where publicly available. Since corporations conduct research as well, I also checked for publications at the download sections of those companies, which are identified by Ameels, Bruggeman & Scheipers (2003) as important promoters of VBM.<sup>4</sup> This process was repeated with the newly found studies until no more relevant literature could be identified. This acknowledged ‘ancestry approach’ (Cooper, 1982) decreases the risk of omitting any important empirical findings on VBM.

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<sup>1</sup> The Accounting Review; Contemporary Accounting Research; Journal of Accounting and Economics; Journal of Accounting Research; Review of Accounting Studies; Accounting Horizons; Academy of Management Accounting; Accounting, Organizations, and Society; Journal of Accounting, Auditing and Finance; Journal of Accounting and Public Policy; Journal of Accounting Literature; Journal of Business, Finance, and Accounting; Journal of Management Accounting Research; Management Accounting Research; AICPA publications; FASB publications; Financial Analysts Journal; Harvard Business Review; Institute of Management Accountants; Journal of Applied Corporate Finance.

<sup>2</sup> It may be argued that other language areas with well developed capital markets could be included as well, e.g. Japan. Nevertheless, extending the English-speaking sample with evidence from German-speaking countries is not likely to be a detriment to this research.

<sup>3</sup> Controlling; Der Betrieb; Die Betriebswirtschaft; Finanz Betrieb; Schmalenbach Business Review; Zeitschrift für Betriebswirtschaft; Zeitschrift für betriebswirtschaftliche Forschung; Zeitschrift für Controlling und Management.

<sup>4</sup> HOLT Value Associates (and their prior/ current owners The Boston Consulting Group and Credit Suisse First Boston); LEK Consulting; Marakon Associates; McKinsey & Co; Pricewaterhouse Coopers; Stern Stewart & Co.

Overall, 123 studies can be identified in 84 literature sources. Three duplicated studies are excluded (e.g. parts of a dissertation later published in a journal), which leaves 120 studies for analysis. The intensity of publications follows a geometric progression with decreases in 1998/99 and 2006, and with the years 2000-2005 comprising 65% of the total publication output.

### **3. Development of the framework**

Research on VBM dates back to the analytic and anecdotal evidence of Fruhan (1979) and Rappaport (1981). They attempt to create an integrated MAS which focuses on the processes that most influence firm value. The definition of VBM in this framework follows the philosophy of its early proponents: VBM is defined as an MAS linking strategic objectives to a coherent set of performance measures and compensation through cause-and-effect-chains (Chenhall, 2005; Young & O'Byrne, 2001).

Over time, several VBM-systems were developed and marketed (Velthuis & Wesner, 2005; Madden, 1999; Stewart, 1991). Consequently, numerous empirical studies have examined the interrelationships between value-oriented MAS and performance. This cumulated in the breakout of "Metric Wars" (Myers, 1996) between opponents and proponents, and as well among proponents themselves. Due to the "diversity in samples, research methods, and theories used by researchers" (Ittner & Larcker, 2001, p. 357), an all-encompassing framework is needed to understand the (in)congruencies of the multi-faceted results of this stream of research. A model to conceptualize the influence of value-oriented MAS (i.e. VBM) on corporate performance has been suggested by the International Federation of Accountants (IFAC, 2002), cf. figure 1. It comprises four categories: (1) Performance outcomes, which include all dependent variables in a study, e.g. stock returns. (2) Capacities required, which include all independent variables, e.g. the resources utilized to enforce an incentive system. (3) Performance contexts, which include all contingency variables, e.g. size. (4) Competency, which describes the statistical relationship between the three variable groups. The IFAC model is chosen as a basic framework since it grasps mutually exclusively and collectively exhaustively all variables usable in performance measurement, as well as the relationships between them.

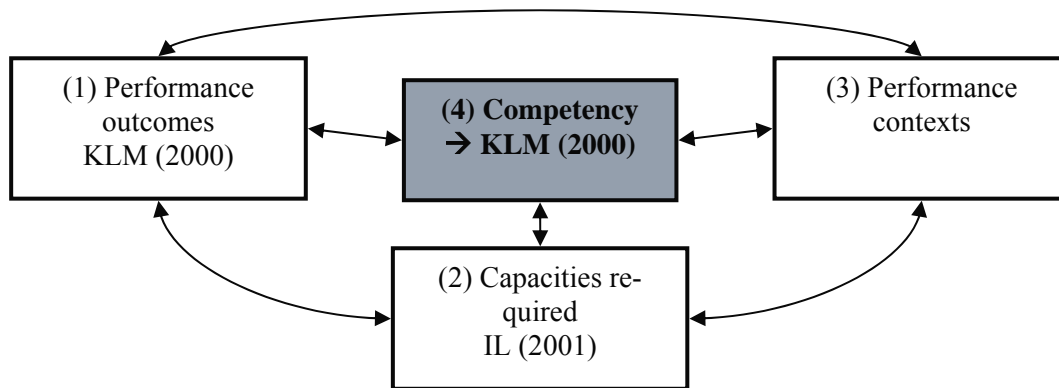


Figure 1: Operationalization of the IFAC (2002) competency model.

To code the sample according to this categorization, I need to parameterize these four categories with variables. Since IFAC (2002) does not provide such an operationalization, existing ones are adopted: (1) Performance outcomes and (4) competency is adopted from Katsikeas, Leonidou & Morgan (2000). They developed their framework for business performance assessment based on a comprehensive literature review on topics like organizational effectiveness, management, or strategy. This makes the framework suitable for a VBM-context as well. For (2) capacities required, I apply Katsikeas, Leonidou & Morgan's (2000) binary coding method to the framework of Ittner & Larcker (2001), who explicitly describe all capacities required for a full VBM implementation. This assures that this framework is contextualized for VBM.

This investigation will not further deal with (3) performance contexts despite the initial intention to do so. The final analysis shows that the consideration of contextual variables is virtually non-existent in VBM research, and does hence not contribute insights to this research. In order to save the reader from the cumbersome discussion of the few but incoherent contingency factors used in the reviewed papers, the conclusion is offered up-front: Contrary to most other MAS like budgets or ABC, the factors influencing the use and sophistication of VBM-systems have been hardly explored yet. Given the rich insights from related MAS (Chenhall, 2003), a contingency analysis of VBM would clearly contribute to the understanding of VBM: In the pursuit of shareholder value, it may make sense for some for-profit-organizations to draconically enforce all commandments of VBM-advocates. For other for-profit-organizations, it may create more value if VBM is 'only' applied pragmatically. For the inclined reader, Lovata & Costigan (2002), Garvey & Milbourn (2000) and Perlitz, Bufka & Specht (1997) offer an encouraging empirical introduction to this topic.

I used Katsikeas, Leonidou & Morgan's (2000) three stage process for drafting the coding protocol. First, the frameworks of Katsikeas, Leonidou & Morgan (2000) and Ittner & Larcker (2001) were used as a basis for the analysis of the studies. Second, 20 studies were randomly selected and evaluated using this draft protocol, resulting in a refinement and adaptation of the sub-classification to a VBM-context. Third, 15 other randomly selected articles were evaluated by an independent expert judge (a senior researcher with significant experience in management accounting) to further refine the coding protocol ex-ante. All studies were then evaluated and coded independently by two researchers. The differences in the coding protocols were neither significant nor concentrated on particular areas of the coding instrument. Disagreements on coding were settled in cooperation with the independent expert judge, who himself coded ex-post 15 additional, randomly selected studies. His coding complied with those of the two primary raters in all instances, indicating a high reliability of the evaluation procedure.

The classification system developed for the evaluation of VBM-research has three major strengths: (1) It is theoretically anchored in other disciplines that are well developed in terms of business performance measurement. (2) Since it is systematically derived from existing literature (IFAC, 2002; Ittner & Larcker, 2001; Katsikeas, Leonidou & Morgan, 2000), it makes this review comparable to other works in related fields of business research. (3) It is universally applicable to assess any VBM-study. The following chapter explains this operationalization of the IFAC (2002) framework, and reviews the variables of the study sample.

#### **4. Evaluation of the variables employed in prior research**

##### **4.1 Review of performance outcomes**

The dependent variables in the framework, 'performance outcomes', are determined by the capacities and their relevant contexts (IFAC, 2002). The coding method of Katsikeas, Leonidou & Morgan (2000) distinguishes three types of performance measures: Economic (e.g. sales), non-economic (e.g. product related) and generic (e.g. perceived success). There is an intense discussion in the VBM literature about the differences between accounting and capital-market measures. Therefore, the economic measure is subdivided into the two categories 'capital-market-measures' (used by 57 studies) and 'accounting measures' (used by 20 studies). Furthermore, 'generic measures' are renamed 'perceptive measures' (used 64 times) since this better conveys the content of these variables. The utilization of non-economic measures is minuscule (10

times, cf. table 1). In these four categories, this literature review reveals the use of 52 different performance indicators. 10 of them are capital market measures, 24 accounting measures, four non-economic, and 14 perceptive. Despite the large number of performance indicators, only few were frequently utilized, namely ‘abnormal/ market-adjusted returns’, ‘researcher’s satisfaction with the system’ and ‘total/ non-adjusted returns’. The remaining ones are each examined only in a few studies (in most cases less than five times), indicating a fragmented and uncoordinated effort to conceptualize VBM performance. The broad categories are discussed subsequently.

<b>ORGANIZING CATEGORY</b>	Frequency of use (%)
Classifier Variable	
<b>CAPITAL MARKET MEASURES</b>	57 (48)
Abnormal / market-adjusted returns	41 (34)
Total / non-adjusted returns	29 (24)
Stock appreciation	5 (4)
Dividends & share buybacks; beta & volatility & cost of capital; growth in equity; market-to-book-ratio (level / change) & Tobin’s Q; total business return; predictive ability for stock returns; trade volume	each < 5
<b>ACCOUNTING MEASURES</b>	20 (17)
Sales related	
Return on sales (ROS), growth in sales, R&D-sales-ratio	each < 5
Cash-related	
(Capital expenditure + R&D)-to-total-assets-ratio; cash flow margin; change in working capital, operating cash flow per employee	each < 5
Profit-/ balance sheet related	
Change in assets; return on equity (ROE); accounts receivables/ payables	each < 5
Super-profit-related	
Added value on equity (level / change), residual income, EVA (level / change)	each < 5
<b>NON-ECONOMIC MEASURES</b>	10 (8)
Personnel-related	7 (6)
Product-related; market-related; number of analysts making forecasts	each < 5
<b>PERCEPTIVE MEASURES</b>	64 (53)
Researcher’s satisfaction with the system	34 (28)
Management’s satisfaction with the system	16 (13)
Impact on strategic evaluations / decision making	10 (8)
Perceived success / performance meets expectations	9 (8)
Perceived outperformance of stock market	7 (6)
Amortization of costs of implementation	7 (6)
Perceived increased transparency	5 (4)
Perceived consistency of intrinsic and market value	5 (4)
Reduction of principal-agent-conflict; increased cost consciousness; information & system quality; perceived increased market capitalization; improved public image of the company; risk diversification	each < 5

Table 1: Performance outcomes

*Capital Market Data:* Stock returns are most frequently used to assess the performance of a VBM system (57 times). VBM aims at increased stock returns and is based on the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965). Therefore, the number of studies using capital market data seems still quite low. The only two important types of capital market data are ‘abnormal/ market-adjusted returns’ and ‘total/ non-adjusted returns’. The latter measures bear the problem of comparing returns with different risk profiles (Lashgari, 2001). To analyze performance effects of VBM meaningfully, it is necessary to adjust e.g. for prior performance, market trends, or the total volatility of the stock (Knight, 1998; McTaggart, Kontes & Mankins, 1994). Generally, there is no best way to adjust stock returns. Still, studies accounting for external influences draw a sharper picture of the isolated influence of VBM on stock performance. E.g. it can be advisable to adjust for beta (volatility of the stock relative to the market). One reason is that factors beyond managements’ control affecting *all* companies in the market in different ways (e.g. changes in the price of crude oil) should be filtered out to assess the performance of management. This issue has been widely debated under the term of ‘windfall profits’. With some exceptions (Stern & Shiely, 2001), VBM-proponents suggest to eliminate losses of this kind, since those were neither the fault nor the merit of management (Knight, 1998). Studies that do not adjust total stock returns for risk need to be critically evaluated: It is not clear, if an individual organization’s performance was influenced by the VBM-system, or alternatively by general trends in the market or industry-specific aspects.

*Accounting Data:* In total, 20 studies make use of 24 different accounting indicators. No variable has been used more than five times. This alludes on the one hand to a fragmented conceptualization of performance in accounting terms. On the other hand, the low importance of accounting data in a VBM context is not surprising since VBM has been invented to address the weaknesses of accounting numbers for valuation and decision making (Copeland, Koller & Murrin, 2000; Ball, 1992; McConnell & Muscarella, 1985; Beaver & Morse, 1978; Basu, 1977; Sunder, 1975; Kaplan & Roll, 1972). It might seem counter-intuitive to the reader why super-profit-related measures – i.e. a typical VBM measures like EVA – are seldom used as a performance variable. Yet, a VBM-system like EVA is denoted in nearly all studies as the *capacities required* (independent variable) to pursue the corporate goal of value maximization. If it was used as *performance outcomes* (dependent variable) itself, this would lead to circular reasoning. EVA calculations should only be used to triangulate other performance variables.



*Operative measures:* Non-economic measures only appear in 10 studies and are thus negligible. Only one study uses them as their only performance measure ('CEO turnover'). Others use them for triangulation. Analogous to the accounting indicators, this finding is not surprising since VBM has been developed to shift attention to financial measures.

*Perceptive measures:* The most frequently used perceptive measure is 'researcher's satisfaction with the system', which was used 21 times as the *only* performance variable. By using this variable exclusively, researchers descriptively compare observations from practice with textbook theory. Still, those researchers make claims that they have identified an implementation gap and rate non-adopters as unsuccessful (Lorson, 2004). Davies (2000, p. 41, brackets added) questions this type of research since "[...] to find that VBM is not widely used cannot justify the assumption that it should be [...because...] a failure to adopt textbook techniques might be due to a logical trade-off between the benefits and costs from their introduction." This alludes to the difference between the *maximum* and the *optimum* level of VBM-implementation.

It is also a remarkable finding that *all* of these studies were conducted on corporations in the German-speaking area. Studies on firms in English-speaking countries generally investigate at least e.g. management's satisfaction with VBM. But despite the fact that they do, they do not always use this information for further statistical tests. These problems apply to the other variables as well: While researchers address benefits from the system (e.g. 'impact on strategic decision making'), they disregard incurred costs (Zimmerman, 1997). These costs include e.g. foregone profits because management was busy optimizing the VBM-system instead of taking care of daily business.

Moreover, it is questionable why key informants of listed corporations are asked to estimate effects on stock returns. Researchers could at least compare these estimates to the actual publicly observable returns. In this matter, Ittner, Larcker & Randall (2003) find that perceptive performance data seems to be unrelated to performance data from capital markets, and thus may not function as a substitute.

## 4.2 Review of capacities required

In their VBM-framework, Ittner & Larcker (2001) list an overall objective plus five steps required by the prevailing literature (commitment to shareholders, strategy, ratios, value drivers, business modelling, and performance evaluation). Based on their review, this constitutes a full-fledged VBM-system. Adhering to their framework, Ittner & Larcker (2001) highlight (in)consistencies in findings on VBM, and identify

remaining gaps and venues for future research. Hence, I only shortly explain how the review of this sample further contributes or contradicts their findings. Analogous to Katsikeas, Leonidou & Morgan (2000), a study is coded '1' if it deals with the relevant step and '0' otherwise. Each step of the VBM-framework is discussed in an individual subcategory:

<b>ORGANIZING CATEGORY</b> Classifier Variable	<b>Frequency of use (%)</b>
<b>0. Shareholder value objective</b>	<b>31 (26)</b>
<b>1. Choice of key financial ratio</b>	
Check existence of key financial ratio	75 (63)
Calculate assumed key financial ratio	38 (32)
Economic value added (all types)	24 (20)
Cash flow return on investment (all types)	17 (14)
Return on investment / on assets / on capital employed	10 (8)
Return on equity	9 (8)
Cash flow from operations	5 (4)
Residual income	5 (4)
Return on sales; cash flow return (gross / net); earnings before extraordinary items; earnings per share (all types); accruals; economic profit; increase in sales; operating income; value spread / capital charge; after tax interest expense; bond rating score; change in assets; change in dividends; change in sales; discounted cash flows; earnings (level / change); management wealth return / wealth leverage; research & development spending; market value added; Stewart's R; market-to-book-ratio (level / change) & Tobin's Q	each < 5
<b>2. Selection of strategy and organizational design</b>	
Investigation of corporate strategy	44 (37)
Investigation of organizational design	22 (18)
<b>3. Development of value drivers</b>	
Financial value drivers	75 (63)
Non-financial value drivers	42 (36)
<b>4.a) Development of action plans</b>	<b>34 (28)</b>
<b>4.b) Definition of KPIs</b>	
Definition of KPIs	31 (26)
Adjustments made to KPIs	19 (16)
<b>4.c) Setting of targets</b>	<b>28 (23)</b>
<b>4.d) System quality</b>	
Integration / consistency / formalization	30 (25)
Flexibility	9 (8)
Reliability / unambiguousness	8 (7)
Response time	4 (3)
Accessibility	3 (3)
<b>4.e) Information quality</b>	
Format / understandability / simplicity	17 (14)
Currency / timeliness	11 (9)
Accuracy	9 (8)
Completeness / scope	8 (7)
<b>4.f) Design of value oriented culture</b>	<b>22 (18)</b>

<b>ORGANIZING CATEGORY</b> Classifier Variable	<b>Frequency of use (%)</b>
<b>5.a) Information use stakeholders</b>	
Information use management	61 (51)
Information use investor relations	39 (33)
Value-based reporting	31 (26)
Feedback from shareholders	10 (8)
Information use supervisory board	8 (7)
Information use corporate partners	4 (3)
Information use remaining stakeholders	3 (3)
Information use debt-holders	3 (3)
<b>5.b) Incentive systems</b>	<b>56 (47)</b>
<b>6. Value distribution</b>	
Dividend policy	13 (11)
Share repurchases	9 (8)

*Table 2: Capacities required*

#### 4.2.1 Overall objective: Increase shareholder value

Ittner & Larcker (2001) discuss the importance of a firm's primary objective since a VBM-system is likely to be more successful in companies focusing on their shareholders. Therefore, researchers need to explicitly check on the goals of the companies in their sample. Findings suggest that only 31 studies explicitly state the overall objectives of the organizations they examine (cf. table 2). This impedes a later comparison of firms' performance since some firms in the sample may be pursuing other goals than value maximization. Beyond this, the observance of value oriented practices within companies, or their listing at the stock exchange, does not necessarily allow an inference on their overall objective being value maximization (KPMG, 1999; Loderer & Zraggen, 1999; General Accounting Office, 1998).

#### 4.2.2 Identify specific organizational objectives

In a first step, shareholder-oriented companies are generally expected to choose a key financial ratio, which states performance in terms of firm value added (Arnold, 2000; Copeland, Koller & Murrin, 2000; Stewart, 1995). Yet, only 75 studies explicitly investigate whether a key financial ratio is used. This is remarkably low: First, the key financial ratio is commonly understood to be the centerpiece of VBM. Second, the use of a key financial ratio is fairly easy to detect compared to other variables of the VBM framework. Moreover, only six of these 75 studies later calculate values for the identified key financial ratios. This would be necessary to separate successful companies from the rest in a later comparison. There are few critical discussions on the feasibility of key financial ratios, e.g. that even if a key financial ratio correlates with stock

prices, it is not generally recommendable to utilize it for planning and control purposes (Paul, 1992). Just as well, divisional key financial ratios may cause dysfunctional behavior, even if the main key financial ratio perfectly tracks value creation (Bromwich & Walker, 1998; Zimmerman, 1997).

An alternative stream of studies simply assumes that the companies in their sample use key financial ratios like EVA. They calculate these figures on the basis of publicly available data as a simulacrum of a full VBM-implementation (32 studies, which make 38 calculators in total). Of the 32 calculated key financial ratios, the most common are by far different versions of SternStewart's EVA and HOLT Value Associates' Cash Flow Return on Investment (CFROI) (24 and 17 respectively). These studies mostly try to test the hypothesis that VBM-measures track stock returns better than accounting data does, or that one key financial ratio is superior to another one. This research approach faces some problems: First, it might be inappropriate to simply *assume* that a company uses a special key financial ratio. The company may actually try to maximize its stock return but not this specific ratio. Thus, findings that stock returns do not correlate with potentially non-utilized or incorrectly calculated key financial ratios create little surprise (McCormack & Vytheswaran, 1998). Second, VBM-proponents do generally not claim that a company maximizes its value by the ex-post calculation of a number. On the contrary, the key financial ratio is supposed to be the *basis* of all other actions taken within the company, and eventually, pay should be based on it (Copeland, Koller & Murrin, 2000; Knight, 1998; McTaggart, Kontes & Mankins, 1994). The precursors of this research stream are Biddle, Bowen & Wallace (1997). They find that EVA has more explanatory value for stock returns in companies that adopt EVA as a key financial ratio *and* base a bonus system on it. Unfortunately, the latter correlations are not significant. This might be due to the fact that they measure only two VBM-variables (key financial ratio and incentives). As more variables suggested by VBM-proponents are added, the results could possibly become significant. Third – even if researchers can prove the utilization of a special key financial ratio in a company – insufficient publicly available information exists on the way organizations calculate their customized ratio (Fischer & Wenzel, 2004; Farsio, Degel & Degner, 2000). Researchers may come up with a number for EVA, but this may not necessarily be the same EVA which management bases its decisions upon. SternStewart e.g. offers 167 different adjustments for EVA-calculations. If these were all independent binary decisions (i.e. =  $2^{167}$ ), this would yield about 1.9 times  $10^{50}$  different possible adjustment patterns. Forth, even if researchers correctly identified e.g. McKinsey's Eco-

nomic-Profit-users, and obtained the correct values for it, the choice of the control sample is still critical. It may well contain very sophisticated users of Holt Value Associates' CFROI or SternStewart's EVA. The minor differences in basic practices (Ameels, Bruggeman & Scheipers, 2003) could cause an endogeneity bias and lead to meaningless results (Ittner & Larcker, 2001). Finally, 13 studies neither ask for key financial ratio nor do they calculate an arbitrary number. Four of these investigate the corporate objectives instead, possibly as a substitute for a key financial ratio.

#### 4.2.3 Develop strategy and select organizational design

As a second step, companies should follow those strategies with the highest influence on firm value. Since no general best strategy exists in all contexts, I only investigate if the studies have tried to understand the chosen strategy and the organizational design. A main criticism about strategy assessment in the general management accounting literature is that strategy is measured by simplified continua, or by individual proxies like the market-to-book-ratio (Langfield-Smith, 1997). This sample discloses an even more critical situation of only 44 studies that investigate corporate strategy. Coding on this is done liberally already, i.e. if anything on this topic is reported (e.g. the business model of the company). If rated more strictly, there is less than a handful. Hardly ever, strategies within the sample are compared to each other. Also, the level of standardization of strategy types is low: Even more seldom than Ittner & Larcker's (2001) review may forebode, typical frameworks like Porter (1980) or Miles & Snow (1978) are rarely used to describe strategy. Also, the use of individual indicators from those frameworks is low (e.g. hints on a special focus on costs). An empirical study that actually links VBM to strategy is the paper of Ittner, Larcker & Randall (2003). Future research needs to take strategy into account more rigorously since all advocates of VBM identify its link to strategy as pivotal (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994).

Furthermore, only 22 studies investigate organizational design, which is also coded quite liberally, i.e. as soon as the study mentions anything on this topic. It is also not necessary for a coding that organizational design is explicitly adapted to strategy, since a positive example of their interplay is nonexistent in the VBM-literature. This also marks a wide research gap since VBM-proponents hold interactions of strategy and organizational design to be self-evident (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994).

#### 4.2.4 Identify value drivers

The third step in the implementation encompasses the identification of value drivers (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994). Just 75 studies gather empirical data on financial value drivers (mostly on the cost of capital). Only 42 are able to provide additional information on non-financial value drivers. In all cases, value drivers are only descriptively listed. No affirmation is given that any of these lists includes all relevant value drivers. Moreover, no study provides evidence on how value drivers are chosen, e.g. on the basis of a value-gap-analysis. While it seems intuitive that e.g. ‘product quality’ may be a value driver, no study gives insights how much value is created by increased quality in comparison to other value drivers. Moreover, no study provides evidence how value drivers interact (e.g. the negative influence of increased quality on cost-cutting). This gap is remarkable since interactions and overall effects on value creation are of high importance to VBM-advocates.

#### 4.2.5 Develop action plans, select measures and set targets

The fourth step requires the selection of action plans (e.g. via a BSC), performance measures / key performance indicators (KPIs), and targets. As recommended by the normative literature, all of these should be based on the preceding value driver analysis (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994). The investigation of these three categories is especially important since more recent research has found that corporations cannot be easily divided into VBM-adopters and non-adopters: Even among adopters, significant differences in implementation exist (Marr, 2005; Weber, Bramsemann, Heinecke & Hirsch, 2004; PA Consulting, 2003; Malmi & Ikäheimo, 2003; Cooper & Petry, 1994).

60 studies investigate at least one of these three variables, but it is striking that only three studies deal with all of them, unfortunately mostly not in great detail. Ittner & Larcker (2001) conclude that action plans have received virtually no attention in VBM research except for capital investment decisions. This investigation finds that in total 34 studies account for this variable, e.g. by inquiring the existence of a BSC, integrated software (e.g. SAP), decision algorithms (e.g. net present value), or an increase in empowerment. The deviation from Ittner & Larcker’s (2001) findings may mainly stem from the fact that most of the literature reviewed in this paper was published after Ittner & Larcker (2001). Still, I agree with them insofar that the current analysis is shallow. Furthermore, evidence shows that only 43 studies – again coded liberally – deal

in some way with KPIs. Of these 43 studies, 31 mention the existence of KPIs in broader sense, e.g. that they are part of a BSC. 19 of these 43 studies report on practices or problems of the adjustment of KPIs, which are recommended by the normative literature (Young & O'Byrne, 2001; Stewart, 1991). Nevertheless, no study presents either a conclusive list of (a) what adjustments were made or (b) what the managements' reasons for the adjustments were. Very few detailed insights are given. An exemption is e.g. KPMG (2003) who prove lower level KPIs to be inconsistent with key financial ratios in German HDAX companies. A detailed case study could shed light on this issue. Ittner & Larcker (2001) state that empirical studies typically ignore the aspect of target setting. Coding liberally, 28 studies deal tentatively with this issue, mostly by mentioning that targets are derived from the BSC, or that benchmarking is used to agree on targets. Nevertheless, researchers could still deepen their understanding of the target setting process.

Apart from their framework, Ittner & Larcker (2001) criticize that the quality of VBM-information as well as the quality of the VBM-system itself have never been part of a study. To test this, I adopt the quality framework of Nelson, Todd & Wixom (2005) from the information systems literature, who segment system quality and information quality into nine indicators. Contrary to the findings of Ittner & Larcker (2001), 44 studies investigate at least one of the nine different quality-variables, but just five studies explore more than four. Only Bassen & Schulz (2000) examine all nine variables. Yet, they neither use a meaningful framework nor do they conduct further statistical analysis on these variables. Concerning the quality of the system, a relatively large number of studies (30) investigate 'integration' of VBM-systems, followed at distance by the 'flexibility' of the system (9) and its 'reliability' (8). The investigation of 'accessibility' and 'response time' are uncommon, maybe due to their specificity of information systems. Incongruent with Nelson, Todd & Wixom (2005), integration and flexibility were generally not labeled as a quality aspect of the VBM-system, but as constituting parts of it. This would be consistent with the fact that the term 'value driver technique' is used as a synonym for VBM, which includes integration by definition (Copeland, Koller & Murrin, 2000; Knight, 1998).

Concerning the quality of information, 'format' is relatively often an issue in research (17), followed by 'currency' (11). Interestingly, 'completeness' – an important topic in the literature on financial vs. non-financial KPIs – is rarely investigated (8). 'Accuracy' (9) does not seem to be an interesting topic in the management accounting literature, either, and might be more typical for information systems. Contrary to system

quality, information quality is rather associated with being a quality instead of being an integral part of the VBM-system.

The normative literature considers value-based culture as part of a fully developed VBM system, or as a critical success factor for its implementation (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994). Nevertheless, the construct is not conclusively defined. Since Ittner & Larcker (2001) also ignore this aspect, I gathered indicators which empirical studies presumed to be related to culture as a basis for a first construct. Coding broad-minded, 22 studies diffusely mention cultural aspects of VBM. Examples are the extent at which VBM gains the acceptance of employees, or if trainings on VBM are given to explain to employees its application in daily routine. Despite the apparent importance of value-based culture in the normative literature, empirical evidence is descriptive and unsophisticated compared to other areas of research in management. A positive example from the research area of marketing is the “market-oriented organizational culture” by Homburg & Pflesser (2000). VBM-proponents could develop an analogous model.

#### 4.2.6 Evaluate performance

The fifth step in the framework is the evaluation of information generated by the VBM-system. While Ittner & Larcker (2001) suggest investigating the context in which the information is used (e.g. for planning or compensation), other researchers suggest examining the different manners of use (Vandenbosch, 1999). Since most studies explore the use of information crudely, I could only liberally code the groups of recipients of VBM-information. Basically, there are agents of equity (i.e. the executive board and the supervisory board), the principal of equity (i.e. the shareholders, e.g. the use for legally required disclosure, and the use for additional investor relations), and other recipients. In total, 80 studies examine the use of VBM-information directly or indirectly (e.g. the use of value-based remuneration implies the use of this information for management purposes). In detail, 61 studies investigate the use of information by/ for management, 39 studies were concerned with voluntary information disclosure to shareholders, and 31 about compulsory disclosure. As management, shareholders and the supervisory board can be seen as the representatives of equity capital, they are in the focus of these studies. Interestingly, only eight studies try to discover the way information is used towards/ by the supervisory board, which is supposed to be the stronghold of shareholders against dysfunctional management behavior. Concomitantly, the use of information towards/ by debt-holders, corporate partners, and all re-



maintaining stakeholders, is dealt with only alongside. This lack of data highlights that little evidence exists on the often made claim that VBM needs to account for all stakeholders in order to maximize shareholder value (Arnold, 2000; Copeland, Koller & Murrin, 2000).

Ittner & Larcker (2001) explicitly exclude compensation and only address this topic in relation to target setting. This subject is yet included in this study since it represents a fundamental part of VBM (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994; Stewart, 1991). Nevertheless, empirical evidence about the incentive system is provided by only 56 studies. This seems to be a rather low number since VBM-theory suggests incentive systems to be the decisive step for putting VBM-objectives into real actions.

#### 4.2.7 Value distribution

Some studies also regard value distribution as part of an integrated VBM-system (i.e. dividend policy and share repurchases under tax aspects). Interestingly, 12 of the 15 studies gathering information on value distribution are conducted on German-speaking companies. This could be rooted in the fact that German tax law treats distributed earnings differently from retained earnings. That way, dividend policy and share repurchases can be a source of creating wealth. Additionally, Germany's tax code and commercial code are highly interwoven compared to the English-speaking world.

### 4.3 Review of competency

Competency as defined by IFAC (2002, p. 23) comprises “successful negotiation of *performance* in a *context* through the use of appropriate *capacities*. Thus, it is a relational notion: It refers to a relationship (successful negotiation) between performance outcomes (as defined) and appropriate (or requisite) capacities. Neither appropriate capacities nor (contextualized) performances constitute competency – it is the relationship between them that does. Competency thus cannot be observed directly – it can only be inferred from performance (in context) or capacities manifested, or both.”

Contextualized for VBM-systems, competency can be inferred from the statistical relationship between a change in VBM-sophistication (capacities) and e.g. the company's change in shareholder value (performance). This relationship is always contingent to a benchmark, e.g. overall market performance (context). Even more simplified, compe-

tency indicates if an implementation can be deemed *successful*. This issue is reflected in Katsikeas, Leonidou & Morgan's (2000) three categories that influence this relationship: Operationalization, sample selection, and the collection of data (cf. table 3).

<b>EVALUATION CATEGORY</b>	<b>Frequency of use (%)</b>
Evaluative Criterion	
<b>OPERATIONALIZATION</b>	
<b>Dimensions of performance</b>	
Effectiveness	69 (58)
Efficiency	63 (53)
Result positive? *	76 (63)
<b>Frame of reference</b>	
Industry / peer performance	43 (36)
Domestic market performance	36 (30)
Prior firm performance	32 (27)
International market performance *	23 (19)
Other measures *	16 (13)
<b>Stakeholder perspectives</b>	
Management / entire company	101 (84)
Shareholders *	30 (25)
Employees *	5 (4)
Supervisory board *	2 (2)
<b>Time horizon (performance variable)</b>	
Historical (time span)	63 (53)
Current (point in time)	65 (54)
Future (time span)	4 (3)
<b>Time horizon (capacity variable) *</b>	
Historical (time span) *	46 (38)
Current (point in time) *	74 (62)
Future (time span) *	13 (11)
<b>SAMPLING</b>	
<b>Unit of analysis</b>	
Corporate level *	116 (97)
Lower levels *	33 (28)
<b>Scope of analysis</b>	
German-speaking countries *	63 (53)
English-speaking countries *	58 (48)
Other *	19 (16)
Unknown, but likely to be English-speaking *	13 (11)
<b>Legal form *</b>	
Listed *	102 (86)
Not listed *	15 (13)
Unknown *	13 (11)
<b>DATA COLLECTION</b>	
<b>Source of data (capacity variable) *</b>	
Primary source *	60 (50)
Questionnaire (key informant) *	46 (38)
Interview (key informant) *	14 (12)
Case study design *	9 (8)
Interview (direct) *	5 (4)

<b>EVALUATION CATEGORY</b>	<b>Frequency of use (%)</b>
Evaluative Criterion	
Archival data *	4 (3)
Questionnaire (direct) *	3 (3)
Secondary source *	74 (62)
Database *	51 (43)
Financial statement analysis *	22 (18)
Specialized press *	16 (13)
Corporate press release *	11 (9)
Internet analysis *	8 (7)
Analyst reports *	6 (5)
<b>Source of data (performance variable)</b>	
Primary source	37 (31)
Questionnaire (key informant) *	29 (24)
Case study design *	5 (4)
Interview (direct) *	4 (3)
Interview (key informant) *	3 (3)
Secondary source	98 (82)
Database *	62 (52)
Catalogue of researcher *	34 (28)
Financial statement analysis *	5 (4)
Analyst reports *	4 (3)
Specialized press *	1 (1)
<b>Mode of assessment (performance variable)</b>	
Objective (direct and predetermined way)	66 (55)
Subjective (use of reference point)	61 (51)

\* Items added to the original framework of Katsikeas, Leonidou & Morgan (2000).

Table 3: Competency

#### 4.3.1 Operationalization

*Dimensions of performance:* Katsikeas, Leonidou & Morgan (2000) use three dimensions of performance: (1) Adaptiveness, which this review categorizes under system quality as ‘flexibility’ in accordance with the management accounting and information systems literature (Nelson, Todd & Wixom, 2005; Dodd & Johns, 1999). (2) Effectiveness, which describes the extent to which organizational goals and objectives are achieved, i.e. only benefits without regard to the cost of implementation. (3) Efficiency, which is the ratio of performance outcomes to the inputs required to achieve them. Thus, tests for efficiency are more informative than tests for effectiveness. This is because the former contains all information of the latter *plus* information on the cost incurred. About an equal number of studies test for effectiveness and efficiency. Testing for both at the same time is possible if different performance variables are used. This high ratio of efficiency may surprise since it is mentioned above that the costs of capacities are rarely addressed. The explanation is that these studies use capital market data as a performance variable. Thereby, they all qualify for an efficiency test. In this

context, total returns are seen as analogous to discounted cash flows, from which investors have already implicitly deducted the costs for implementing the VBM-system. This, however, must not conceal the insight that most of those studies only investigate the key financial ratio of the VBM-system with disregard to all other implementation steps. The aforementioned research shows that even VBM-systems having the same acronym are not implemented the same way across companies. Thus, the top performers in terms of stock returns may accidentally have a high key financial ratio without even having implemented a full VBM-system. Some companies could even have set a broad stakeholder approach as their final goal. Consequently, they may base their decisions on non-value-oriented MAS like Corporate Social Responsibility but report a figure like CFROI anyway, e.g. to satisfy the interests of the shareholders. Most studies do not control for any of these eventualities. This clearly impairs the validity of their results despite their test for efficiency. They help to understand how these companies have performed. But since they have conceptual flaws, they cannot explain if performance improved due to VBM – or due to any other, arbitrary factors.

*Frame of reference:* Katsikeas, Leonidou & Morgan (2000, p. 499) define a frame of reference as the “implicit or explicit standards against which performance is assessed”. The use of such a benchmark or a control group is inevitable to avoid an endogeneity bias (Ittner & Larcker, 2001). Thus, the seemingly high number of 92 studies using benchmarks can still not be seen as satisfactory, especially as they are coded liberally again. The most popular benchmark researchers use is the direct comparison to single peers or an industry-peer-sample (42). The problem is, of course, to discover the right peer for a sample. This can sometimes lead to awkward combinations. Schaffer (2005) and Kleiman (1999) are relatively transparent in their peer-sample selection and offer fruitful insights into methodological problems.

The use of a *domestic* benchmark (36) can give a more reliable comparison that eliminates unsystematic movements of single peers’ stock. Still, a strong correlation of the observed sample to the domestic market can eventually overstate the beta of each stock. In case non-capital market data is benchmarked, a larger domestic control sample increases the chance that the sample firm is compared to peers which are not matching. Temporal benchmarking and inter-firm-comparisons where current results are compared to prior ones is a popular method (32), but especially hard to conduct for diversified companies in changing environments. Katsikeas, Leonidou & Morgan’s (2000) benchmark variable ‘firm’s own goals’ was shifted to ‘performance outcomes’ since this is rather a performance variable.

Another benchmark is using a broad *international* sample (23). A problem of this benchmark is inversely related to the domestic benchmark: Stock returns of the sample and the control group could have a low correlation, which understates the observed beta and thus the risk the returns are actually exposed to. In case that non-capital market data is used, the chance of finding a peer group that resembles the observed organizations increases with the size of the population from which the control group is drawn. Nevertheless, additional benchmarks e.g. for national culture, or different economic circumstances need to be introduced for international samples, which blurs the exactness of the performance variable (McTaggart, Kontes & Mankins, 1994). ‘Other measures’ (16) are used as a benchmark by researchers comparing the information content of two or more key financial ratios to each other, e.g. as a proxy for stock returns (Biddle, Bowen & Wallace, 1997).

*Stakeholder perspectives:* Katsikeas, Leonidou & Morgan (2000, p. 500) define stakeholder perspective as “the viewpoint from which the performance measure is used”. While their three perspectives management, customers, and competitors are quite suitable for export performance, a VBM-perspective requires investigating the important equity-stakeholders: The executive board, the supervisory board, and the shareholders. Most studies take the point of view of the executive board and the company on an aggregate level (101), which Katsikeas, Leonidou & Morgan (2000) call ‘internally oriented’. The viewpoint of shareholders is considered only 30 times, probably because this group can be seen as more diverse than management. Thus, its interdependencies are harder to model. Moreover, no study tries to sketch the effects of VBM on the shareholders’ portfolios. Due to the claim that VBM shall profit all stakeholders (Copeland, Koller & Murrin, 2000), some studies should take the point of view of non-equity-stakeholders. Still, only five studies provide some general evidence on the employee perspective, measured e.g. by retention rates.

*Time horizon:* Analogous to Katsikeas, Leonidou & Morgan (2000), this review employs three categories of time horizons. ‘Historical’ and ‘future’ reflect cumulative amounts measured over a time span, and ‘current’ represents a snapshot in time. The same categories are coded for ‘capacities’ to observe matching practices for these two variables. Future performance measures are seldom used and are exclusively related to future earnings (4). Future measures for capacities are generally plans to increase the level of implementation within the firm, e.g. enlarging the department for investor relations (13). Current measures of capacities are the most popular variable (74). This is

likely so because it is far easier to measure than historical capacities (46) – double counts are possible since multiple capacities can be measured in different ways. Current data includes e.g. the past announcement to adopt VBM. This easily incurs biases since the announcer may later become a best-practice user, or may as well later abandon the entire system. The use of historical data on the other hand is preferable since it includes all information on current data *plus* additional information, e.g. how the system developed years after the announcement. 46 studies using this historical data seems to be an encouraging number, but this is a fallacy. As criticized several times, 34 of these 46 studies calculate e.g. the CFROI over several years for a set of companies. Consequently they claim that a higher CFROI is a simulacrum for more value-orientation. Yet, these studies do not deliver evidence that any of these companies even uses CFROI. Even if the organizations did, they may not have implemented any other steps from the VBM-framework. A positive example is Malmi & Ikäheimo (2003) who trace the development of six VBM-systems over several years. Current performance data (65) consists mainly of current satisfaction levels, while historical performance data (63) tracks the development of financial numbers over time.

#### 4.3.2 Sampling

*Unit of analysis:* Based on the findings in the pre-tests, I differentiated between the corporate level and all other lower levels for Katsikeas, Leonidou & Morgan's (2000, p. 500) "organizational level under investigation". Only four studies deal exclusively with lower levels, and 87 articles deal with VBM solely on the corporate level. This can be attributed to (a) the fact that VBM focuses strongly on overall company performance, (b) aggregated data on the corporations being more easily available, and (c) greater ability and willingness of key informants to answer, e.g. due to specialized investor relations departments (Nix & Wolbert, 2005). Only 29 articles provided some kind of evidence on corporate as well as lower level practices. Coding was granted if it was mentioned that the system was expanded to all levels, even if no further information was given. This number is still remarkably low given the claim that VBM unfolds its highest potential at lower levels (Stern & Shiely, 2001). Katsikeas, Leonidou & Morgan's (2000) categories of 'product' and 'export venture' were deleted due to their marketing specificity.

*Scope of analysis:* Katsikeas, Leonidou & Morgan's (2000, p. 500) three categories for "product-market(s) under evaluation" were exchanged for the geographic location of firms. 63 studies investigate companies from German-speaking countries (Austria,

Germany, Switzerland), and 58 deal with English-speaking countries (Australia, Canada, New Zealand, UK, USA). Double counts are possible, of course, for international samples. 13 studies do not disclose the geographic location of their sample. Yet, those are likely to be English speaking regions since 12 of these studies are written in the English language. Only 19 studies provided data on firms from other parts of the world. This could have several reasons: (a) Research on local firms may be published in the national language, which English or German-speaking researchers do not cite, or (b) VBM has a lower popularity in other parts of the world.

*Legal form:* Listed companies are coded since VBM is a capital-market-oriented MAS. According to VBM-proponents, VBM is nevertheless applicable to any type of organization (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000; McCormack & Vytheeswaran, 1998; McTaggart, Kontes & Mankins, 1994). While 13 studies do not provide information on this, 92 studies deal exclusively with listed companies, four studies exclusively with non-listed ones, and 11 studies with both. Probably, the low number of non-listed companies is partly due to the availability of data on the one hand. On the other hand, non-listed companies have fewer and less diversified owners who might incorporate other aspects than risk and stock returns into their utility functions. In that case, they would be likely to choose a different MAS than VBM.

*Sample size:* As an addition to Katsikeas, Leonidou & Morgan's (2000) classification system, sample sizes are recorded (not reported in the table). Besides the fact that 26 studies disclose neither the ex-ante size of their original samples nor the response rates, total responses vary widely from 1 company to over 4100 companies with an average of 325 and a median of 84. 14 studies do not disclose their ex-post sample size. If the remaining 106 studies are analyzed separately, the 53 (53) studies gathering primary (*only* secondary) data on capacities have an average of 108 (541) responses and a median of 62 (181). The two-tailed t-test shows that this difference is significant at  $p < 0.001$ . This confirms Zimmerman's (2001) conjecture on the difficulty of gathering data on actual corporate practices compared to publicly available data.

#### 4.3.3 Data collection

*Source of data (capacities):* Primary data is "generated directly from the firms studied and secondary data is obtained from third parties" (Katsikeas, Leonidou & Morgan, 2000, p. 500). Primary source data on capacities is collected by a total of 60 studies. It is based mainly on key informants, either through questionnaires (46) or personal in-

interviews (14). The use of key informants has been criticized for providing biased and unreliable information, mostly due to poorly conceived research designs. These include e.g. arbitrary selection of the key informant or a lack of psychologically based pre-tests. If these problems are dealt with, key informants can become more reliable and convenient sources of primary data (Hurrle & Kieser, 2005). Nine studies claim to take a holistic case study approach with direct contact to concerned employees. This is a rather low number accounting for the complexity of a VBM-system. Four studies use archival data or other internal documents from the companies to assess capacities. Secondary data on capacities is collected by a total of 74 studies. As criticized before, most of them (51) use databases to calculate a key financial ratio (e.g. ROI or EVA). Other studies draw strongly from information used in financial statements (22) to identify adopters. The limitation is that little information is provided there. The same is true for the remaining sources. Only the striking low number of 14 studies used primary and secondary data jointly to classify implementers.

*Source of data (performance):* Primary source data on performance was collected by 37 studies consisting mainly of questionnaires or interviews with key informants. To a lesser extent, case studies and direct interviews with the concerned employees are used. Secondary sources for performance variables were gathered by 98 studies, and were mainly drawn from large databases like CRSP (62). Alternatively, researchers use text books to identify the degree of compliance of practice and theory (34). Only 17 studies use primary and secondary data jointly.

*Mode of assessment:* Katsikeas, Leonidou & Morgan (2000, p. 501) segment the primary and secondary data sources into objective, i.e. “in a direct and predetermined way”, and subjective, i.e. “allow the respondent to use a reference point”. Double counts are of course possible. There is a high congruence between objective (subjective) data and secondary (primary) data, the only exception being the ‘researcher’s satisfaction with the system’, which is a secondary measure, but highly subjective.

## **5. Discussion of the research questions**

### **5.1 Research clusters in the VBM-literature**

The first research question asks if it is possible to detect clusters in the VBM-literature in order to identify the most relevant performance studies. To conduct this categorization as objectively as possible, it seems reasonable to employ the descriptive evidence from the last chapter: Studies discussing the same variables for their investigation are similar in their design, and should therefore be seen as a related stream of research. As



a result, four different types of studies can be identified. Yet, only one cluster of study-types fulfills the basic requirements of VBM-proponents for a performance study. In addition to that, this cluster only contains four of the 120 reviewed studies. The results are explained below:

Before the employment of cluster analysis, the information from the variables coded above needs to be condensed with factor analysis. As these variables represent the constructs ‘performance outcomes’ (table 1) and ‘capacities required’ (table 2), it is reasonable to expect that a factor analysis will suggest factors relating to both performance and the way VBM is implemented. It is also reasonable to expect that ‘competency’ (table 3) will not constitute separate factors as it does not represent actual variables but the statistical relationship between them.

As a matter of fact, the interpretation of the factor analysis leads to an extraction of two factors (cf. table 4). Factor 1 is named ‘VBM-orientation of performance variable’ and factor 2 ‘analytic breadth of implementation level’. As expected, they resemble the variables ‘performance outcomes’ and ‘capacities required’ from the IFAC (2002) model. Of course, variables from the category ‘competency’ may load on both these factors since ‘competency’ does not represent a variable itself but the relationship between the VBM-system (factor 2) and corporate performance (factor 1). The factor analysis condenses approximately 200 different variables from the initial coding protocol into two factors, and still explains 50.6% of their original variance (cf. table 4).

Factor name	Factor loadings	
<b>1. VBM-ORIENTATION OF PERFORMANCE VARIABLE</b>		
(VBM-orientation)	<b>1</b>	<b>2</b>
Capital market measures <sup>a</sup>	0.872	
Perceptive measures <sup>a</sup>	(0.834)	0.426
Effectiveness <sup>b</sup>	(0.893)	
Efficiency <sup>b</sup>	0.851	
English-speaking countries <sup>b</sup>	0.421	
German-speaking countries <sup>b</sup>	(0.432)	
Shareholder value objective <sup>c</sup>	(0.509)	
Check existence of key financial ratio <sup>c</sup>	(0.648)	
Calculate assumed key financial ratio <sup>d</sup>	0.771	
Incentive systems <sup>c</sup>	(0.435)	
Information use stakeholders <sup>d</sup>	(0.529)	0.410
Quality (system and information) <sup>d</sup>	(0.496)	0.473
<b>2. ANALYTIC BREADTH OF IMPLEMENTATION LEVEL</b>		
(breadth-implementation)		
Investigation of corporate strategy <sup>c</sup>		0.564
Investigation of organizational design <sup>c</sup>		0.615
Financial value drivers <sup>c</sup>		0.657
Non-financial value drivers <sup>c</sup>		0.721
Development of action plans <sup>c</sup>		0.675
Definition of KPIs <sup>d</sup>		0.693
Setting of targets <sup>c</sup>		0.622
Design of value oriented culture <sup>d</sup>		0.449

Data was meaningfully aggregated and eliminated beforehand. Only variables with a Kaiser-Meyer-Olkin measure above 0.7 ('middling') were accepted leaving values for nearly all variables well above 0.8 (0.5 would be required). The overall Kaiser-Meyer-Olkin measure was 0.872 (nearly 'marvelous') and the Bartlett test was significant at  $p < 0.001$ . I used principal component analysis and varimax rotation (loadings above 0.4 are displayed above). This model explains 50.6% of the variance (factor 1: 29.9%, Cronbach's  $\alpha = 0.90$ , factor 2: 20.7%, Cronbach's  $\alpha = 0.83$ ). This is satisfactory taken into account that these two factors summarize diverse findings from over 15 years of research. From the four factors which initially had eigenvalues above 1, I dropped the last two since each explained only 6% of the variance and could not be meaningfully interpreted.

a = performance outcomes (aggregated)

b = competency

c = capacities required

d = capacities required (aggregated)

Table 4: Factor analysis

With respect to the performance variable ('VBM-orientation'), literature on English-speaking firms (mostly congruent with English-speaking researchers) employs secondary capital market data. It also uses benchmarks for efficiency tests, mostly in connection with the aforementioned calculation of the key financial ratios, which the company is assumed to use. Research on German-speaking firms (mostly conducted by German-speaking researchers) on the other hand rather tests for effectiveness based on perceptive measures. It gathers internal data on key financial ratios, on the quality of information, and its *actual* use, e.g. for compensation purposes. Overall, German and English-speaking research foci seem to be strongly *negatively* related, consistent with the notion that the former refer more to economics-based frameworks while the latter base their research on the social sciences.

The geographic locations of the investigated firms do not load on the second factor ('breadth-implementation'). This suggests that there are no differences in how broadly German and English-speaking firm's VBM systems are scrutinized. As expected, most variables derived from Ittner & Larcker's (2001) framework load on this factor. Exceptions are those variables strongly related to key financial ratios (shareholder value objective, check existence of key financial ratio, calculate assumed key financial ratio, incentive systems): They are frequently used to test for competency in connection with a performance variable. Thus, it is not surprising that they also load on the factor representing performance.

The positive loading of 'perceptive measures' on factor 2 hints at a common method bias, since key informants or researchers are frequently asked to describe *and* assess their VBM-systems. To test this allegation of method bias, I compared the likelihood of VBM being classified as successful. Across all studies, the likelihood is 63%, for studies using perceptive measures, and for capital market data the likelihood is 67%. The chi-square test was not significant which – surprisingly – makes a method bias seem unlikely. This finding is also backed by the factor analysis: The variable 'result positive' – which contains the overall assessment on the performance effects of VBM – drops out of the factor analysis early, indicating that there is no significant correlation with perceptive or capital market measures.

Splitting up the perceptive measures into those mirroring the opinions of managers ('management's satisfaction') and researchers ('researcher's satisfaction'), results are quite different: In 77% of all cases, managers rate their VBM-system as successful while in studies using the researcher's opinion the likelihood is only 50%. This difference is significant at  $p < 0.05$  and may point to a method bias: Managers might be prone

to defend their past work on VBM-implementation by rating VBM as successful. Studies using researchers' opinions – some of them which are conducted by consulting agencies – may tend to make more negative judgments since they might be more interested in conveying to practitioners the existence of implementation gaps to generate new business. The consequent cluster analysis with the two extracted factors and the between-groups-linkage algorithm helps to better understand similarities and differences within/ between possible research clusters (cf. figure 2):

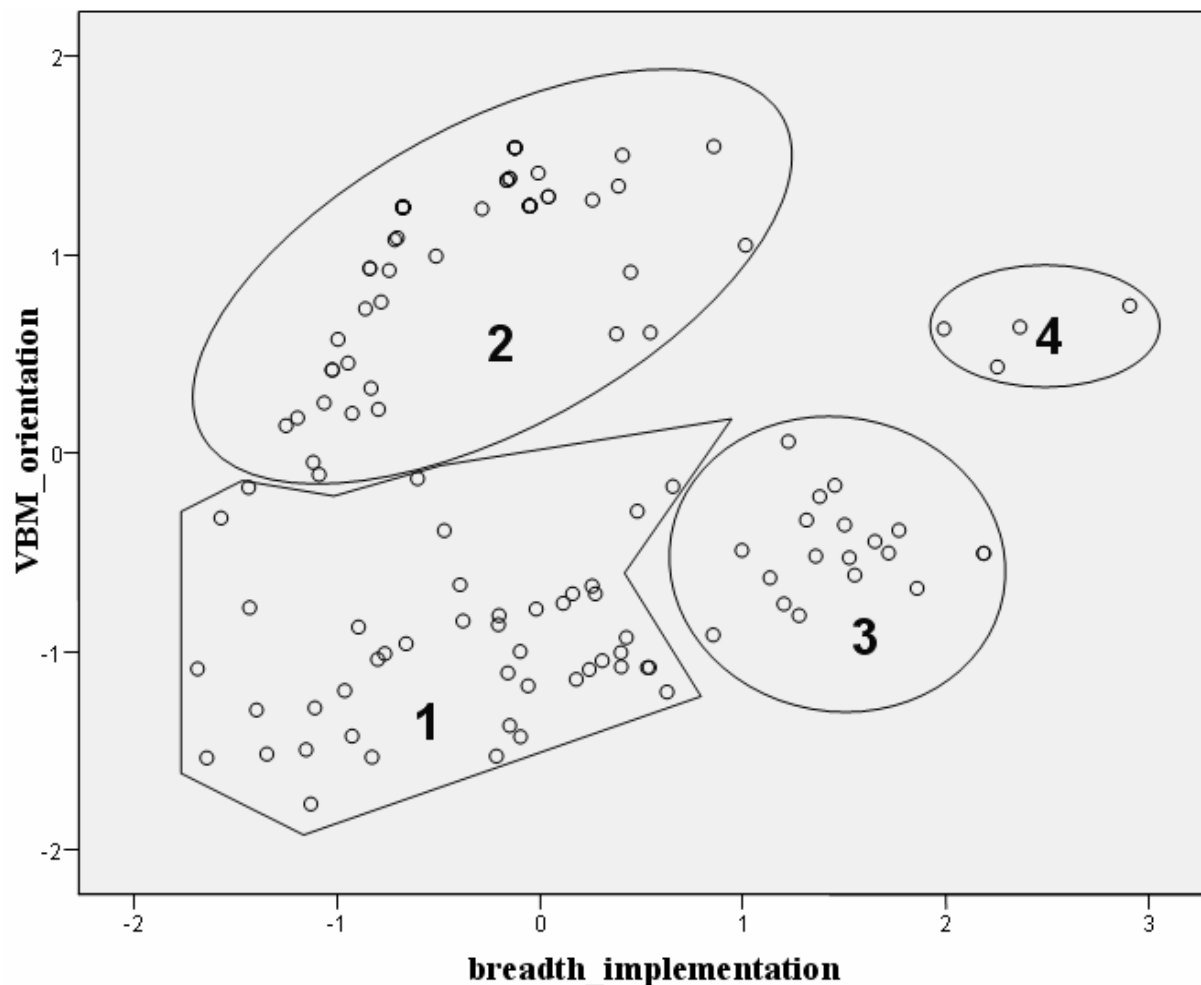


Figure 2: Study clusters in VBM-research

The interpretation of the coefficients (elbow-criterion) suggests four clusters. A major finding of this review is therefore that different schools of thoughts do exist in the empirical VBM-literature. Based on the insights gained in the previous chapter, I offer an interpretation of these clusters:

The first cluster is called 'Pragmatic Classifiers'. It contains over 70% German-speaking studies, which are mostly practitioner-oriented and corporate publications as

well as doctoral dissertations. Mostly, these studies neither use an objective performance measure (e.g. ‘researcher’s satisfaction’ vs. stock returns) nor do they investigate the VBM-system broadly.

The second cluster is called ‘Correlation Testers’, and contains about 70% English-speaking, mostly practitioner-oriented studies. They make extensive use of capital market data. Yet on average, they analyze the breadth of the VBM-system even less broadly (mostly only the key financial ratio) than cluster 1 does. This cluster also contains studies that are cited most often by other studies of this sample: While the popular paper of Biddle, Bowen & Wallace (1997) is quoted by 25 other studies, Wallace (1997) gets 15 citations, and Kleiman (1999) 10. Acknowledging that later studies can only be cited by a smaller sample does not change the ranking of these top-3-papers.

Cluster 3 is called ‘VBM-System Analysts’ since its studies receive a high rating on the factor containing only capacities required. The studies stem significantly from academic sources compared to the other clusters (approximately 40%). It contains both German and English-speaking studies, which analyze the VBM-system more thoroughly, but *none* of them triangulates subjective performance with objective data.

Only the four studies in cluster 4 – called ‘Performance Measurers’ – stand out because they broadly analyze the VBM-system like cluster 3 *and* make use of objective performance data just as cluster 2. This indicates that the claim of VBM-advocates that a *full* implementation *demonstrably* increases performance has seldom been tested: Only these four studies have investigated most variables that would be necessary to make a profound statement in the first place. This finding does not lessen the diverse accomplishments of the studies in the other three clusters. Yet, it underlines the potential to contribute further research to the relatively undersized cluster 4 in order to improve understanding of the performance effects of VBM. Table 5 in the appendix lists the studies by cluster and their main findings.

## 5.2 The association of VBM and performance

The second research question asks if VBM leads to improved corporate performance. There are two answers to this, one based on the best-practice cluster 4, and the other one based on all 120 studies:

With respect to cluster 4, findings of its four studies are noteworthy: All of them agree that a holistic VBM-system increases corporate performance. No other cluster reaches such a unanimous result. The verdict of these four studies is particularly important since they investigate both the VBM-system and performance measures quite profoundly. Of course, also their interpretations are subject to several limitations. Still, these four studies do not intent to draw a black-or-white picture of the performance effects of VBM, and offer many critical perspectives on this subject. Discussing each study in its details is however beyond the scope of this paper.

With regard to all 120 sources, there is also the ‘average opinion of *the* literature’: 76 (63%) studies report a positive relationship between their performance variable and the VBM-system. Nevertheless, this result is not of great importance, and needs to be interpreted with caution: First, the performance variables differ greatly. One researcher can see a company as successful because it has rigorously implemented a VBM-system. A researcher investigating abnormal stock returns, employee retention or the management’s satisfaction with the VBM-system may reach a completely different conclusion for the same data set. Second, even if the same measure is used, the thresholds when VBM is a success are diffuse. For their sample, Coleman & Eccles (1997) describe value-based reporting as unsuccessful since ‘only’ 87% of the respondents are somehow satisfied with VBM. Other researchers may had classified this finding as an overwhelming success. Third, some of these 76 studies have found no correlation between most performance variables and the VBM-system, but were coded positive if they found at least *one* variable for which an association exists. Fourth, it is harder for a researcher to get a paper published that finds no correlations whatsoever than to publish a paper with highly significant results, especially due to the fact that few testable hypothesis exists for VBM (Zimmerman, 2001).

### **5.3 Guidelines for improved hypothesis testing**

The third research questions aims at improving hypotheses testing, since the performance effects of VBM are obviously an under-researched topic. Due to the nearly unlimited possibilities to model the relationship between VBM and performance, there cannot be a uniform recipe for future studies. Adhering to the concept of ‘competency’, I attempt to integrate the findings from all 120 studies into some basic research guidelines.

It is nearly redundant to mention that even the four studies in the cluster ‘Performance Measurers’ cannot conform to every suggestion made in this chapter. E.g. an any-

mous questionnaire cannot be matched with publicly available data. Hence, I leave the evaluation of single studies to the reader, and outline some general issues that should be observed when judging or conducting VBM-research.

### 5.3.1 Operationalization

*Dimensions of performance:* Since VBM ultimately aims at increasing stock returns, researchers need to seriously consider the adoption of an event-study-methodology from finance (MacKinlay, 1997). In order to test for ‘efficiency’, variables on capacities and performance have to be matched more carefully, since VBM makes very strong assumptions based on the Efficient Market Hypothesis (EMH) and the CAPM (Stern & Shiely, 2001; Copeland, Koller & Murrin, 2000). According to the EMH, all publicly available information is reflected in current share prices (Fama, 1976). Any profits are arbitrated away, and abnormal returns can therefore only be generated if new information reaches the market. The implications for VBM-research are overwhelming: If the market already expected company A with a highly sophisticated VBM-system to make optimal value-oriented decisions during the last 10 years, no potential for improvement remains. Hence, no abnormal returns can currently be generated. On the other hand, company B that has yet only used a value-oriented key financial ratio, could expand this onto its BSC and its incentive system. This may surprise the market and signals stronger value-oriented decisions. Consequently, the cash flows of B could increase while those of A should not. This happens even if B’s system is still not as sophisticated as A’s. According to the EMH, the best-practice-VBM-company A with no change in capacities will have no abnormal return. But company B will since it surprises the market with increased cash flows due to its change in capacities (Copeland & Dolgoff, 2006). As Dobbs & Koller (2005, p. 1) put it: “Companies that consistently meet high performance standards can thus find it hard to deliver high TRS: The market may think that management is doing an outstanding job, but this belief has already been factored into share prices.”

Researchers will only be able to test this hypothesis if they match this change in capacities with the corresponding change in performance. This conjecture is based on the VBM-proponents’ assumption of an at least semi-strong efficient market. In effect, this implies that adjusted/ abnormal stock returns of a period have to be matched with the *changes* in the sophistication of the VBM-systems that relate to that period. It may be necessary to allow for a short time lag, e.g. of three months until the next quarterly report is issued. Consequently, the VBM-performance hypothesis can only be tested

with both historical performance *and* historical capacities. I suggest investigating in-depth *which* VBM-subsystems are expanded, reduced or not altered during a fixed time period, e.g. three years. Expanders should exhibit positive, reducers negative, and all others no adjusted/ abnormal returns according to the theory of VBM-proponents.

Within the sample, 12 event studies use current-point-in-time data for capacities required, which seems to contradict these suggestions. Quite contrary and in accordance with the finance literature, researchers need to identify the event *very* carefully due to the high sensitivity of the dependent variable (MacKinlay, 1997; Fama, 1991; Brown & Warner, 1985; Bowman, 1983): E.g. the Challenger crash is an ideal event for an event study because it lasted a short and clearly defined time, it was exogenous and surprising, and there was no prior leakage (Maloney & Mulherin, 2003). VBM-implementations on the other hand are fundamentally different. They always take months, sometimes years (Schaffer, 2005; Knight, 1998; Stewart, 1995). Moreover, it comprises multiple phases, i.e. the information phase about the MAS, the adoption, the implementation, and the point in time when VBM becomes a corporate practice (Gosselin, 1997). Kleiman (1999) and Schaffer (2005) need to make very strong assumptions for their event studies. Additionally and as mentioned before, current research in management accounting urges to ask not only *when*, but *what type* of VBM-system has been implemented. If an event study design hence identifies when the change took place (e.g. the equal-worded announcement of firm C, D, and E to fully adopt EVA) and what changes are made after three years (C and D fully implemented, E abandoned EVA after three months), the design of the event study resembles the classification of different users. This additional information on the implementation-steps actually taken after the announcements adds credibility for investors and analysts. It also transforms the current 'event' into an historical overview on changes in capacities.

These suggestions take into account the cost of implementation indirectly. Some VBM-proponents explicitly claim that only *full* implementation completely unfolds value creation potential (Stern & Shiely, 2001; McTaggart, Kontes & Mankins, 1994). They assume that the benefits of VBM always outweigh its costs – e.g. consultants' fees, increased bureaucracy, or union strikes. Empirical findings for other objectives like the maximization of customer satisfaction show that a further increase beyond prime-customers has a *negative* impact on profitability, e.g. (Keiningham et al., 2005). Likewise, future research on VBM needs to investigate the relationship between the



increase in VBM-sophistication and its incurred cost. This can determine whether VBM-systems should always be fully implemented, or if the profit-maximum is reached already at an earlier point. Such a test requires the use of adjusted/ abnormal stock returns since they account for the incurred costs indirectly: In the opinion of VBM-advocates, shareholders will discount a company's stock if the increased cash flows from improved VBM-decision-making are outweighed by even larger negative cash flows caused by exploding overheads. This also implies the investigation of contextual variables, which could impact performance in addition to the VBM-system.

*Frame of reference:* Another remark is that any VBM-study avoiding some kind of abnormal return as a performance variable needs to be seriously questioned: According to the CAPM on which VBM-proponents rely, stock performance depends on the relationship of return and risk (McTaggart, Kontes & Mankins, 1994; Lintner, 1965; Sharpe, 1964). Some studies therefore make use of different forms of abnormal returns known from finance (Sinn et al., 2005; Biddle, Bowen & Wallace, 1997).

Analogous, associated expectations for accounting data are hard to replicate and highly depend on nature and context of the sample. Schaffer (2005) therefore demonstrates the variability of his findings on the same sample due to various super-profit-calculations. An interesting application of internal company data could be if capital market data does not exist, or if it does not reflect all available information. Christensen, Feltham & Wu (2002) point out that if e.g. the cost of capital is assessed according to the CAPM and thus externally by the market, researchers disregard the insider information upon which management actually bases its decision.

Operative measures are seldom used in VBM-research because valid hypotheses are nonexistent, which makes this data already hard to interpret before a reliable benchmark is found: E.g. long employment retention rates can be a good sign of an experienced and satisfied workforce. It could also be an indicator of an organization foregoing important divestments, or with an inability to adapt to environmental changes. Nevertheless, researchers can use these measures, provided they find valid hypotheses beforehand and use triangulation, e.g. with capital market data.

Most perceived measures are hard to benchmark since they have no common reference point. Based on the findings of Ittner, Larcker & Randall (2003), future studies should consider using data from perceptible measures only for triangulation purposes.

*Stakeholder perspective:* A further remark is that studies investigating shareholder-value-instruments could start to adopt the perspective of the shareholder, and not as

usual the one of the CEO: The chosen stakeholder perspective significantly determines the performance measure used, and thereby influences whether VBM is seen as successful, e.g. if designers or users of an MAS are asked to judge the system (Anderson & Young, 1999). Even ‘objective’ data from capital markets depends on the perspective: Despite the term ‘total *shareholder* return’, the performance of an individual *organization* is measured, i.e. from a CEO-perspective. Studies need to take into account the perspective of the owners: According to the CAPM, shareholders are diversified and hold different investments instead of only one stock, which has implications: First, the maximization of individual firm profits is not overall value maximizing for shareholders if they hold direct or indirect mutual equity stakes in competing organizations. Loderer & Zgraggen (1999, p. 91) show for the takeover-attempt of the United Bank of Switzerland that “the holder of registered stock ended up voting for a plan that caused them to lose [...] 11% of the value of their shares [...]. Most of these shareholders were apparently UBS employees (afraid that a victorious Mr. Ebner would restructure their jobs out of existence) as well as shareholders with business ties to UBS.”

Second, initially equal returns to international investors can differ when they are paid out since they receive them after tax, depending on national legislation. Future studies need to expand the unilateral evaluation of VBM-systems from the management’s perspective to a broader perspective, including the supervisory board, and especially the shareholders’ portfolios. Furthermore, the perspectives of other stakeholders have to be taken into account due to the claim that VBM benefits all stakeholder groups (Arnold, 2000; Copeland, Koller & Murrin, 2000; Rappaport, 1986).

*Time horizon:* A fatal flaw of many studies is the mismatch of capacities, context and performance measures as discussed under ‘dimensions of performance’. There are two feasible alternatives: The first one compares *static* situations or levels in these three variables to each other (‘current data’). This alternative is useful to test definite characteristics and contingencies related to VBM implementations, e.g. if listed firms are generally more inclined than unlisted firms to implement VBM.

The second alternative compares *dynamic* states or changes in the sophistication of the VBM-system (‘historic data’). This test is suitable to explain the outcomes of a VBM-implementation, e.g. in how far stock returns can be explained by changes in market participants’ expectations. For this type of research, expectations could be approximated by a change in VBM-sophistication. The latter research design requires a costly

and time-consuming longitudinal study as well as the combination of different research methods.

### 5.3.2 Sampling

*Unit of analysis:* VBM is a holistic MAS; therefore, it makes sense to measure this complex instrument with a sophisticated research design employing several constructs. Up to date, there are many studies defining VBM as a binary variable. Also, VBM-proponents state clearly that VBM needs to be implemented at all levels of the organization since especially lower levels are major source of value creation (Stern & Shiely, 2001). Nevertheless, the number of studies investigating more than the corporate level is remarkably low. If future studies want to test hypotheses based on existing VBM-frameworks, they need to delve more deeply into these issues and gather information on concrete value-based practices beyond publicly available information. Additionally, investigating the different styles of VBM-use, e.g. among departments, could be a fruitful setting since the observation of corporate capacities as a whole reduces the variance of the single business units. As a result, the difference between e.g. value-based business units with excellent performance, and non-value-oriented business units with poor performance is easily overlooked. Nevertheless, the analysis of business units is subject to critique since the explicit aim of VBM is the maximization of the value of the entire company, not of single parts. To minimize complexity, it is sensible to investigate only profit and investment centers (Young & O'Byrne, 2001). Alternatively, business units with a high influence on value creation could be deliberately chosen and compared to a random selection of all others (Katsikeas, Leonidou & Morgan, 2000). A good example is Malmi & Ikäheimo (2003) who analyze the different styles VBM is used across six organizations.

*Scope of analysis:* Future studies could determine whether VBM is applied similarly among cultures. Examples of this are Wagner & Möller (1997), Carr & Tomkins (1996), as well as Horváth & Minning (2001) who use the same research framework in different countries.

*Legal form:* Future hypotheses tests can determine if the number of publicly traded organizations in the samples is so low due to the greater availability of data on listed firms. Instead, it could be possible that VBM is not meaningfully applicable in non-listed firms (which would contradict the claims of VBM-proponents as stated above).

*Sample size:* While in-depth analysis of case studies has generally lower sample sizes, more superficial capital market studies on the key financial ratio can investigate thousands of companies. Nonetheless, some studies prove that detailed primary data is available also for large sets of companies: Haspeslagh, Noda & Boulos (2001) and KPMG (2003) exhibit good response rates using a questionnaire with 30 and 10 pages, respectively, which is encouraging for the use of questionnaires.

### 5.3.3 Data collection

*Source of data (capacities):* Primary data can be used for determining VBM capacities, and secondary data may help to triangulate the rather qualitative primary sources. Yet, researchers need to be aware of the limitations of this data: The reliance on primary sources impedes easy reproduction of the data set. This is especially the case if no reference point for a key informant's assessment is set by the researcher. Another problem is if the researcher makes use of only a single key informant. The 'key informant bias' can be reduced by (a) a clear determination of the context in which research is conducted, e.g. differences in answers may stem from industry effects, (b) triangulation of data sources from different key informants with an internal dyadic system, e.g. users and designers, (c) an external dyadic system using external key informants, e.g. the statements made by management could be verified by analysts, business journalists, consultants or customers, and (d) rigorous pre-testing and careful selection of the key informant (Hurtle & Kieser, 2005; Anderson & Young, 1999; Huber & Power, 1985; Philips, 1981). Despite the qualitative nature of this data, Zimmerman (2001) strongly encourages its systematic collection. The use of secondary data to classify VBM-users from databases or audited financial statements seems more objective and easier to replicate. But there is an ongoing debate on its quality or inconsistencies (D'Arcy & Grabensberger, 2003; Courtenay & Keller, 1994; Rosenberg & Houghlet, 1974). Moreover, these data sets contain little if any information on actual practices (Fischer, Becker & Wenzel, 2001).

*Source of data (performance):* Contrary to the measurement of capacities, subjective (i.e. mostly primary) data for performance assessment has been proven to diverge significantly from stock returns (i.e. mostly secondary data). As stock returns are VBM's final goal, this raises serious doubts about the validity of perceptive measures (Ittner, Larcker & Randall, 2003). In case a company is not listed, multiple accounting substitutes are available that can be calculated to approximate stock prices (Biddle, Bowen & Wallace, 1997). To avoid the critique of method bias, the key informant's percep-

tion of performance should generally be triangulated by secondary measures (Podsakoff & Organ, 1986).

## 6. Conclusion, limitations, and implications

It is the purpose of this review to better understand the literature's findings of the performance effects of VBM. This goal is approached by three research questions.

The first question concerns the identification of different streams of research in the empirical VBM-literature that allows the identification of the relevant VBM-performance studies. I identify four clusters: The first one contains the 'Pragmatic Classifiers', which neither use an objective performance measure nor do they investigate the VBM-system broadly. The second cluster is called 'Correlation Testers', which contains studies that make extensive use of capital market data, but analyze the breadth of the VBM-system even less broadly than those in cluster 1. The 'VBM-System Analysts' in cluster 3 thoroughly investigate the sophistication of VBM-systems, but do not use objective performance measures. Only the 'Performance Measurers' in cluster 4 both broadly analyze the VBM-system like cluster 3 *and* make use of objective performance data just as in cluster 2. Yet, cluster 4 contains only four of the 120 studies. Given that VBM is such a popular topic, this indicates that there is still considerable need for further investigation. In addition to that, there are significant differences of research designs between sociology-oriented German-speaking research (cluster 1) and economics-focused English-speaking studies (cluster 2).

The second research question considers the performance effects of VBM. In a nutshell, VBM seems to improve performance. Of course, the literature as a whole does not agree on this. But as most studies do neither possess the methodological scope nor sufficient data to make a clear judgement on performance effects, the 'average opinion of *the* literature' cannot be a reference point for how far knowledge has advanced on this topic. Far more important is what the more complex studies of cluster 4 conclude. The studies in this cluster fulfill the minimum requirements set by VBM-proponents: They analyze how the VBM system is implemented in detail, and how this relates to inter-subjectively measurable performance. And these four studies (classified as 'Performance Measurers') agree on the positive contribution of VBM on organizational performance. Of course, all of these studies have minor limitations, and they also criticize VBM from different perspectives. But overall, their encouraging verdict on VBM can serve as a good indicator for what can be expected from future research.

The third research question focuses on guideline for improved hypotheses testing on the performance effects on VBM. The advice given in the previous chapter is certainly complex. For the sake of a conclusion, the most important requirements are highlighted, yet with a slightly truncated line of reasoning:

1. In the future, contingency factors should be taken into account. Research on related MAS leads one to suspect that corporate performance is partly explained by environmental factors, and not just by the VBM-system itself.
2. Since VBM should increase the wealth of the shareholders, researchers could attempt to adopt their perspective instead of the one of the CEO when interpreting results. This would make a link to portfolio theory from finance necessary.
3. Researchers should spend more rigor and creativity in measuring VBM-systems. VBM-systems are meant to be holistic. Therefore, binary ‘implemented or not’-measures or simplistic EVA-calculations do not cope with the complexity of VBM. There is also a need to standardize the measurement of VBM. The reader of VBM-studies is often left with the emperor’s new cloths: Many subsystems like ‘value-based culture’ are frequently mentioned but have not yet been operationalized. One reason for this gap could be that research is motivated by practice rather than theory, and selection of constructs is anecdotal and eclectic. To delve more deeply into these issues, researchers need to gather more internal and qualitative instead of just analyzing financial statements.
4. Contrary to probably all other MAS, VBM predetermines its performance variable: Company value. Still, many studies do not justify why they do not use (abnormal) stock returns or intrinsic values. Based on the high number of positive results among studies employing only perceptive measures, there is a clue that these studies seem prone to a common method bias, e.g. when managers describe *and* evaluate their VBM-implementation at the same time. Hence, perceptive or accounting measures should only be used for triangulation purposes, or if stock returns are not available.
5. Corporate performance may increase for many reasons. If researchers want to understand if VBM is the cause, there are few viable alternatives to an event-study. It is crucial to carefully define the VBM-event that supposedly triggers these returns, and to match it with appropriate control groups and time horizons of performance. This makes further analytic links to the EMH and the CAPM necessary. Moreover, there may be fruitful insights on the non-linearity of the relationship between stock returns and VBM-subsystems – an overly complex VBM-system could possibly destroy shareholder value. A further advantage of employing event studies with

stock returns is that – according to VBM-proponents – investors have already deducted *all* explicit and implicit costs associated with the VBM-implementation, e.g. increased complexity in daily tasks. Consequently, researchers will then see the relevant ‘*net*’-effects of a VBM-implementation.

In some further areas, these findings deviate from prior evidence: The reviewed set of studies deals even *less* with the topics strategy and compensation as Ittner & Larcker (2001) conjecture. Moreover, and contrary to Ittner & Larcker (2001), action plans and information quality are investigated *more* often than they report. Also, there is additional evidence on the topic of value distribution. These differences may be due to the fact that Ittner & Larcker (2001) also assess papers dealing with related topics like budgeting or strategy. This paper, on the other hand, only includes those explicitly stating their affiliation to VBM. Besides, most of them are published after the review of Ittner & Larcker (2001). The more recent studies may already have incorporated their suggestions. Likewise, it is possible that researchers refer more to actions plans and quality since VBM-sophistication has already further advanced in practice.

The literature review and the cluster analysis are subject to several limitations. First, the literature search could initially have included literature from further important capital markets like Japan, or working papers in the investigated language areas. Nevertheless, there is little reason to believe that studies are omitted that would qualitatively change the paper’s main findings: I explicitly went through all important international journals on these topics as well as all of their references. Moreover, other researchers could define other studies which needed to be reviewed. Since this sample has reached a size of 120 studies, it should yet be large enough for meaningful analysis. Also, it roughly deals with most issues in this stream of research.

Second, this study could be criticized for comparing studies that e.g. try to find an implementation gap in a company, and studies that investigate the correlation of CFROI with stock returns, since they seem to have different aims. I am not of the opinion that this critique would be appropriate in the special case of this investigation since VBM inevitably raises questions about increased stock returns (performance outcomes) that are caused by value driver techniques (capacities required) in different settings (performance context). Of course, an exhaustive operationalization of the framework in this paper can raise methodological and practical problems. Still, future studies on VBM should systematically address these difficulties by e.g. limiting the universal validity of their results.

Third, the binary coding method only allows for horizontally estimating the breadth of variables that the studies have used. It does not allow for vertically accounting for reliability, validity or analytical depth of these variables. This is beyond the scope of a single paper.

This review contains multiple implications and directions for future research. First, it may be of interest to further scrutinize the four studies in cluster four: They contain most indispensable variables as well as basically comprehensive research frameworks. It would further contribute to research if the reliability and validity of these studies were compared in more detail, e.g. following the review-framework of Davies (2000). Second, the more concise definition of VBM and its performance effects in this paper can serve as a basis for linking VBM to established theories like the CAPM. Valuable explanations can also be drawn from other disciplines like psychology to explain phenomena in VBM (Zimmerman, 2001). This helps anchoring VBM in the scientific community. Eventually, sound, testable hypotheses can be developed.

Third, future research could follow the suggestions for improved hypotheses testing. This includes a contingency analysis of VBM, or the adoptions of theories and methods from finance (portfolio theory, abnormal returns, and event studies). Most importantly, researchers need to define and standardize the subsystems of a VBM-system to make findings more comparable. This includes e.g. the exact valuation of stock options, determination of caps, (dis)functional behaviors of VBM-users, quality of information/ system, or a clearer definition of value-oriented culture. In the normative literature, these aspects are deemed to be important. But despite over 25 years of VBM, there is very little evidence on them in empirical research.



## 7. Appendix

Table 5: Main findings of the studies by clusters

<b>Cluster 1: Pragmatic Classifiers</b>	
Achleitner & Bassen (2002)	VBM adoption increases in practice, but traditional measures prevail due to insufficient knowledge about VBM and fear of complexity. Gaps remain in the areas of cost of capital, incentive systems, segment analysis and corporate culture.
Balachandran (2006)	The pattern and changes of investment for firms switching to residual income from earnings-based compensation is opposite to that of firms switching from ROI-based compensation. Additionally, residual income increases in firms that implement it.
Bassen, Koch & Wichels (2000)	Value-orientation is widely applied in incentive systems. Nevertheless, most of these systems are unsophisticated since they have a strong short-term-focus.
Bassen & Schulz (2000)	Multiple VBM-indicators are used in practice, but satisfaction with them is low.
Bühner (1993)	VBM can be suitable for management purposes. Nevertheless, VBM does not allow analysts to externally value a company since most information for this is not available from financial statements.
Carr & Tomkins (1996)	Differences in VBM-application depend on national culture (Germany, U.K. and U.S.). Generally, successful companies place more emphasis on strategy and value-driver-techniques than unsuccessful ones.
Chahed, Kaub & Müller (2004)	Management compensation does not just depend on changes in aggregate firm value but also on non-financial factors related to employees, customers or corporate social responsibility.
Clinton & Chen (1998)	Ordinary operating figures as well as the VBM-measure “residual cash flow” show significant correlations with stock prices and returns.
Dodd & Johns (1999)	EVA adoption may foster an environment in which the pursuit of higher EVAs may overshadow the pursuit of quality and fulfillment of customer needs.
Eccles & Mavrinac (1995)	Market imperfections can be reduced by upgrading the role of investor relations, and by the voluntary disclosure of value-oriented information.
Eccles & Weibel (2002)	Analysts and investors demand an increase in publicly available information on actual VBM practices.
Fischer (2002)	The international competition for capital has fostered additional, voluntary corporate disclosure on planned and realized improvements in corporate value.
Fischer & Rödl (2005a)	While VBM adoption among companies increases, compensation is still focused on other goals than value-orientation.
Fischer & Rödl (2005b)	Most VBM-ratios differ significantly in wording, definition and reproducibility.
Fischer & Wenzel (2004)	There are different ways of reporting on value drivers relating to customers, suppliers, employees, processes, and innovation.
Fischer, Wenzel & Kühn (2001)	VBM companies insufficiently report information on their VBM systems, especially concerning value-orientation of strategy and non-financial value drivers. Only information on compensation and segments is sufficient.
Glaum (1998)	The diffusion of the use of VBM for assessing strategic alternatives is fostered by international accounting harmonization and regulations on corporate governance. VBM-methods are still applied in an unsophisticated way.
Günther & Gonschorek (2006)	Mid-size companies are very interested in VBM but do not apply it due to a lack of organizational knowledge.
Hansmann & Kehl (2000)	VBM is increasingly popular among investor relations and incentive systems. Nevertheless, a strong reliance on traditional accounting measures highlights the persisting under-development of VBM systems.

Happel (2002)	Most companies have insufficiently implemented VBM, especially in the areas of planning, control, and incentive systems.
Homburg et al. (2004)	Most companies use VBM-figures for lower levels and for planning. Gaps still exist in the area of compensation.
Höpner (2001)	The rise of VBM is explained by increased competition (products, capital, corporate control) and by internal developments (changing management careers, increasing compensation, reduced monitoring by banks and corporate networks).
Horváth & Minning (2001)	VBM has been widely adopted in Europe but differences remain due to size, country, and corporate life-cycles.
Kirchhoff Consult (2002)	Analysts and investors see room for improvement in communicating VBM-information to the market, especially in terms of decision usefulness of VBM-information and the value orientation of strategy.
Kirchhoff Consult (2004)	Reporting of VBM-information is well developed in the areas of management reports and financial figures. Lacks remain in the description of the VBM-system, corporate governance, and strategy.
KPMG (2000)	VBM is widely adopted, but its application is too simplistic.
Lehn & Makhija (1997)	The worse the firm's performance in terms of EVA and MVA, the greater the probability of a CEO-turnover. Accounting measures do not seem related to turnover.
LEK Consulting (1995)	Companies believe VBM to be a holistic system, including key financial ratios, overall value-oriented objectives, action plans, evaluation processes, and value based compensation.
Lovata & Costigan (2002)	EVA adopters exhibit a high (low) percentage of institutional (insider) ownership. Prospector firms tend to use EVA less than defender firms. Providing appropriate incentives may be more complex than the developers of EVA imply.
Machuga, Pfeiffer & Verma (2002)	EVA contains information incremental to EPS in predicting future earnings. Despite this potential, analysts do not use the EVA-information appropriately in their forecasts of future earnings, but appear rather to overweigh it.
Ossadnik & Barklage (2003)	The implementation of VBM shows deficits that damage investors' trust in the respective companies.
Palli (2004)	VBM contributes to performance through improved investor relations, supporting acquisitions, and increasing information content of traditional measures.
Pellens, Hillebrandt & Tomaszewski (2000)	Value-based reporting has improved over the years. Still, gaps remain in the areas of forecasts and consistency of information.
Pellens et al. (1997)	VBM adoption increases significantly. Implementation gaps remain in investment decisions, use of value-oriented performance indicators, and incentive systems.
Pellens, Tomaszewski & Weber (2000)	VBM-adoption has increased but gaps remain in the areas of cost-of-capital-calculation, incentive systems, post acquisition controlling, and integration of key performance indicators with the key financial ratio.
Pricewaterhouse Coopers (1998)	Ratios used in connection with VBM are often not value-oriented. Analysts anticipate a low sophistication of VBM-systems early but still appreciate any additional information.
Riceman, Cahan & Lal (2002)	Managers on EVA bonus plans who understand the EVA concept perform better than managers on traditional bonus plans since EVA makes the manager's evaluation-reward process more congruent. The strength of this effect depends highly on the department of the firm.
Ruhwedel & Schulze (2002)	Value based reporting improved over the years. Still, gaps remain in the areas of cost of capital, intellectual capital and forecasts. The gap is larger for smaller companies.
Ryan & Trahan (1999)	There is room for improvement in the design and implementation of VBM-systems.
Späth, Ngyuen & Ahr (2005)	Improvements in earnings seem to indicate that VBM-implementations pay off for insurances.
Vettinger & Volkart (1997)	Companies apply VBM differently in terms of performance indicators, cost of capital, investor relations, incentives system, and dividend policy.

Wagner & Möller (1997)	VBM is often inconsistently and incorrectly applied by companies in terms of the valuation of strategic alternatives, calculation of the cost of capital, and communications with investors.
Wallace (1998)	The interest of organizations is shifting from bottom-line-earnings to the cost of capital. EVA performance measures appear to align the interests of management with those of the firm's shareholders.
Weaver (2001)	EVA is measured differently across companies. Even within industries, inconsistencies exist in accounting adjustments and the estimation of the risk premium.

### Cluster 2: Correlation Testers

Bacidore et al. (1997)	If EVA is calculated based on market values instead of book values, its explanatory value for stock returns increases.
Biddle et al. (1999)	EVA does not dominate net income in associations with stock returns. Still, EVA can be useful since managers do respond to residual income-based incentives.
Bughin & Copeland (1997)	Companies focusing strictly on shareholder value also increase the wealth of other stakeholders. These companies outperform broader stakeholder-focused companies in terms of productivity (esp. labor productivity), employment growth and resource-utilization.
Bühner, Stiller & Tuschke (2004)	Companies can legitimize the adoption of VBM for the following reasons: Change in the executive board, VBM's popularity in the press, large size, and high performance.
Chen & Dodd (2001)	Even though the cost of capital in residual income and EVA adds information content over operating income, the benefit may not be large enough to justify the extra cost involved making the adjustments to the audited financial statements.
Coleman & Eccles (1997)	Companies can substantially improve scope and quality of their value-based-reporting. Organizations need to realize that analysts and investors are two different user groups: Analysts require a broader scope of information, especially in the non-financial area.
Cooper & Petry (1994)	VBM-sophistication correlates with company size, earnings-per-share, abnormal returns, and growth.
Copeland & Dolgoff (2006)	Changes in analysts' expectations have by far the greatest explanatory power for abnormal returns. Investors take a long-term approach to the valuation of companies and seem to care most about earnings three to five years down the road.
Cordeiro & Kent (2001)	No relationship exists between EVA adoption and an increase in anticipated earnings-per-share. It is reasonable to assume that EVA adoption may not be suitable for all firms all the time.
Deutsche Morgan Grenfell (1996)	Stock market outperformers place more weight on investor relations, best-practice-management, productivity, cash generation, and core competencies than underperformers.
Farsio, Degel & Degner (2000)	EVA is not a good indicator of stock performance.
Feltham et al. (2004)	Findings of Biddle, Bowen & Wallace (1997, 1999) cannot be replicated: EVA has greater power than earnings in explaining market-adjusted stock returns.
Ferguson & Rentzler (2005)	There is insufficient evidence to conclude that poor stock performance leads firms to adopt EVA, or that adopting EVA improves stock performance. Adopters appear to already outperform peers before the adoption of EVA. Only few increase profitability afterwards.
Fernández (2002)	EVA, Economic profit and CVA do not measure shareholder value creation. Sometimes the relationship is even negative. Only changes in expectations about cash and risk influence market value added.
Finegan (1991)	EVA is the best performance measure for investors and is a powerful tool for rewarding managers.

Garvey & Milbourn (2000)	Due to their high correlation with stock returns, EVA and earnings are good incentive contracting tools. Estimates are positive and significant in predicting which firms have actually adopted EVA as an internal performance measure.
Graf, Lenke & Schießer (1997)	Transparency, investor relations and implementation of VBM partially explain performance. Evidence on well-performing non-implementers shows that other factors than VBM also drive performance.
Grant (1996)	EVA is a valuable analytical tool for corporate managers. It may offer a powerful synergy for investment firms with research departments segmented traditionally by bond and equity functions.
Griffith (2004)	Investments in EVA adopters or in firms for which EVA has been used to forecast stock performance would have yielded negative returns.
Günther & Beyer (2001)	Companies do not sufficiently report to the market on the value orientation of strategy, non-financial value drivers, risk management, and business segments.
Günther, Landrock & Muche (2005)	VBM-measures do not outperform traditional measures in explaining stock returns. Nevertheless, the authors conjecture that this result could be due to the assumptions necessary to calculate a value for a VBM-measure.
Hogan & Lewis (2000)	For creating shareholder value, economic profit plans are not superior to traditional ones providing a blend of earnings-based bonuses and stock-based compensation.
Jörg, Loderer & Roth (2004)	Most managers pursue conflicting targets and have inconsistent investment criteria. Maximization of shareholder value is mentioned mostly by managers whose share price has fallen. VBM has nevertheless positive effects on share price if adopted by underperformers.
Kleiman (1999)	Companies adopting EVA as the basis for a total management- and incentive compensation system experience increases in stock market performance, operating performance, and divestments, as well as decreases in employees and new investments.
Kramer & Peters (2001)	EVA is a good proxy for market value added irrespective of the industry, but marginal costs of using EVA are not justified by its benefit
Kramer & Pushner (1997)	Results do not fully support the arguments of EVA proponents that it is the best internal measure of corporate success in adding value to shareholder investments.
Kröger (2005)	Changes in EVA are negatively correlated with changes in sales.
Lougee, Nataraajan & Wallace (2002)	Market returns increase after the announcements of EVA adoption because the market expects the elimination of obvious inefficiencies within the companies. When there are no opportunities for improvements left, returns are negative since the market is disappointed.
Milunovich & Tsuei (1996)	EVA is the superior financial measure for managing and externally valuing companies.
O'Byrne & Young (2005)	Compensation effects from VBM-systems are positive for managers receiving stock options. Companies with this high "wealth leverage" outperform their peers.
Olsen et al. (2004)	Value creation for shareholders correlates with CFROI. Its drivers are fundamentals, investor expectations, and cash flows.
Olsen (1999)	EVA discourages growth.
Oppenheim Finanzanalyse (1996)	Stock returns correlate with financial value drivers, investor relation activities, and value-oriented compensation.
Peterson & Peterson (1996)	Value-added-measures correlate with stock returns. Hence, management may use VBM for planning and control purposes. Quite contrary, VBM does not add value for analysts in semi-strong efficient markets and should thus not be used for valuation purposes.
Schaffer (2005)	VBM sophistication neither correlates with accounting nor with capital market data.
Schremper & Pälchen (2001)	Traditional measures have nearly the same information content as VBM-measures in explaining stock returns, probably due to the fact that investors base their decisions mainly on accounting numbers.

Sheikholeslami (2001)	MVA and EVA are associated with base salary, cash bonuses and long-term compensation of CEOs. The model only explains part of the variance since a major portion of CEO compensation is not related to stock performance.
Siebrecht, Heidorn & Klein (2001)	EVA has only information content for market value added (1) if its value is positive, (2) if levels are measured, not changes, (3) in growing and stagnating industries, not in cyclical ones.
Sinn, Dayal & Pitman (2003)	CFROI correlates with abnormal returns. Drivers are investors' expectations and specialization of the banks rather than fundamentals.
Sinn et al. (2004)	Total business return correlates with abnormal returns.
Sinn, Dayal & Pitman (2005)	CFROI correlates with abnormal returns. Drivers are return on equity, growth, customer relationship management, specialization, and strategic acquisitions.
Souza & Jansco (2003)	EVA companies outperform the market with normal and abnormal returns.
Stark & Thomas (1998)	Residual income has a stronger association with market value than earnings, both with respect to R&D expenditures and closing book value. The capital charge element of Residual Income does appear to add explanatory power.
Stelter (1999)	Cash Value Added correlates with stock returns and is driven by the cash-flow-margin, asset productivity and investment growth.
Stelter (2000)	Value creation is driven by fundamentals beyond capital returns. Therefore, companies should focus on figures like value added per employee or customer value added.
Stelter (2001)	Fundamentals do not explain value creation, but expectation premiums do. They again are driven by external economic factors and internal value-drivers.
Stelter & Xhonneux (2002)	CFROI is related to shareholder value creation. Gaps in value orientation include unsuitable key financial ratios, failure to manage market expectations, and the pursuit of investments/divestments into (un)profitable business units.
Stelter & Xhonneux (2003)	CFROI and stock market performance correlate. The most important drivers are investment growth and fundamentals. Investor's expectations play only minor role.
Tortella & Brusco (2003)	The introduction of EVA does not generate any abnormal returns. Formerly underperforming companies however improve in the long run. EVA encourages increases in investments, level of debt, and cash flows.
Turvey, Lake, Duren & Sparling (2000)	There is little support for the conjecture that organizations with high EVAs create more shareholder value. However, because EVA is so popular in the press, there is resistance to dismissing EVA as a valued paradigm.
Uyemura et al. (1996)	EVA highly correlates with increased market value and is employed by important industrial companies and banks for cost allocation, risk management and incentives.
Wallace (1997)	VBM-adoption in incentive plans changes management behavior: Executives increase dispositions of assets and decrease their new investment, increase their payouts to shareholders through share repurchases, and use assets more intensively.
WestLB Research (1997)	Abnormal returns correlate with the transparency on value drivers, compensation, management, and financials.

### Cluster 3: System Analysts

Besanger, Motis & Ponsard (2001)	In practice, value-driver-analysis does not sufficiently capture all operational levers. Non-VBM levers are re-introduced, the inherent long-term-planning is very complex. Mostly, the incentive effects of stock options are not understood.
Chenhall & Langfield-Smith (2003)	Value-based compensation to encourage strategic change fosters organizational trust and overcomes hostility within the workforce. This level of employee cooperation cannot be sustained over a longer period.
Chow & Van der Stede (2006)	The relative use of financial, quantitative nonfinancial and subjective performance measures are found to vary with the companies' manufacturing strategies. Moreover, the measure types have different impacts on executives' actions.

Fischer, Becker & Wenzel (2001)	Web-based investor relations have less information content than audited financial statements. They do not differentiate user groups, and make no use of the advantage being “real-time”.
Fischer & Wenzel (2005)	Companies have broadly adopted value-oriented incentive systems. Yet, they do not sufficiently report on their VBM-systems, strategy, and non-financial value drivers.
Francis & Minchington (2000)	While VBM and the Balanced Scorecard are increasingly popular in practice, traditional accounting measures are still dominant. The adoption of the former seems to be contingent to organizational circumstances.
Gates (2000)	The use of VBM for strategy assessment varies by company and is driven by environmental factors.
Günther, Haulbold & White (2004)	Human-based residual income figures correlate with capital market returns and can increase explanatory power for a subset of large companies. In small companies, human-based figures have more explanatory power than capital based figures.
KPMG (2003)	VBM is increasingly but still differently applied among companies. Gaps include incentive systems, investor relations, operationalization throughout the organization, and lacking consistency in performance indicators.
Lamarde & Ponsard (2004)	EVA-based compensation strongly favors goal-congruence but has a major controllability problem.
Malmi & Ikäheimo (2003)	VBM is applied differently among organization. None of them applies it in a manner that is as comprehensive as suggested in the normative literature. This raises questions regarding the benefits promised by VBM-proponents.
Marr (2005)	Fully implemented VBM-systems positively influence corporate performance.
Nix & Aebersold (2006)	Most companies pursue a sustainable investor relations approach since increased transparency leads to increased stock returns. Information lacks exist in the alignment with strategy, and the explanation of business models at lower levels.
Nix & Wolbert (2005)	Most companies pursue a sustainable investor relations approach since increased transparency leads to supposedly increased stock prices. Information lacks exist concerning the alignment with strategy, forecasts, and the explanation of business models at lower levels.
Nix, Wolbert & Gazdar (2006)	Companies report sufficiently about KPIs on financials, non-financials, employees, processes and innovation. Gaps exist in the areas of strategy, structure, governance, forecasts, customers, alignment, and the analysis of firm value added.
Perlitz, Bufka & Specht (1997)	Companies adopting VBM share the following characteristics: Internationalization, innovation and R&D, diversification, institutional investors, and low leverage. Success is higher if VBM is supported by the supervisory/ executive boards, and if VBM focuses on finance, strategy, planning, and particular business units.
Stührenberg, Streich & Henke (2003)	Key financial ratios and the calculation of the cost of capital are applied differently among companies. Many organizations operationalize VBM at lower levels and conduct long term planning of cash flows.
Tuomela (2005)	First, VBM measures are used to confirm or reject alleged relationships on the business model. Second, no tight connections between the new measurement system and managerial bonuses are made.
Volkart (2003)	Investor relations increase company value. The following gaps exists: (1) Strategic mission of the investor relations department is not clear, (2) no externally communicated analyses of the market, (3) no reporting on non-financials and their influence on corporate value.

#### Cluster 4: Performance Measurers

Haspeslagh, Noda & Boulos (2001)	Successful VBM-companies share five main characteristics: (1) Explicit/ public commitment to VBM (2) rigorous training (3) aligned incentive systems to foster ownership (4) all-encompassing empowerment (5) changes are broad rather than focused narrowly on financials.
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Ittner, Larcker & Randall (2003)	Firms making more extensive use of a broad set of measures and greater measurement diversity have higher measurement system satisfaction and stock market returns. VBM-systems are associated with higher measurement system satisfaction, but exhibit almost no association with economic performance.
Lingle & Schiemann (1996)	Companies measuring their value outperform non-measurers. Special emphasis is placed on the quality of information and its use for measuring financial/ operating/ employee performance, customer satisfaction, innovation, and stakeholder concerns.
PA Consulting (2003)	Variation in performance stem largely from the sophistication of the VBM-system, with strategic alignment being the most important issue. Companies with fully developed VBM-systems outperform the market significantly.

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## **C The impact of contextual factors on the sophistication of Strategic Performance Measurement Systems**

### **1. Introduction**

Strategic Performance Measurement Systems (SPMS) are commonly defined as management accounting systems (MAS) linking strategic objectives to a coherent set of performance measures and compensation through cause-and-effect-chains (Chenhall, 2005; Ittner & Larcker 2001). In corporate practice, these systems are generally linked to profit objectives, and have been marketed by management consultants as different brands (e.g. Gates, 2000; Copeland, Koller & Murrin, 2000; Stewart, 1991). Celebrated as a revolutionary management approach, the proponents' recommendations are that all for-profit-companies should implement a full set of SPMS (PA Consulting 2003; Copeland, Koller & Murrin, 2000; McTaggart, Kontes & Mankins, 1994). Moreover, consultants persistently defend the idea that SPMS can be fully implemented, irrespective of different environmental or organizational circumstances (Lovata & Costigan, 2002; Stern & Shiely, 2001; Finegan, 1991).

Besides numerous analytical objections on the general newness of this MAS and its universal applicability (Bromwich & Walker, 1998; Zimmerman, 1997), empirical evidence on contingency factors supporting or restricting their implementation is scarce (Lovata & Costigan, 2002; Garvey & Milbourn, 2000). This is quite startling taken that SPMS are the successors of prior waste-reduction-programs and cost-driver-techniques like Activity-based Costing (ABC) or strategic cost management (IFAC 2002, 1998; Ittner & Larcker, 2001). Rich empirical evidence supports the view that the application of these cost-driver-techniques as well as MAS in general significantly depends on the context surrounding the implementing organizations (for an overview, cf. the reviews of Chenhall, 2003; Reid & Smith, 2000; Chapman, 1997; Langfield-Smith, 1997; Otley, 1980). Overall, Anderson & Young (1999, p. 527) note that despite "caveats concerning comparability of prior studies, the research findings are remarkably consistent". This makes similar findings for value-driver techniques – alias SPMS – probable since they are the descendants of cost-driver-techniques. Hence, several authors urge to conduct additional research on the contingencies of SPMS (Chenhall, 2003; Ittner & Larcker, 1998). Ittner & Larcker (2001, p. 376) state in their review on value-oriented SPMS:

“It is likely that these practices are not equally beneficial in all settings, requiring researchers to examine the contingency factors that influence the performance effects (if any) from these techniques.”

This study attempts to identify contingency factors driving the sophistication of SPMS. It uses data collected in interviews and questionnaires from top executives, databases and audited financial statements. Regression analyses and multivariate analysis of variance (MANOVA) are used to investigate the influence of contingency factors on the sophistication of SPMS for a company sample comprising 80% of the daily turnover at Frankfurt Stock Exchange, Germany.

This paper contributes to three aspects discussed in the literature: First, it establishes a link from the contingency literature on cost-driver-techniques to contingencies on SPMS. Second, it proposes a holistic ensemble of constructs based on Ittner & Larcker (2001) to measure SPMS-sophistication beyond a binary ‘implemented-or-not’-variable. Third, this paper gives evidence that different SPMS-sophistication among implementers is related to contextual factors.

The remainder of the paper is organized as follows: Section two develops the theoretical model and hypotheses. Section three describes the research design. Section four explains the measurement of the constructs for SPMS-sophistication and the contextual variables. Section five presents and discusses the results. Section six concludes findings, points out limitations of this study, and suggests fruitful avenues for future research.

## **2. Model development**

### **2.1 Summary of prior research**

Research on contingency theory will be discussed first, and an overview on SPMS is given subsequently.

*CONTINGENCY THEORY:* Contingency theory purports the claim that no optimal sophistication of an MAS exist, but that these systems adapt to the context in which they operate in order to aim for the company’s optimal performance (Waterhouse & Tiessen, 1978). Comprehensive reviews on the development of this theory are Chenhall (2003), Reid & Smith (2000), Chapman (1997), Langfield-Smith (1997), and Otley (1980). Contingency research distinguishes three different approaches: Selection,

interaction, and systems (Chenhall, 2003; Selto, Renner & Young, 1995): The *selection* approach is widely used in the literature (Al-Omiri & Drury, 2007). Performance is generally not investigated based on the assumption of a market-equilibrium, i.e. companies with poor performance rooted in the misfit of context and MAS will ultimately vanish from the market. Therefore, managers are assumed to implement MAS at their optimal sophistication to pursue corporate objectives. Consequently, “studying performance is inappropriate as every firm has optimal performance in its given situation.” (Chenhall 2003, p. 134; Selto, Renner & Young, 1995).<sup>5</sup> The *interaction* approach investigates how the relationship of MAS and performance is moderated by contingency variables. The *systems* approach explains variations in performance with differences in the overall fit of various contextual- and MAS-variables.

All three approaches have their limitations: On the one hand, the selection approach does not make an attempt to explain performance and assumes that the market is in equilibrium. Equilibrium means that all organizations have achieved the desired sophistication of their MAS in order to match their relevant context, i.e. management does not plan on restructuring the MAS shortly after the researcher finishes the investigation.

On the other hand, the interaction- and the systems-approach initially assume disequilibrium in the market. This implies that the researcher knows the optimal fit of MAS and relevant context for any organization in the sample, and explains differences in performance by the deviation from this optimal fit. Since such a comprehensive knowledge is hardly realistic, researchers assume either that – just as in the selection approach – the majority of companies is in equilibrium, and that only outliers should under-perform. Alternatively, the organizations with the highest performance are assumed to have achieved the best fit. Therefore, none of the three contingency approaches is free of some equilibrium assumption in applied research. As a result, Selto, Renner & Young (1995, p. 670) point out that the weakness of the interaction- and systems-approaches is circular reasoning: “[...] it is possible there are many equally effective, feasible sets of organizational design elements (equifinality). Defining opti-

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<sup>5</sup> It is important to understand that ‘optimal’ means that executives have – on average – efficiently used all available information to make the decision how sophisticated the VBM-systems should be (ex-ante). This does not mean that ten years from 2006, an individual executive will still insist that her decision has led to optimal performance (ex-post). With the benefit of hindsight, she understands that some of the information she based her decision on ten years ago turned out to be material, and other to be noisy. Unfortunately, back then she could not differentiate between these two types, and the decisions based on the noisy information turned out to be sub-optimal. ‘Optimal’ hence means that she made the decision to her best knowledge, and that – if sent back in time and without this hindsight – she would make a similar decision again. Hence, there is no need in this analysis to consider noise. Yet, it would be possible without impairing results: There is a rich discussion in the finance literature initiated by Grossmann & Stiglitz (1980) and Black (1986) on the assumption of decision making in an efficient market under the condition of noise.

mal fit is problematic, as well, and is usually defined in a somewhat circular manner: optimal fit is the configuration of the optimally performing organization.”

*SPMS*: Based on an analysis of the history of management accounting, IFAC (1998, 2002) interprets SPMS as a fourth evolutionary step in this academic field. SPMS can be seen as closely related, direct successors of prior cost-driver-techniques like ABC. SPMS can include different MAS like ABC, the Balanced Scorecard (BSC) or diverse economic value measures, and are hence located on a level above these stand-alone MAS like Economic Value Added (EVA) (Hoque, 2004; Ittner & Larcker 2001; Young & O’Byrne 2001; Innes & Mitchell, 1995). While a key financial ratio based on profits exceeding the cost of capital is not a new concept (Bromwich & Walker 1998; Marshall, 1890; Hamilton 1777), the innovative nature of SPMS lays in their integrative approach. SPMS defined as a holistic system incorporating all levels of the company and mutually linking across functions are first mentioned by Fruhan (1979) and later popularized under different brand names in the practitioner literature (e.g. Copeland, Koller & Murrin, 2000; Stewart, 1991; Rappaport, 1981, 1986). Chenhall (2005) emphasizes that two different types of SPMS exist in practice. The first one is a combination of financials and non-financials where no attempt of integration is made, e.g. the use of either EVA or the four BSC perspectives detached from a value-driver-analysis or compensation. The second type of SPMS demonstrates its most distinctive feature to be the integration of information for management on all decisive areas of the company, financials and non-financials. In this context, Young & O’Byrne (2001, p. 18) emphasize “that all key processes and systems in a company must be oriented to the creation of value” if a number like EVA is to take effect. Following the genuine philosophy of SPMS-proponents, this study builds on the second, more sophisticated definition of “coherent SPMS” with a focus on for-profit organizations (Chenhall, 2005, p. 400, 416; Ittner & Larcker, 2001).

## **2.2 Structural framework**

The framework is a selection-approach and hence postulates multivariate direct effects of context factors (independent variables) on the sophistication of SPMS (dependent variables), as depicted in figure 3. For the context of this study, the selection approach is the most appropriate. First, no attempt has been made yet to transfer insights from contingency theory and cost-driver techniques onto value-driver techniques. This venture is complex because selection and effects of contextual factors relating to cost drivers may be similar for SPMS, but not necessarily the same. In this case, research-

ers use the selection approach because it does not require additional hypotheses about performance effects (Davila, 2005; Ezzamel, 1990). Furthermore, the idiosyncrasies and holistic nature of SPMS suggest investigating a broad range of context factors. More complex models involving fewer factors, testing interactions, or using benchmarks for optimal performance are beyond the scope of a single paper at this early stage. Second, the critical assumption of optimal (i.e. informed) ex-ante decision making of executives is likely to be fulfilled for any sample consisting of the largest listed corporations in an important capital market as in this case (Jörg, Loderer & Roth, 2004; Manne, 1965).

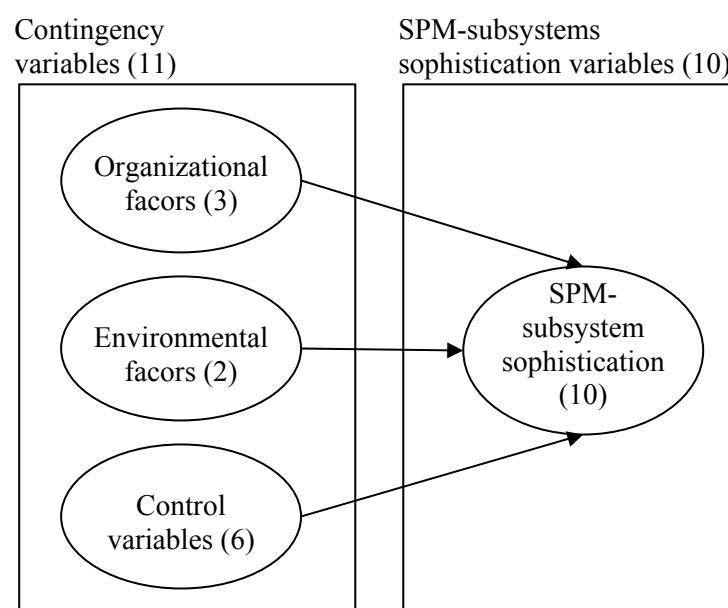


Figure 3: Structural model of contingencies and SPMS-sophistication

Constructs for SPMS-sophistication are based on the five steps of the framework of Ittner & Larcker (2001). They point out that besides (1) value-orientation and the existence of a key financial ratio, SPMS encompass all issues concerning (2) strategy and organizational objectives, (3) a conclusive value driver analysis, (4) the development of action plans, the selection of measures and the setting of targets, and (5) the evaluation of performance including reassessment of objectives and plans, communication of results, and incentive systems. Their framework will be used for this study to measure the sophistication of 10 SPM-subsystems, e.g. the value-oriented selection of strategies. Contingency factors, the development of the constructs measuring the subsystems, and the relationship of the latter to the framework of Ittner & Larcker (2001) are discussed in chapter 4. Items for the constructs are listed in the appendix in table 11.

### 2.3 Hypothesis development

Hypotheses are developed to outline some of the contingencies under which SPMS may be more or less extensively utilized by for-profit-companies. Analogous to Al-Omiri & Drury (2007), I conducted a literature review on SPMS, and a further profound literature review on the related field of MAS like cost-driver-techniques.

The first literature review helps to identify the contingency factors relevant for SPMS. Based on Zimmerman (2001), the most important English-speaking journals on this topic are chosen because the majority of the normative SPMS literature is written in this language. Following Hennig-Thurau, Walsh & Schrader (2004) and Schrader & Henning-Thurau (2008), I also reviewed the most important German-speaking journals on managerial accounting as this study is conducted in Germany. Last, Ameels, Bruggeman & Scheipers (2003) acknowledge the contribution of consulting firms to this topic; hence I also checked their websites for relevant publications. Cooper's (1982) ancestry approach is used, i.e. following pertinent footnotes to identify further relevant sources. Overall, 120 empirical studies are identified. In summary, the review reveals the scarcity of empirical evidence on SPMS and contingency theory: Most studies only mention contextual variables as possible future areas of research. And with scant exceptions, the few studies actually collecting data are afflicted by underdeveloped theory and underspecified research models. Table 6 presents an attempt to categorize the observed variables and lists their number of occurrence. As one study can comment on several contextual variables or on none, the figures do not add to 120:

<b>Organizational factors</b>		<b>Environmental factors</b>	
Size (and some life cycle effects e.g. listing, diversification etc.)	33 (28%)	Industry membership	30 (25%)
Strategy content	15 (13%)	Prior performance (& related change of executives)	12 (10%)
Risk (systematic & unsystematic)	10 (8%)	Environmental uncertainty	7 (6%)
SPMS application experience	5 (4%)	Others	16 (13%)
Organizational structure	3 (3%)		
Characteristics of executives	2 (2%)		

*Table 6: Contingency factors acknowledged by empirical SPMS-studies (number and percentage)*

Little surprising, ‘size’ and ‘industry membership’ are cited quite often. This may be due to the fact that the collection of this data imposes few challenges. Classifications of ‘strategy’, ‘prior performance’ (or crises), as well as ‘risk’ and ‘uncertainty’ are also frequently mentioned. Given the intense discussion in business administration on organizational structure, the low number of studies relating to this topic stands out. The category ‘Others’ summarizes some non-standard variables, which are unsuitable for this general study, e.g. national tax or legal aspects.

Based on the insights of table 6, I choose those contextual factors and control variables which the literature deems to be important. This study will deal with three organizational context factors (H1a-c: Strategy, organizational design, and company-specific risk) and two environmental ones (H2a-b: Uncertainty and corporate crises). This eclectic approach suggests itself since no coherent framework lists all relevant determinants of SPMS, yet. Relying on the indications of 120 SPMS-studies represents a feasible way of identifying contingencies in the first place. Possibly counter-intuitive combinations of contextual variables should be tolerable at this early stage of research. The literature reckons the six control variables (market risk, company size, SPMS-application experience, CFO-changes, CFO-education, CFO-age) to be associated with SPMS-sophistication. Nevertheless, the direction of the relationship is either not clearly predictable, or it could equally be argued that they are an effect of SPMS-sophistication. The review on other MAS, e.g. cost driver techniques, supports the consequent development of the hypotheses:

### 2.3.1 Strategy

The difference in corporate strategies across organizations plays a key role in shaping the sophistication of SPMS (Van der Stede, Chow & Lin, 2006, Gates, 2000; Simons, 1987). Miles & Snow (1978) suggest that companies should adjust their MAS to their chosen strategy in order to perform optimally. They identify three successful, generic strategies: Prospectors, defenders, and analyzers. Prospectors are characterized by dynamism and the quest for market opportunities. They aim for new product development and a gain of market share. Hence, they dedicate a considerable amount of resources to research and development. Defenders rather emphasize the profitability of a smaller, existing product range with high production volume in known markets with a distinct focus on quality, service, or costs. They consciously direct attention to problem areas, and support formalized and specialized work. Prospectors and defenders represent a continuum of which the analyzer is a hybrid (Langfield-Smith, 1997).

The typology of Miles & Snow (1978) has been chosen for three reasons: First, it is compatible with other prototypes of strategies. Langfield-Smith (1997), Simons (1987), and Gosselin (1997) affiliate prospectors and defenders with entrepreneurial and planning mode firms, performance maximizing and cost minimizing firms, innovators and dominant firms, build and harvest, and differentiation and low-cost generic types. Second, the archetypes are internally consistent, academically accepted, and empirically tested (Chapman, 1997). Moreover, they are measurable with external data to prevent a common rater bias (March & Sutton, 1997; Podsakoff & Organ, 1986). Third, if prospector or defender strategies are implemented optimally, they can perform equally well independent of the environmental setting, which constitute different context variables in this model (Miles & Snow, 1978). As any selection model assumes optimal performance to be independent of the other contextual variables, this becomes a decisive feature of this investigation. It would not be supported by other typologies, e.g. Porter (1980).<sup>6</sup>

Empirical evidence suggests that defenders focus on financial overall objectives and hence rather rely on financial performance measures like strict budget control or ABC (Hoque 2004; Chapman, 1997; Simons, 1987). SPMS are most similar to this category and can help defenders to better understand important areas of performance hierarchies (Kallunki & Silvola, 2008). Prospectors on the other hand place high importance on non-financial objectives (Baines & Langfield-Smith, 2003). While it can, of course, be argued that companies with a high sophistication in SPMS will also employ non-financial value drivers as well, e.g. via their BSC, the essential frame of SPMS remains strictly financial. Hence, I hypothesize:

**H1a:** Companies following a prospector strategy have a lower sophistication of SPMS than companies following a defender strategy.

### 2.3.2 Organizational design

As highlighted by the literature review, the effects of organizational design on the sophistication of SPMS are not an issue in current research, and hence hypotheses on this issue are scarce. Yet, organizational structure has proven to be a quite influential factor in the general business literature, e.g. for processes or strategy (Harris & Ruefli, 2000;

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<sup>6</sup> It is crucial to note that the contextual market strategy, i.e. prospector and defender (PROSDEF), is mutually exclusive of value-based strategy (STRATEGY) mentioned in the framework of SPMS-sophistication. The value-based strategy (STRATEGY) only suggests picking projects according to their net-present-value (NPV), which is equally possible for any chosen market strategy (PROSDEF). Due to this mutual exclusivity, the two strategy variables (PROSDEF and STRATEGY) can appear as independent and dependent variables in the same statistical model, respectively.



Donaldson, 1987; Govindarajan, 1986). It is hence likely that there will be an effect on a specialized MAS like SPMS as well.

Zimmerman (1997) is one of the few authors explicitly commenting on the relationship between organizational design and EVA, demonstrating problems of overheads and transfer pricing of interdependent business units managed by EVA. He argues that managers of these interdependent business units easily oversee synergies for the overall maximization of firm value: They are misguided by divisional SPMS-incentives to make dysfunctional decisions. In conclusion, he advises against managing interdependent units by residual income. Another argument for the negative relationship between SPMS-sophistication and interdependence is brought forward by Garvey & Milbourn (2000). They point to the fact that for organizations with many subunits – a structure generally associated with lower interdependence (Chenhall, 2003) – the stock price conveys little information on subunit performance. Hence, they recommend the use of EVA at those levels for this type of organization. However, both Zimmerman (1997) and Garvey & Milbourn (2000) argue on an analytical basis. There is not existing empirical evidence yet.

The remaining contingency literature does not provide further specified conjectures on this relationship with a specific focus on value-oriented SPMS. Yet, authors investigating related MAS and similar organizational concepts offer support for Zimmerman (1997) and Garvey & Milbourn (2000): Chenhall (2003) conducts a comprehensive review on existing empirical studies on contingencies generally influencing MAS. In that matter, diverse continua of organizational design are related to each other. Overall, he summarizes that MAS are generally more sophisticated in larger, decentralized organizations with many, *independent* subunits, and generally less sophisticated in smaller, centralized companies with fewer, *interdependent* subunits.<sup>7</sup> Hence I hypothesize:

**H1b:** The sophistication of SPMS decreases with the interdependence of business units.

### 2.3.3 Company-specific risk

Opposed to uncertainty, risk describes circumstances in which probabilities of occurrence of particular events can be approximated (Chenhall, 2003). According to the capital asset pricing model (CAPM) on which most SPMS-proponents rely, two types

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<sup>7</sup> Organizational design (ORGDESGN) can be an independent variable despite item 5 of the dependent construct STRATEGY being organizational adjustment. Analogous to PROSDEF and STRATEGY, ORGDESGN and STRATEGY are generally mutually exclusive: ORGDESGN measures interdependency of subunits, while item 5 of STRATEGY measures organizational adjustments related to the choice of new projects.

of risk exist: Market-specific (systematic) risk also known as ‘beta’, and company-specific (unsystematic) risk. While unsystematic risk is irrelevant to diversified and therefore risk-neutral shareholders, undiversified and hence risk-averse managers will attempt to reduce unsystematic risk they are not compensated for in the cook-book versions of SPMS (Christensen, Feltham & Wu, 2002). Unsystematic risk relates to factors that are specific to a company and do not affect the market as a whole, e.g. an unfavorable management decision. In a capital intense company – measured as the capital invested per full-time-employee – the impact of an individual value-destructive management decision is relatively strong compared to a less capital intensive company. Hence, company-specific risk becomes a determinant of SPMS-sophistication as executives in capital intensive companies should be interested in enforcing value-oriented governance (e.g. SPMS) on their colleagues. This may lower the negative impact of unsystematic risk (Garvey & Milbourn, 2000). The recent European stock market crisis provoked by the decisions of a single, low-level employee from a French bank illustrates the need for value-oriented controls in capital intensive firms. Hence, I hypothesize:

**H1c:** The sophistication of SPMS increases with the company’s capital intensity.

#### 2.3.4 Uncertainty

Besides the three organizational factors discussed above, environmental contingencies constitute important influences. The external environment comprises several factors, among which uncertainty is the most widely researched (Chenhall, 2003; Hartmann, 2000; Chapman, 1997). The construct of uncertainty is not unanimously defined in the general management literature but describes broadly managements’ inability to predict changes in external or internal organizational factors (Pagell & Krause, 1999; Duncan, 1972). The sub-concept ‘unpredictability’ is homogeneously referred to in the literature as environmental uncertainty, non-routineness, or dynamism (Hartmann, 2000; Otley, 1980). This construct of unpredictability is chosen for two reasons: First, it offers linkages to previous studies relating to Duncan (1972) or Swamidass & Newell (1987). Second, it can both be measured perceptively and with archival data. There is a more detailed comment on this issue in section 4.

Empirical research suggests that high uncertainty restricting managements’ ability to estimate targets and outcomes is associated with a diminished use of accounting-based, formula-driven performance measures that demand e.g. exact cash forecasts (Tu, Vonderbremse & Ragu-Nathan, 2004; Hoque, 2004; Gates, 2000; Ezzamel, 1990). This stems from the fact that – opposed to the concept of ‘risk’ – uncertainty is by defini-

tion barely quantifiable, and hence hard to cope with by using formalized MAS. Organizations operating in an uncertain environment will rather place reliance on broad-scope, non-financial MAS-information since this helps executives to identify changes in their environment based on leading indicators. (Hoque, 2005; Chenhall, 2003; Lovata & Costigan, 2002; Chapman, 1997; Ittner, Larcker & Rajan, 1997; Chenhall & Morris, 1986; Govindarajan & Gupta, 1985; Gordon & Narayanan 1984; Govindarajan, 1984). E.g., this could be the case for a BSC which emphasizes non-financial goals in its perspectives (i.e. low SPMS sophistication). The counter example would be a BSC which subordinates all other perspectives under a key figure like EVA (i.e. high SPMS sophistication). Hence, I hypothesize:

**H2a:** The sophistication of SPMS decreases with the perceived environmental uncertainty.

### 2.3.5 Corporate crises

Stern & Shiely (2001) argue that most organizations implementing SPMS are experiencing financial crises related to external shocks in the market, e.g. deregulation.<sup>8</sup> Also Merchant (1984) and Otley (1978) note that managers tend to adopt a tight, budget-constrained style of evaluation under difficult economic conditions. Reid & Smith (2000) find that management reacts to financial crises by implementing more complex MAS in order to adapt to these turbulences. Besides likely performance improvements, Cooper & Petry (1994) interpret from their results that raising the sophistication of SPMS makes it easier for management to blame other factors than non-value-oriented decision making for poor performance.

Since it may not be easy for a researcher to define such a shock for an individual organization, Stern & Shiely (2001) suggest that a fired chief executive might be an acceptable simulacrum for a subsequent performance crisis relating to value creation. Taking into account that SPMS are primarily a CFO issue (Verbeeten, 2006), an involuntary change in the position of the CFO is representative of a financial crisis. E.g. Healy & Palepu (1993) find that a CFO-change is often related to prior bad financial performance.

A forced CFO-change may motivate the successor to implement (even more) rigorous SPMS in the company (Gates, 2000; Cooper & Petry 1994) to signal to shareholders that the company has learnt from the crisis and intends to improve its financial per-

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<sup>8</sup> I am aware that a financial crisis could be caused endogenously by a top executive decision as well, and could therefore be just as well an organizational factor. Moreover, a finance-related crisis does not contradict the assumption of the selection approach that management had made an informed (i.e. 'optimal') decision in the past, understanding that the worst case (i.e. that financial crisis) had a certain probability of occurrence.

formance. Moreover, CFOs who replace fired predecessors can criticize them more openly as their old strategy and MAS are seen as not successful (Simons, 1994). In addition to that, Markus & Pfeffer (1983) argue that MAS drive the gathering and use of information, which in turn constitutes power in terms of knowledge for decision making. SPMS fall into the responsibility of the CFO and will hence be shaped by her characteristics and events related to that position. Therefore, after any change in this position (in this case forced), the successor may be interested in strengthening her position, e.g. through fast achievements or the (further) implementation of MAS in her area, i.e. SPMS (Davila, 2005; Simons, 1994). In that matter, Chenhall (2003, p. 135, brackets added) hypothesizes: “For example, a new Chief Executive Officer [or CFO] may stipulate that improved shareholder value is a priority. Consequently, performance measurement based on Economic Value Analysis may be introduced in an attempt to align the actions of all employees with the single objective of improving economic value.” From their practical experience, Stern & Shiely (2001) expect sophistication to increase especially in the areas of value-based culture and compensation. Westphal & Zayac (1994, p. 384) summarize evidence that executives may react to a financial crisis with “impression management”, e.g. by adopting a prestigious stock option plan to signal shareholders their dedication towards value creation. Chenhall (2003) remarks in that matter that an increase of CFO power through SPMS may seem selfish. Nevertheless, this is not necessarily inconsistent with economic causes, i.e. the maximization of shareholder value. Hence, I hypothesize:

**H2b:** The sophistication of SPMS increases due to corporate crises related to a scandal resulting in the forced release of the CFO.

### 2.3.6 Control variables

*BETA:* Lovata & Costigan (2002) argue that the relationship between SPMS-sophistication and systematic, market-specific risk (beta) is not clear due to conflicting interests of shareholders and top executives. Shareholders of high-beta companies would urge to increase the sophistication of SPMS, because as the influence of the market (beta) increases, it becomes more difficult to judge management’s contribution to value creation. By incorporating beta via the weighted average cost of capital into the bonus function, this intransparency is lowered.

But then in turn, risk-averse executives of this company would attempt to lower the influence of high betas on their bonuses. This could be achieved by underinvesting into volatile projects, despite the fact that they may have a positive net-present-value (NPV) (Bromwich & Walker, 1998; Zimmerman, 1997). This would force the com-

pany's beta down in the long run, and it would follow that high SPMS-sophistication induces lower betas (Christensen, Feltham & Wu, 2002).

*SIZE*: Empirical evidence shows that size influences the sophistication of MAS. This is mainly thought to be due to two reasons: First, larger firms have access to more resources which makes experimenting with innovations in MAS relatively inexpensive. Smaller firms on the other hand often perceive a lack of resources to implement such MAS (e.g. Kallunki & Silvola, 2008; Al-Omiri & Drury, 2007; Verbeeten, 2006; Chenhall & Langfield-Smith, 1998a; Ho & Pike, 1998). Second, size furthers the division of labor, specialized and decentralized divisions and thence complexity and increased governance costs. Consequently, integrative information systems like SPMS need to be sophisticated in order to ensure that the activities of the business units are directed toward a common purpose (e.g. Davila, 2005; Garvey & Milbourn, 2000). The reason why it is complicated to predict a concise effect on SPMS-sophistication is that in comparison to the cited literature, this study deals with remarkably large, listed, and mature companies which may have already passed a threshold where size is an indicator of maturity.

*APPLICATION EXPERIENCE*: The innovation literature suggests that the implementation of an MAS undergoes different stages before it becomes a corporate practice. Dependent on the model, this process starts with the unofficial pre-adoption phase and ends when the MAS has become fully integrated into corporate practices (Krumwiede, 1998; Anderson, 1995). Yet, it is possible that even after the implementation is finished, companies apply these MAS differently (Malmi & Ikäheimo, 2003; Speckbacher, Bischof & Pfeiffer, 2003; Gosselin, 1997). Anderson & Young (1999) find that different sophistication of ABC can be explained by the amount of time ABC has been adopted. Therefore, application experience functions as a control variable.

*CFO-CHANGE*: Since a forced release of the CFO is seen as a simulacrum of a corporate crisis, I control for any change taking place in this position. Effects should be different from those changes on an involuntary basis, and less strong: Successors of a 'friendly' change in positions cannot alter the existing SPMS as profoundly since that might be seen as a critique on the predecessor (Simons, 1994).

*CFO-EDUCATION*: To achieve optimal performance, it is crucial that the characteristics of management match the MAS used in the organization (Markus & Pfeffer, 1983; Mintzberg, 1973). More concise, the sophistication of MAS is generally associated

with the educational level of top executives. (Kallunki & Silvola, 2008; Davila, 2005; Graham & Harvey, 2001). It is hence likely that CFOs with a business school education have a different managerial mindset opposed to other majors, which leads them to prefer MAS matching their business school education, especially finance- and entrepreneurial-oriented ones like SPMS (Anderson 1995; Hambrick & Mason, 1984). Yet, this characteristic functions only as a control variable because it can equally be argued that a CFO with a business school degree purports SPMS, as well as that a CEO opting to use SPMS consequently hires a CFO who matches the SPMS-mindset.

*CFO-AGE*: Younger CFOs may be more responsive than older ones to relatively innovative MAS like SPMS independent from their major. Based on psychology-oriented literature, Hambrick & Mason (1984) argue on the one hand that older executives may be less open to new ideas, and less capable of learning new behaviors. On the other hand, they point out that younger executives have an underdeveloped cognitive ability to integrate information for decision making and lack confidence in their own judgement. Consequently, they exhibit a greater need for gathering detailed information. In addition to this, it is more likely that younger CFOs have been exposed to the ideas of SPMS during their education, since SPMS are relatively innovative MAS (Graham & Harvey, 2001). Analogous to the education of the CFO, the age of the CFO can determine the sophistication of SPMS, on the one hand. On the other hand, it is possible that a CEO hires a younger CFO who is more receptive to the SPMS-mindset (Naranjo-Gil & Hartmann, 2007; Simons, 1994).

### **3. Research design**

#### **3.1 Selection of companies**

The target population of this study are listed companies with a separation of ownership and management. Of course, also other types of organizations may use SPMS. Nevertheless, instruments mentioned by theoretical works on SPMS like stock-options and the market's cost of capital are only eligible for the aforementioned companies. SPMS-proponents also rely strongly on the efficient market hypothesis (EMH) and the CAPM; but these theories only apply to tradable assets in a frictionless market with a separation of ownership and management, low transaction costs, and few information asymmetries (Jörg, Loderer & Roth, 2004; Stewart, 1991). Moreover, SPMS were developed to maximize the value of a company. Yet, companies without a large, diversified investor base may have other overall objectives than value maximization: Managing-owners of small-and-medium-enterprises may rightfully incorporate leisure time,

power, or a spotless image of themselves in the local community into their utility function and *thereby* into the final goals of their companies (Bromwich & Walker 1998). For top managers on the other hand, those goals are seen as dysfunctional behavior. As a result, they experience stricter controls by the owners to prevent this behavior, e.g. through SPMS. In that context, Lovata & Costigan (2002) argue that companies with a high percentage of managing-owners will not need to rely on value-oriented control systems as less principal agent conflicts arise. Lastly, researchers deal nearly without exception with listed companies: The literature review on 120 empirical studies on SPMS shows that only four studies (3.3%) deal exclusively with a survey population of non-listed companies.

To prevent possible distortions based on different environments (e.g. legal), only one national market is investigated. Germany was chosen because of facilitated access to top management. The survey population comprises the 110 companies in the HDAX, which represents about 80% of the daily turnover at Frankfurt stock exchange.<sup>9</sup> Hence, this cross-sectional selection represents a probability sample and not a convenience sample. Moreover, results are more meaningful since the target population is about equal to the survey population (Van der Stede, Young & Chen, 2005). It is noteworthy that this set of companies is rather comparable to the largest listed firms of e.g. the U.S., the U.K. or Japan than to the average German firm. No significant differences in the understanding of SPMS should exist among these countries as the bestsellers on SPMS are mostly written by U.S.-authors and sold internationally.

KPMG (2003) estimates that 97% of the German DAX100 companies (precursor of the HDAX) have adopted value-oriented SPMS. Congruent with this, and confirmed by the key informants contacted, the sample hence comprises only companies which have finished their implementation of SPMS. This is important since this study deals with the persistent impact of contextual variables on SPMS-sophistication rather than with their impact on the adoption or implementation process of SPMS. The level of analysis is the company on a macro level since SPMS demand the maximization of total company value, not of its parts.

### 3.2 Selection of key informants

The questionnaire method is selected since it allows collecting data from a representative subset of population (Dillman, 2007; Van der Stede, Young & Chen, 2005). This research approach requires detailed information on internal processes of multiple com-

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<sup>9</sup> The HDAX is a trademark of Deutsche Börse AG Frankfurt and comprises the 80 largest German companies (DAX30 and the MDAX) plus the 30 largest technology companies (TecDAX) by market capitalization.

panies, and individual perceptions of top managers. Those are both hardly verifiable from other sources. Thus, key informants are used (Podsakoff & Organ, 1986; Huber & Power, 1985). Individuals were targeted as key informants who possess an exhaustive understanding of the group-wide SPMS (Phillips, 1981). Theory and empirical evidence suggest these informants to be (1) the CFO & direct staff (Gates, 2000; Ryan & Trahan, 1999) (2) the central controlling department (Chenhall & Langfield-Smith, 1998c), or (3) investor relations (Ryan & Trahan, 1999). In order to identify the most appropriate key informant irrespective of different organizational designs, the selection method of Chenhall & Langfield-Smith (1998b) and Chenhall (2005) was applied: Either existing contacts to top executives via the university's network were used, or the head of investor relations was contacted. In both cases, I asked to be directed to a knowledgeable informant who was either a member of the executive board, or reported directly to it. Responding organizations are representative for the three indices the HDAX comprises. Table 7 summarizes information on the companies.

<b>Employees</b>		<b>Sales (mill. EUR)</b>		<b>Market capitalization (mill. EUR)</b>		<b>Industry (1-digit-SIC)</b>		<b>Respondents (by function)</b>	
<500	2	<500	2	<500	8	Manufacturing	33	Accounting,	34
<1,000	7	<1,000	13	<1,000	7	Finance,	8	Control &	
<5,000	11	<5,000	18	<5,000	21	insurance, real		Finance	
<10,000	10	<10,000	7	<10,000	6	estate		Investor	13
<50,000	14	<50,000	15	<50,000	14	Services	7	Relations	
<100,000	8	<100,000	4	<100,000	4	Trade	6	Corporate	8
<250,000	4	<250,000	1			Transportation &	6	Development	
<500,000	4					public utilities		Executive Board	5
<b>n =</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>		<b>60</b>		<b>60</b>

Table 7: Descriptive information on the 60 organizations in the sample

The test for late response bias does not show significant differences (Van der Stede, Young & Chen, 2005; Armstrong & Overton, 1977; Oppenheim, 1966). Only one of the items is significant at 10%. Means of item scores are also compared with a Kruskal-Wallis-test across functions (Chenhall, 2003; Ittner & Larcker, 1997). Only four of the 58 items show a significant difference of  $p < 0.05$  at the maximum, but they are distributed erratically over the sample. Both results seem to be coincidental. A test across industries, however, does show a significant difference between the finance, insurance & real estate companies and the rest of the sample. But as this seems not to be rooted in the industry per se, it is explained in section 4.



Podsakoff & Organ (1986, p. 531) point out that the key informant method is “indispensable in many research contexts”, while – of course – several caveats exist (Van der Stede, Young & Chen 2005; Kumar, Stern & Anderson, 1993; Bagozzi, Yi & Phillips, 1991; Phillips, 1981; Seidler, 1974). Hence, I rigorously followed the suggestions in the literature to reduce this key informant bias (Van der Stede, Young & Chen, 2005; Podsakoff et al., 2003; Mitchell, 1994; Poggie, 1972):

First, pre-tests of the questionnaire were conducted to reduce possible misunderstanding by the key informant. Pilot-tests are described in the following sub-section. Second, once the key informant was identified, semi-structured interviews were arranged to ensure her interest and expertise. It was stated explicitly that not a self-report was desired, but that all questions relate to the level of the consolidated group (Bagozzi, Yi & Phillips, 1991; Campbell, 1955). Following Chenhall & Langfield-Smith (1998b) and Foster & Swenson (1997), key informants were encouraged to consult knowledgeable colleagues in case specific issues could not be assessed on the spot. Follow-up interviews demonstrated that this practice was often applied even across major departments. It was also requested that the respective most senior executive with reporting responsibilities towards the executive board was involved in the survey: E.g. if an accountant was ordered to gather parts of the necessary data, approval from the director of accounting & finance on the completed survey was demanded. Third, social desirability is not a threatening issue since it was granted not to publish the names of the participating companies (Podsakoff & Organ, 1986). Fourth, the consistency of key informant answers were controlled through reverse coded items (Podsakoff et al., 2003). Fifth, wording for the construct-items relates to concise processes or physically existing documents, where possible. Avoiding excessive abstractness left less room for interpretation, misunderstanding, and response bias (Van der Stede, Young & Chen 2005; Bagozzi, Yi & Phillips, 1991). This presumption is backed by the fact that item-non-response is very low, as discussed in a later sub-section. Sixth, independent variables for the study are gathered from public sources where possible, and not through the key informants (Al-Omiri & Drury, 2007; Chenhall, 2003; Podsakoff et al., 2003). A dyadic system involving multiple key informants was not used due to the fact that this approach is most fruitful when key informants differ greatly (Phillips, 1981). This was not a possibility for this study since there are few knowledgeable key informants with access to all relevant data on SPMS. Moreover, getting access to members of the executive board has proven to be difficult: A cross validation of this data, e.g. by the staff of the CEO or the companies’ external auditors, would have significantly diminished the response rate.

Having used all of these controls, and taking into account studies that have found key-informant reports to be reliable after triangulation (for an overview cf. Chenhall, 2003), there is little reason to believe that the data has been biased through the use of key informants.

### **3.3 Data collection**

Based on the framework of Ittner & Larcker (2001), indicators for SPMS-sophistication were identified from the relevant literature sources for the five steps. The development of the 10 corresponding constructs was based on a comprehensive literature review of the prevalent SPMS-literature. I attempted to sketch what SPMS-proponents understand by complete, state-of-the art SPMS. The resulting constructs are described in the next chapter.

Significant time was invested into pre-testing the constructs (Dillmann, 2007, 1978; Van der Stede, Young & Chen, 2005; Podsakoff et al., 2003), using three distinct groups of pre-testers to make the wording most comprehensible to practitioners: The first one comprised academics as conductors of the study. The second one embodies the designers of SPMS and comprised top management consultants from associates to partners. The third group stands for the users of SPMS and consisted of headquarter-controllers from several large, listed companies (Van der Stede 2000, 2001). Consequently, a three step procedure was used to draft the questionnaire. First, I conducted cognitive interviews in which pre-testers are to immediately articulate their first understanding of the question (think-aloud-method). This allows the researcher to identify possible sources of misunderstanding. Consequently, the pre-tester were asked how the question needs to be formulated to share the researcher's understanding (Sudman, Bradburn & Schwarz, 1996). In a second step, pre-testers made overall suggestions on the questionnaire. Interviews were tape-recorded for later revision and took between 50 and 190 minutes. This procedure helped to significantly reduce the initial number of questionnaire items. Last, the visual appearance of the questionnaire was refined. The questionnaire was then re-checked by the interview partners. In a third step, new pre-testers from all three groups filled out the questionnaire and gave feedback afterwards. It resulted that no further changes were necessary.

The identified key informants received a copy of the survey in April 2007 to prevent schedule conflicts with the composition of 2006's financial statements. Response rates were increased through several actions (Van der Stede, Young & Chen, 2005; Baldauf,

Reisinger & Moncrief, 1999; Sudman & Blair, 1999): First, key informants were identified carefully as described above, and pre-notified of the survey. Second, the respondents could choose between an online questionnaire and a printable version. Third, a copy of survey results plus a choice of different presents was offered to all participants. Fourth, a hot-line was available for any support needed with respect to the questionnaire. Fifth, several follow-up-procedures were used: A reminder was sent out eight weeks after the initial mailing containing again both the link to the online survey and the printable document. Another four weeks later, non-respondents were called by a senior professor of the faculty. Eight weeks later a last reminder was sent out.

The two callings and the three mailings resulted in 60 usable responses. 50 key informants did not succeed in completing the questionnaire, giving reasons such as shortage in human resources or contravening corporate policy (Hoque & James, 2000). The standard response rates of top executive-research being around 36% in the leading academic journals (Van der Stede, Young & Chen 2005), the response rate of 54.5% can be considered excellent. This rate was achieved despite the facts that the survey was fairly long, as the questionnaire contained considerably more scales than used in this study. Furthermore, full anonymity could not be granted to the respondents since I needed to associate objective data for context factors, e.g. the analysis of financial statements described in the following chapter.

## **4. Measurement of variables**

### **4.1 SPMS-sophistication variables**

It is not clear how MAS like total quality management, ABC, or the BSC can be measured by academics: Chenhall & Langfield-Smith (1998b, p. 244, brackets added) point out that “the ambiguous nature of philosophies [...] creates difficulties in defining and researching these management techniques”. As a matter of fact, few attempts have been made to conclusively define the essence and measurement of SPMS apart from branded concepts like EVA. The prior review of 120 empirical studies on SPMS reveals that exploratory and confirmatory research often defines SPMS as a binary variable: Either a company has fully implemented SPMS or not (e.g. Kleiman, 1999). First, this view contrasts with descriptive research on SPMS who find instruments with the same name to be applied differently across companies (Malmi & Ikäheimo 2003; Speckbacher, Bischhoff & Pfeiffer, 2003; Gates, 2000). At the same time, instruments with different names resemble each other significantly (Ameels, Bruggeman & Scheipers, 2003; Cordeiro & Kent, 2001). Second, this view contrasts with the insight that an adoption of an MAS does not necessarily indicate its use for decision making.

Prior research highlights that MAS need to go a long way before the implementation phase is over (KPMG, 2003; Kleiman, 1999). And although MAS might pass the adoption stage, they are often abandoned before ending the implementation stage or becoming a corporate routine (Chenhall, 2003; Anderson & Young, 1999; Gosselin, 1997). Researchers following such a binary classification may oversee the pitfall of comparing two adopters of which one has become a best-practice-user while the other one may have abandoned the system shortly after the adoption date. Analogously, organizations with sophisticated SPM-subsystems and obvious value-oriented practices may be classified as non-users, only because they do not use a branded key financial ratio. Alternatively, they may simply abstain from propagandizing their shareholder-orientation for political reasons. Chapman (1997) explains that the unambiguousness of research findings on contingencies is easily impaired if MAS are measured as such a binary variable.

Hence, this study goes beyond a simple yes-or-no-measure, and investigates different characteristics of SPMS to improve the understanding of how exactly SPMS adjust to context (Al-Omiri & Drury, 2007). The measurement of SPMS based on internal information from key informants can easily be criticized. Still, it should be superior to any existing externally determined categorization: As already noted by Khandwalla (1972, p. 275):

“It is not easy to measure how extensively a particular control is used in a firm. Two firms may both claim to use internal audits or activity budgeting. But one may be using it occasionally, or with respect to only a small part of its operations, while the other may have a full-fledged system of internal audit and activity or flexible budgeting. Thus, a dichotomous yes-no measure is not very useful. Nor is a management control a physical thing that can be measured cardinally. We are therefore forced to use ordinal measures, such as rating scales, particularly in preliminary stages of research.”

As discussed in chapter 2, this study follows the implementation-framework of Ittner & Larcker (2001) who have divided SPMS into the five steps. Overhauling each step is a revolving process as SPMS pass through their phases of maturity. As a result of this revolving process, the 10 constructs (or SPM-subsystems) attached to each step can reach different sophistication levels. Their sophistication does *not* necessarily build on one another: E.g. the performance evaluation (step 5) could already be very sophisticated at early stages of the adoption employing stock-options and bonus-banks,

while at the same time, no attention has been paid to the development of action plans for employees (step 4) (Marr, 2005). The resulting variety of SPMS-sophistication suggests a separate investigation of each subsystem.

Although the framework of Ittner & Larcker (2001) has already been differently measured by other empirical studies, new constructs had to be drafted. Prior articles using this framework are inappropriate for this specific research question: Ittner, Larcker & Randall (2003) focus primarily on strategy, paying less attention to the later steps of the framework. Malmi & Ikäheimo (2003) measure the steps using a case study methodology without specified items, which is not applicable for a questionnaire method.

Relating to the framework of Ittner & Larcker (2001), I will now explain how SPMS are measured according to the normative requirements of their proponents. Except for two cases explicitly specified, all items were measured using a Likert scale ranging from one ('does not apply at all') to seven ('fully applies'). The derivation of the 10 constructs from the five-step-framework of Ittner & Larcker (2001) is shown in figure 4. Construct items are listed in the appendix in table 11. Since the items were drawn from a comprehensive literature review and have been adapted during the pilot-tests, it would be beyond the scope of this paper to discuss the origin of each single item.

Five-step VBM-framework by Ittner & Larcker (2001, p. 353)	10 constructs for the affected SPM-subsystems
1 Overall objective: Increase shareholder value & identify specific organizational objectives	OBJECTIV
2 Develop strategies and select organizational design	STRATEGY
3 Identify value drivers	VALUEDRV
4 Develop action plans, select measures, set targets	BUSIMOD
5 Evaluate performance	CULTURE; USEINT; USEEXT (evaluation) BONUSIMP; BONUSBAS; BONUSTYP (compensation)

Figure 4: Derivation of SPM-subsystems from the five-step-framework of Ittner & Larcker (2001)

*STEP ONE* ("Overall objective: Increase shareholder value & identify specific organizational objectives"): The first step is measured by the construct OBJECTIV. It involves the corporate objectives, i.e. the profit orientation and the choice of a key fi-

nancial ratio to be maximized. Requirements for the key financial ratio are e.g. that it can express the increase in value of the firm, or that it incorporates the cost of capital.

*STEP TWO (“Develop strategies and organizational design”)*: The construct STRATEGY measures if the main driver of all strategic decisions is the optimization of long-term portfolio value. This is achieved by the acceptance of positive NPV projects on the top management level (Bromwich & Walker, 1998). Concomitantly, the construct measures if organizational design is adjusted to these portfolio decisions. SPMS-proponents are not any more specific about strategies to pursue (cf. Langfield-Smith 1997) since they claim SPMS to be universally applicable.

*STEP THREE (“Identify value drivers”)*: The construct VALUEDRV approximates if financial and non-financial value drivers are identified based on the strategic goals. While SPMS proponents name some generic *financial* value drivers congruent with NPV-decision rules (Copeland, Koller & Murrin, 2000; Rappaport, 1986), universal *non-financial* drivers do not exist (Chenhall, 2003). E.g. customer satisfaction is frequently mentioned to be one of the most crucial non-financial value-drivers. Nevertheless, this may not be true for every company (McTaggart, Kontes & Mankins, 1994). Attention should be paid to the fact that the interactions of these value drivers are explicitly measured, as integration – not stand-alone ratios – is seen as the essence of SPMS (Chenhall, 2003; Hoque & James, 2000).

*STEP FOUR (“Develop action plans, select measures, and set targets”)*: This step resembles the process of drafting a business model or a BSC, and is represented by the construct BUSIMOD. It measures if the identified value drivers are actually transformed into manageable key performance indicators (KPIs) corresponding to concise targets, and connected to instructions for employees, e.g. empowerment, as demanded by SPMS-proponents. Items relating to integration are adopted from Chenhall (2005).

*STEP FIVE (“Evaluate performance”)*: The prior four steps are all described by one construct. This step, however, deals with the use of SPMS-information for several purposes, which makes the use of six different constructs necessary. Two constructs describe different uses of information, one the value-oriented culture, and three the compensation system.

The construct USEINT measures if performance and underlying assumptions of the strategy are evaluated by management on the basis of this SPMS information. USSEXT relates to the use of SPMS-information relating to external stakeholders e.g. investor relations or the supervisory board. Splitting up the use of information into these two constructs suggests itself as most of the VBM-literature explicitly differenti-

ates between the uses of VBM-information for internal management purposes (USEINT) and the use for external investor relations (USEEXT).

A related construct especially mentioned by the practitioner literature is value-based culture. Chenhall (2005) regards this also as a part of SPMS, while Foster & Swenson (1997) and Shields & Young (1989) regard it as a contextual variable. But despite good examples from other areas of business administration (Homburg & Pflesser, 2000), no attempt has been made to define what this type of organizational culture comprises. Due to its theoretical importance, I make a first attempt with the construct CULTURE, which measures how strongly value-oriented patterns of shared beliefs are developed among employees (Gordon & DiTomaso, 1992). Items are extracted from another current research project involving semi-structured interviews with 26 chief controllers of the DAX30 companies, as well as from Chenhall & Langfield-Smith (1998c), Copeland, Koller & Murrin (2000), and Besanger, Mottis & Ponsard (2001). Malmi & Ikäheimo (2003) urge to add compensation issues to the model of Ittner & Larcker (2001). The sophistication of the compensation system across top and middle management is assessed by three constructs, because the compensation literature accentuates diverse perspectives that have to be taken into account for a comprehensive compensation system (Young & O'Byrne, 2001): The compensation construct BONUSIMP measures how strongly employees are impacted by the bonus system, asking for the ex-ante ratio of variable to fixed salary they receive on average, and the portion of employees receiving variable compensation components (Ittner, Larcker & Rajan, 1997). BONUSBAS measures if the bonuses' assessment bases are connected to the key financial ratios identified earlier. Chenhall & Langfield-Smith (1998c) give an example how this can be applied. The construct BONUSTYP measures if uncapped stocks or stock options are used for compensation purposes across top and middle management (Young & O'Byrne 2001).

Overall, the first four steps of the framework describe a process of 'gathering information', i.e. the constructs OBJECTIV to BUSIMOD. While CULTURE can be seen as in between, step 5 discusses the 'use of information', i.e. the two constructs on use, and the three on bonuses. I will refer to this terminology again when interpreting results.

## **4.2 Context variables**

To avoid a possible common rater bias, data for context variables is collected from other sources than the key informants where possible (Podsakoff et al., 2003; Salancik

& Pfeffer, 1977). If not mentioned otherwise, data was taken from Thomson Financial Datastream, Hoppenstedt Company Database, and the audited financial statements. Consistent with prior research projects, some of these constructs are determined by one item only (Foster & Swenson, 1997). All calculations are based on data of 31 December 2006 unless stated otherwise. As mentioned above, the first three context variables are organizational factors, the last two environmental factors.

*MARKET STRATEGY:* As discussed above, the measurement of strategy (PROSDEF) spans the continuum from defenders to prospectors (Langfield-Smith, 1997; Miles & Snow, 1978). To avoid a common method bias, key informants did not classify their organization themselves (Hoque, 2004). Another common way to independently approximate these strategies is through the ratio of spending on research and development (R&D) divided by average total sales (Ittner, Larcker & Rajan 1997; Hambrick 1983). The logic behind this is that product research and development is a distinctive competence of prospectors (Desarbo et al., 2005; Chapman, 1997; Shortell & Zayac, 1990). This measurement of strategy however is not feasible for this sample since R&D compellingly differs across industries, e.g. manufacturing and banking. Ittner, Larcker & Rajan (1997) and Lovata & Costigan (2002) alternatively suggest measuring this construct with the market-to-book ratio. According to Smith & Watts (1992) and Bushman, Indjejikian & Smith (1996), a high market-to-book ratio signals more growth options in the opinion of investors, and could thus be used to describe a prospector. These companies invest into R&D and forego current earnings (reflected in the book value of equity) for the option of future earnings (reflected in the market value of equity). Therefore, prospectors should exhibit a higher market-to-book ratio than defenders. Additionally, the natural log of this figure is used to adjust for outliers.

*ORGANIZATIONAL DESIGN:* To measure organizational design (ORGDESIGN) in terms of interdependence of business units, several constructs were pilot-tested. I adopted the scale from Verbeeten (2006) since it was best understood by practitioners. It lets respondents categorize their organizations as “single business”, “related diversified organization”, and “unrelated diversified organization.” Three-item-scales are usual for measuring interdependence (Chenhall & Morris, 1986). Based on the pilot tests, the three-item-scale was adapted and labeled with the interdependence levels ‘parent company’ (very high interdependence, coded ‘3’), ‘management holding’ (coded ‘2’) and ‘financial holding’ (very low interdependence, coded ‘1’).



Again, to avoid the critique of a common method bias, interdependence is assessed with an external proxy. As mentioned, the literature suggests *independence* of business units being positively related to size (see below for the measurement of the construct SIZE). Table 9 shows that the correlation coefficient between ORGDESIGN (i.e. *interdependence*) and SIZE is negative ( $-0.292$  at  $p < 0.05$ ). This suggests that the rating given by key informants seems reliable.

*COMPANY-SPECIFIC RISK*: Capital intensity (CAPINT) is measured as the natural logarithm of the value of total assets divided by the number of employees as of December 2006 (Garvey & Milbourn, 2000). As mentioned above, the statistical pre-tests exhibit a correlation between SPMS-sophistication and membership of a company in the 1-digit-SIC-industry-cluster 'finance, insurance & real estate'. Industry membership is measured by the dummy variable FINANCE (not reported; cf. Verbeeten, 2006). This effect is due to multicollinearity between FINANCE and CAPINT. They exhibit a correlation coefficient of 0.744 (significant at  $p < 0.001$ ), suggesting the industry to be closely associated with this company-specific risk. To avoid a suppressor effect in the statistical models, all industry-related control variables needed to be eliminated beforehand. As described under 'hypothesis development', the prior literature offers explanations for CAPINT, but not for industry affiliation. Hence, CAPINT remains in the model as it is a more logical explanation for a higher sophistication of SPMS than the crudely defined industry-variables per se.

*UNCERTAINTY*: Hartmann (2000) summarizes evidence that the measurement of uncertainty is either not very selective or else subject to considerable debate. Generally, two measures exist: First perceived environmental uncertainty (PEU) following Duncan (1972) and Miller (1993), and second, quantitative environmental uncertainty (QEU). QEU is based on Dess & Beard (1984) who suggest e.g. the volatility of historic accounting data to be an appropriate measure of the degree of uncertainty an organization is exposed to. It is therefore also referred to in the literature by the judgemental term 'objective' environmental uncertainty.

PEU is used as the indicator of uncertainty in this study. Based on Miller (1993), the subset 'dynamism' is selected as a construct for uncertainty. It is reverse-coded: The score '7' indicates high predictability (low uncertainty) and '1' low predictability (high uncertainty) of the environment (Karimi, Somers & Gupta, 2004; Tu, Vonderbrense & Ragu-Nathan, 2004). This construct is chosen for three reasons. First, the concept of PEU relates to a wide body of prior research (Hoque, 2005, 2004; Ezzamel,

1990; Govindarajan, 1984). Second, most researchers claim PEU to be most appropriate given that management decisions are framed not by inter-subjectively existing uncertainties (i.e. QEU) but by the degree of uncertainty individual managers perceive (Chenhall, 2003; Pagell & Krause, 1999; Swamidass & Newell, 1987). In connection to this, Baines & Langfield-Smith (2003) list evidence that PEU can be reliably measured as individuals have sufficient understanding of their decision making process. Third, the construct of ‘dynamism’ seems to be a reliable indicator of uncertainty as it correlates with QEU (Karimi, Somers & Gupta, 2004).

This last point is important to investigate the reliability of the key informant’s rating. There are several reasons why PEU and QEU should not perfectly correlate, and for which I chose to measure PEU in this study: First, PEU is a forward looking construct while QEU relies on historical data and is hence retrospective (Hartmann, 2005; Hoque, 2004; Ezzamel, 1990; Govindarajan, 1984; Khandwalla, 1972). Second, PEU can be seen as only partial and may hence differ across hierarchical levels of the same organization (Chapman, 1997; Govindarajan, 1984).

Nevertheless, some correlation may indicate that the key informants have given a reliable estimate of the uncertainty their organization faces. QEU is measured as the volatility of three-year-stock-returns (not reported, cf. Agle et al., 2006). The test shows – as expected – that re-coded PEU and QEU exhibit a positive correlation (0.319, at  $p < 0.05$ ). Contrary to most previous research, this is a remarkably clear result, which makes a common method bias less likely (Karimi, Somers & Gupta, 2004; Mezner & Nigh, 1995).

*CORPORATE CRISES:* A corporate crisis is measured by the binary variable CRISCFO, and describes if a CFO was forced out of office during the prior four years. Data from press archives needed to be thoughtfully interpreted to define such an event, since involuntary changes may be reported as voluntary to avoid embarrassment for the organization (Lubatkin, Schweiger & Weber, 1999): An example would be a commentary in an influential paper laying out severe differences in corporate policy between CEO and CFO of a company. If the CFO left within a relatable time frame afterwards, CRISCFO was coded ‘1’, i.e. involuntary. CFO-changes related to exitus, or similar or better job offers were coded ‘0’. While it is usual to investigate the previous three years, a fourth year is added since changes in the level of SPMS in reaction to this crisis are time-consuming to implement (KPMG, 2003; Kleiman, 1999; Chenhall & Langfield-Smith, 1998c).

### 4.3 Control variables

Market-specific risk (BETA) is measured by the covariance of the individual companies' stock return and the return from the Datastream 500 stock portfolio for Germany over 60 month, divided by the variance of the latter portfolio (Copeland, Dolgoff & Moel, 2004; Lovata & Costigan, 2002).

Size (SIZE) is measured as the natural logarithm of average full-time employees for two reasons: First, this figure is the standard measure in the contingency literature as it has proven to correlate with other measures of size as well, e.g. assets, earnings or sales (Kallunki & Silvola, 2008; Davila, 2005; Chenhall, 2003; Gosselin, 1997; Pugh et al., 1969, 1968). These findings also apply to this data-set, and it is usual to report only this figure (Hoque & James, 2000; Libby & Waterhouse 1996; Ezzamel, 1990; Merchant, 1984, 1981; Bruns & Waterhouse, 1975). Second, as SPMS are directed towards coordinating individual decision processes, the use of employees as a measure of size is most appropriate (Verbeeten 2006).

The application experience of SPMS within the respective company (EXPIRNCE) is measured in years. Following Balachandran (2006), the necessary information was obtained by both asking key informants for the official adoption date of SPMS, and by cross-checking the audited financial statement for any first notes on SPMS. No significant differences were found between these two sources, again supporting the reliability of data obtained from the key informants.

Data on CFO characteristics were gathered and triangulated from audited financial statements, the top management sections on corporate websites, and the business press. Age (CFOAGE) was measured in years. CFO education (CFOEDU) was coded '1' if the CFO obtained a graduate or (post-)doctoral degree in business administration or economics. Furthermore, a binary variable describes companies which experienced any changes in the position of the CFO (CFOCHNGE) during the prior four years (Davila, 2005).

## 5. Results

Following Davila (2005), two statistical methods are used simultaneously to analyze the data and triangulate results: Regressions and MANOVA. Regression analysis allows for an explanation of an individual SPM-subsystem by contextual factors and control variables. MANOVA takes into account the overall effects of the independent variables on all dependent variables simultaneously. First, this allows testing direct effects of the contingency variables on the subsystems of SPMS. Second, it allows inferences if the individual regression models are feasible as a whole. If e.g. the adoption

of a value-based objective (OBJECTIV) induced a high sophistication in all other nine subsystems – i.e. they are not independent – the use of individual regression models would be meaningless. Structural equation modelling was not used first due to small sample size ( $n=60$ ) in combination with the large number of dependent and independent variables ( $n=21$ ), and second due to an underdeveloped theory on indirect and interaction effects on SPMS (Hoque & James, 2000).

### 5.1 Descriptive statistics

11 latent variables were drafted from the survey questions, 10 relating to SPMS-sophistication and one to context (PEU). Descriptive statistics on the used items, Cronbach's (1951) measures of construct validity, and full text of the survey questions are provided in the appendix in table 12. Since the original questionnaire was composed in German, the translation/back-translation method was applied for the items exhibited in this paper to ensure equivalent meaning in the English language (Mullen, 1995; Brislin, Lonner & Thorndike, 1973). For all but three of the used indicators, scales were used in the survey: 42 of these 55 spanned the whole range from one to seven. Item level response for the 60 respondents ranges from 51 to 60. Congruent with Anderson & Young (1999), items with the highest non-response relate to politically sensitive topics, e.g. top management bonuses and collaboration with the supervisory board. Since the questionnaires are not anonymous to the researcher, the reason for the missing data is likely to be unwillingness to answer, not a lack of knowledge. Resulting item non-response is generally dealt with through imputation (Van der Stede, Young & Chen, 2005). Based on the recommendations of Schafer (1999), the scaled items fulfill all requirements for imputation with the statistics program NORM, making the number of observations always 60.

With one exceptions (BONUSIMP,  $\alpha = 0.57$ ), the constructs are adequately identified, with Cronbach's (1951) alphas exceeding the 0.6 level used in exploratory research (Nunnally & Bernstein, 1994). Past contingency research has already accepted alphas around 0.40 (Ittner, Larcker & Randall, 2003; Anderson & Young, 1999). Relying on less stringent reliability is acceptable given that these constructs are all novelties (Al-Omiri & Drury, 2007; Govindarajan, 1984). Moreover, the value for alpha is positively related to the number of used items (Hair et al., 2006), which were only four in that one case of BONUSIMP.

Principal component analysis was used to extract one factor per latent construct. This procedure is based on the ex-ante considerations of Ittner & Larcker (2001), and supported ex-post by the analysis of scree plots and eigenvalues. From the original 71 in-

dicators intended to be used for the 11 constructs, 13 items (18%) dropped out during the analysis due to poor statistical fit (Baines & Langfield-Smith, 2003; Selto, Renner & Young, 1995). Considering that new constructs can easily reach an item mortality of 60% (Foster & Swenson, 1997), the low amount in this study may be due to careful pre-testing.

Statistics for the Bartlett's test of sphericity are significant at  $p < 0.001$  for all factors but one (significant at  $p < 0.01$ ). Kaiser-Meyer-Olkin measures of sampling adequacy were at least 0.50 for all factors (average: 0.64). Three items were accepted whose factor loadings are only above 0.3 and therefore below the usual 0.4-limit: One belongs to a well established construct (PEU), and two are deemed to be of high importance for target setting by VBM-proponents (BUSIMOD). Variance explained is at least 38% for all factors, while six of the 11 constructs explain over 50% of the variance (Fornell & Larcker, 1981). These values are acceptable in this early stage of research.

Table 8 presents the pairwise correlation matrix among dependent variables representing SPMS-sophistication. Based on the understanding that integration of management subsystems is the essence of SPMS, it is little surprising that correlations are significant and mostly positive. Despite some high correlations among these variables ( $>0.6$ ), Variance Inflation Factors (VIF) do not exceed 2.5 (10.0 would still be acceptable). This makes multicollinearity unlikely. The fact that the three bonus constructs are largely unrelated to the rest of the SPMS manifests the observations from practice that the constructs do not necessarily build on one another as the five steps of Ittner & Larcker (2001) may suggest: Companies employ value-oriented compensation systems like stock options plans without linking them to the relevant key performance indicators or business models (Marr, 2005, Ittner, Larcker & Randall, 2003).

Table 9 displays the pairwise correlations among independent variables. Except for the variable SIZE, there are few significant correlations. Correlation coefficients and VIFs are all below 0.4 and 2.5 respectively. This suggests a low possibility of multicollinearity or suppressor effects in the statistical models.

	D.01	D.02	D.03	D.04	D.05	D.06	D.07	D.08	D.09	D.10	
OBJECTIV	D.01	1									
STRATEGY	D.02	<b>0.420**</b>	1								
VALUEDRV	D.03	<b>0.514**</b>	<b>0.580**</b>	1							
BUSIMOD	D.04	<b>0.266*</b>	<b>0.544**</b>	<b>0.616**</b>	1						
CULTURE	D.05	<b>0.584**</b>	<b>0.390**</b>	<b>0.516**</b>	<b>0.314*</b>	1					
USEINT	D.06	<b>0.250†</b>	<b>0.292*</b>	0.161	<b>0.228†</b>	<b>0.404**</b>	1				
USEEXT	D.07	<b>0.243†</b>	<b>0.368**</b>	<b>0.288*</b>	<b>0.443**</b>	<b>0.491**</b>	<b>0.298*</b>	1			
BONUSIMP	D.08	- 0.177	- 0.088	- 0.104	- 0.156	- 0.068	- 0.056	- 0.075	1		
BONUSBAS	D.09	<b>0.222†</b>	0.191	<b>0.298*</b>	<b>0.467**</b>	<b>0.274*</b>	0.162	<b>0.315*</b>	- 0.063	1	
BONUSTYP	D.10	- <b>0.248†</b>	- 0.095	- 0.046	0.149	0.133	0.029	0.198	0.005	0.097	1
VIF <sup>b</sup>	2.1	1.9	2.5	2.5	2.5	1.3	1.6	1.1	1.4	1.3	

†  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$  (2-tailed).

<sup>a</sup> Cf. results of the factor analysis in table 12.

<sup>b</sup> Variance Inflation Factor (VIF) controls for multicollinearity, and is defined as the inverse of 1 minus the correlation of the independent variable on the rest of independent variables. Multicollinearity is considered to be a problem for VIFs above 10.0.

Table 8: Pearson correlations among the factor scores of the dependent variables <sup>a</sup>

	I.01	I.02	I.03	I.04	I.05	I.06	I.07	I.08	I.09	I.10	I.11	
PROSDEF	I.01	1										
ORGDESGN	I.02	0.178	1									
CAPINT	I.03	-0.177	-0.138	1								
PEU	I.04	0.016	0.093	-0.032	1							
CRISCFO	I.05	-0.030	-0.047	-0.092	-0.227 <sup>†</sup>	1						
BETA	I.06	0.003	0.037	0.034	0.006	1						
SIZE	I.07	-0.172	-0.292*	-0.263*	0.117	0.202	1					
EXPIRNCE	I.08	-0.222 <sup>†</sup>	-0.231 <sup>†</sup>	0.095	-0.135	0.202	0.349**	1				
CFOCHNGE	I.09	0.065	-0.106	-0.111	-0.199	0.021	-0.139	0.350**	0.020	1		
CFOEDU	I.10	-0.221 <sup>†</sup>	0.171	0.229 <sup>†</sup>	-0.140	-0.021	-0.110	-0.172	-0.161	0.005	1	
CFOAGE	I.11	-0.179	0.044	0.052	-0.040	0.177	0.082	0.302*	0.186	-0.043	-0.312*	1
VIF <sup>a</sup>	1.3	1.3	1.4	1.3	1.2	1.1	2.1	1.4	1.2	1.5	1.5	1.5

<sup>†</sup>  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$  (2-tailed).

<sup>a</sup> Variance Inflation Factor (VIF) controls for multicollinearity, and is defined as the inverse of 1 minus the correlation of the independent variable on the rest of independent variables. Multicollinearity is considered to be a problem for VIFs above 10.0.

Table 9: Pearson correlations among the independent variables

## 5.2 Model results

First, 10 individual regression models for each dependent variable are applied:

$$SPMS\text{-construct}=f(PROSDEF, ORGDESGN, CAPINT, PEU, CRISCFO, BETA, SIZE, EXPIRNCE, CFOCHNGE, CFOEDU, CFOAGE)$$

The use of individual regression models is a usual form of analysis for the selection approach (Moll & Hoque, 2006; Davila, 2005; Chenhall, 2003; Selto, Renner & Young, 1995). Table 10 presents the regressions for each of the 10 identified SPMS-constructs. To discover the empirical regularities, stepwise regression is used to identify the contextual variables that best explain each SPM-subsystem (Shields, 1995). Removing noisy variables allows for a more parsimonious regression model, outlining the decisive contextual variables and improving the overall significance of the individual model (Reid & Smith, 2000; Foster & Swenson, 1997).

First, the results of the regression analyses are evaluated from the point of view of the dependent variables. Table 10 has to be read vertically: Five models are significant at  $p < 0.01$ , four at  $p < 0.05$ , and one at  $p < 0.1$ . Even if this were not case, explanatory power could still be considered high as the survey population contains a considerable part of the target population. The variance explained ( $R^2$ ) is on average 24% and ranges from 13% to 38%. VALUEDRV – which could be seen as the very essence of integrative SPMS – receives the best results.



Dependent variables	OBJEC		STRAT		VALUE		BUSI		CULT		USE		BONUS		BONUS	
	TIV		EGY		DRV	MOD	URE	INT	EXT	IMP	BAS	TYP	BAS	TYP		
Intercept	<b>0.225</b> †		0.943		<b>1.763</b> †	1.451	-0.196	0.826	0.083	-0.837	0.374	-1.529	0.374	-1.529		
<i>prob(t)</i>	0.083		0.422		0.076	0.185	0.841	0.269	0.907	0.105	0.314	0.21	0.314	0.21		
PROSDEF	-0.145		- <b>0.266</b> *		- <b>0.205</b> †			- <b>0.209</b> †				<b>0.255</b> *		<b>0.255</b> *		
<i>prob(t)</i>	0.251		0.040		0.078			0.096				0.043		0.043		
ORGDESGN					<b>0.320</b> **			-0.195			<b>0.227</b> †	-0.167	<b>0.227</b> †	-0.167		
<i>prob(t)</i>					0.007			0.129			0.068	0.199	0.068	0.199		
CAPINT						0.186	<b>0.286</b> *			<b>0.265</b> *		<b>0.268</b> *	<b>0.265</b> *	<b>0.268</b> *		
<i>prob(t)</i>						0.142	0.017			0.043		0.042	0.043	0.042		
PEU					- <b>0.293</b> *		-0.151	-0.176		- <b>0.235</b> †			- <b>0.235</b> †			
<i>prob(t)</i>					0.011		0.221	0.169		0.067			0.067			
CRISCO	<b>0.258</b> *					0.177	<b>0.277</b> *		<b>0.243</b> †							
<i>prob(t)</i>	0.046					0.175	0.030		0.065							
BETA			0.155					<b>0.304</b> *	0.209							
<i>prob(t)</i>			0.205					0.017	0.117							
SIZE	0.178							- <b>0.428</b> **	- <b>0.303</b> *					- <b>0.322</b> *		
<i>prob(t)</i>	0.227							0.003	0.048					0.025		
EXPIRNC	<b>0.245</b> †				<b>0.377</b> **	<b>0.324</b> *	<b>0.327</b> *	0.177	0.199							
<i>prob(t)</i>	0.075				0.002	0.017	0.010	0.181	0.160							
CFOCHNGE	0.160		<b>0.219</b> †		<b>0.207</b> †	0.206	0.133		<b>0.238</b> †		<b>0.354</b> **		<b>0.354</b> **			
<i>prob(t)</i>	0.226		0.074		0.068	0.100	0.264		0.088		0.005		0.005			
CFOAGE	-0.197		-0.182		-0.181	- <b>0.288</b> *	- <b>0.222</b> †					0.154		0.154		
<i>prob(t)</i>	0.135		0.167		0.113	0.029	0.069					0.230		0.230		
CFOEDU			<b>0.233</b> †													
<i>prob(t)</i>			0.081													
<b>R<sup>2</sup></b>	24.4%		24.0%		38.0%	22.0%	30.7%	26.1%	18.4%	13.2%	16.0%	26.6%	16.0%	26.6%		
<b>Adj. R<sup>2</sup></b>	15.8%		17.0%		31.0%	13.2%	22.8%	17.7%	9.2%	8.5%	13.1%	19.8%	13.1%	19.8%		
<b>p-value</b>	0.018		0.009		0.000	0.034	0.003	0.011	0.083	0.046	0.007	0.004	0.007	0.004		

† p<0.10; \* p<0.05; \*\* p<0.01 (2-tailed).

Table 10: Individual regression models on SPMS-sophistication

The results are now analyzed from the point of view of the independent contingency variables to confirm or reject the hypotheses. The control variables from the individual analyses are removed firstly due to the relatively small number of observations (n=60) which stabilizes the holistic MANOVA. Second, I intend to analyze the effects of the relevant variables only, i.e. those attached to a hypothesis. Table 11 presents the results from the MANOVA. It needs to be read horizontally (Cohen, 1988). The following model is used:

*(OBJECTIV, STRATEGY, VALUEDRV, BUSIMOD, CULTURE, USEINT, USEEXT, BONUSIMP, BONUSBAS, BONUSTYP)=f(PROSDEF, ORGDESGN, CAPINT, PEU, CRISCFO)*

Correlation coefficients, significance levels, and effect strength in the MANOVA approximately reflect the prior findings from the individual regression analyses. Effect strengths are measured by Partial Eta Squared (PES), which exist for each individual coefficient, and overall for each variable. All coefficients with notable effect strengths (PES > 0.01) are printed in bold. Significance is reported, but of low importance as the survey population approximates the target population.

	OBJEC		STRAT		VALUE		BUSI		CULT		USE		BONUS		BONUS		Partial Eta <sup>2 a</sup>
	TIV		EGY		DRV		MOD		URE		INT		EXT	IMP	BAS	TYP	
Intercept	0.323	<b>0.718</b>	<b>0.839</b>	-1.346	-0.613	-1.023	-0.477	-0.103	-2.018**	<b>0.289</b>							
<i>Partial Eta<sup>2</sup></i>	0.004	0.019	0.029	0.072	0.013	0.037	0.008	0.000	0.149								
PROSDEF	-0.106	-0.162*	-0.124†	-0.030*	-0.095	0.041	-0.04	0.044	<b>0.159*</b>	<b>0.216</b>							
<i>Partial Eta<sup>2</sup></i>	0.035	0.079	0.054	0.003	0.027	0.005	0.005	0.006	0.084								
ORGDESGN	-0.057	0.099	<b>0.400†</b>	-0.287	-0.184	0.006	<b>0.215</b>	-0.119	<b>0.205</b>								
<i>Partial Eta<sup>2</sup></i>	0.001	0.003	0.052	0.027	0.009	0.000	0.014	0.039	0.005								
CAPINT	-0.029	-0.012	0.022	<b>0.158†</b>	<b>0.105</b>	<b>0.144</b>	<b>0.143</b>	<b>0.089</b>	<b>0.239**</b>	<b>0.260</b>							
<i>Partial Eta<sup>2</sup></i>	0.002	0.000	0.001	0.066	0.026	0.048	0.049	0.019	0.140								
PEU	-0.031	-0.137	-0.382**	-0.228	-0.059	-0.048	-0.229†	-0.046	0.027	<b>0.301†</b>							
<i>Partial Eta<sup>2</sup></i>	0.001	0.019	0.148	0.058	0.003	0.002	0.051	0.002	0.001								
CRISCFO	<b>0.663</b>	-0.522	-0.252	<b>0.532</b>	-0.082	0.662	-0.132	0.184	-0.415	<b>0.214</b>							
<i>Partial Eta<sup>2</sup></i>	0.034	0.022	0.006	0.025	0.001	0.033	0.001	0.003	0.016								
<b>Partial eta<sup>2 a</sup></b>	<b>0.08</b>	<b>0.106</b>	<b>0.207*</b>	<b>0.201*</b>	<b>0.088</b>	<b>0.081</b>	<b>0.111</b>	<b>0.062</b>	<b>0.206*</b>								

† p<0.10; \* p<0.05; \*\* p<0.01 (2-tailed).

<sup>a</sup> Partial Eta<sup>2</sup> ( $\eta_p^2$ ), or PES, represents the variance explained of the dependent variable minus the explanatory value of all other independents minus the interaction effects explaining the dependent's variance. The strength of the effect is measured by  $E = [PES / (1-PES)]^{1/2}$ . Weak effects start at PES = 0.01  $\approx$  E = 10%. Middle effects start at PES = 0.1  $\approx$  E = 33%. Strong effects start at PES = 0.25  $\approx$  E = 58%.

Table 11: MANOVA on SPMS-sophistication

The crucial figure to analyze the MANOVA is the overall PES for each independent contingency variable across all dependent SPMS-sophistication variables (last column on the right). The effects of the contingency variables relating to organizational context (PROSDEF and ORGDESGN) are middle ( $PES > 0.1$ , representing a power to explain variance of at least 33%). The effect of firm-specific risk (CAPINT) passes the critical value of 0.25 and can be considered strong ( $PES > 0.25$  represents a power to explain variance of at least 58%). Concerning environmental context, the predictability of the environment (PEU) has a very strong effect on SPMS-sophistication. The effect of a crisis (CRISCFO) is still middle, nearly strong. Overall measures of model fit do not exist for least-square approaches.

Moreover, all partial models for the subsystems have PES above 0.01. Three models are even above 0.1. In the sense of the presented hypotheses, these results suggest that the five contextual factors can partly explain the sophistication of the SPM-subsystems. As the survey population roughly equals the target population, significance becomes less important than effect strengths and correlation coefficients. The five hypotheses will be discussed now in detail.

Hypothesis **H1a** predicted a negative relationship between a prospector strategy (PROSDEF) and SPMS-sophistication. Results support this hypothesis for OBJECTIV, STRATEGY, VALUEDRV, and USEINT. The unexpected positive sign for BONUSTYP alone does not indicate to reject the hypothesis and will be discussed in the next section. Hence, **H1a** is supported.

Hypothesis **H1b** predicted a negative relationship between the interdependence of business units (ORGDESGN) and SPMS-sophistication. The expected negative relationship, however, can only be observed for the construct CULTURE. All other correlation coefficient with weak effects (VALUEDRV, BUSIMOD, BONUSIMP, BONUSBAS) are positive, indicating that SPMS are *more* sophisticated in rather interdependent companies. Hence, **H1b** is rejected.

Hypothesis **H1c** predicted a positive relationship between company-specific risk (CAPINT) and SPMS-sophistication. The MANOVA supports this conjecture. The SPM-subsystems affected are BUSIMOD, CULTURE, USEINT, USEEXT, BONUSIMP, BONUSBAS and BONUSTYP. Hence, **H1c** is supported.

Hypothesis **H2a** suggested a lower SPMS-sophistication for companies perceiving their environment as unpredictable (PEU). As predicted, the effects are negative. The SPMS-constructs affected are STRATEGY, VALUEDRV, CULTURE and BONUSIMP. Hence, **H2a** is supported.

Hypothesis **H2b** predicted that a corporate crisis manifested in the involuntary release of a CFO will be positively related to SPMS sophistication. The results are mixed: Correlation coefficients with a weak effect on the SPMS-sophistication are positive for OBJECTIV, CULTURE and USEEXT, and negative for STRATEGY and BONUSTYP. Nevertheless, there are more indications to accept than to reject the hypothesis: First, the absolute value of the positive correlation coefficients is larger than the one from the negative ones. Second, the effect strength of PES is higher for the positive coefficients. Hence, **H2b** is supported. Figure 5 summarizes these findings:

<b>Hypotheses (predicted sign)</b>	<b>Independent variable</b>	<b>supported</b>
<b>H1a:</b> Companies following a prospector strategy have a lower sophistication of SPMS than companies following a defender strategy (−).	PROSDEF	yes
<b>H1b:</b> The sophistication of SPMS decreases with the interdependence of business units. (−)	ORGDESGN	no
<b>H1c:</b> The sophistication of SPMS increases with the company's capital intensity. (+)	CAPINT	yes
<b>H2a:</b> The sophistication of SPMS decreases with the perceived environmental uncertainty. (−)	PEU	yes
<b>H2b:</b> The sophistication of SPMS increases due to corporate crises related to a scandal resulting in the forced release of the CFO. (+)	CRISCFO	yes

*Figure 5: Summary of tested hypotheses*

### 5.3 Discussion

This section undertakes a more detailed examination of the statistical results from the previous section. This section also relates to the underlying items of the constructs as presented in the appendix in table 12. Based on complexity-limitations, no hypotheses are contrived for every one of the 50 possible combinations of SPMS-sophistication and context variables. Therefore, the following discussion on single SPMS-constructs has a rather exploratory character opposed to the confirmatory character of the previous section.

#### 5.3.1 Contingency variables

*MARKET STRATEGY:* Defenders have a significantly higher sophistication of SPMS in the area of strategic planning (STRATEGY) than prospectors, probably because their experience on their products and markets helps them to identify more precisely ex-ante, which projects generate positive NPVs (items 1-3). Moreover, the constant redefinitions of markets and products may prohibit a constant adjustment of the organ-

izational and financial structure of prospector firms (items 4-5). Consequently, it seems plausible that defenders can better translate their strategic visions into a key financial ratio like EVA (OBJECTIV) as well as concise financial and operative value drivers (VALUEDRV), define the complex interactions between them, and then use this value-oriented information for internal communication (USEINT) (Lovata & Costigan, 2002). A noticeable effect is that contrary to the hypothesis, prospectors seem to employ uncapped financial options (BONUSTYP) for compensation purposes more often than defenders. A possible explanation for this could be the fact that options are more valuable for firms with extensive but volatile growth potential. Hence, the incentive potential for managers is higher in prospector firms, and top management may prefer this type of bonus as it underlines the long-term orientation of prospector firms (Ittner, Larcker & Rajan, 1997). It can be observed that defenders are more engaged *gathering* information with this system, e.g. with the value driver analysis. There is a slight clue that prospectors rather *use* the information more extensively than defenders, e.g. for compensation. Hence, this example shows that SPMS are too complex to be defined as a binary variable.

*ORGANIZATIONAL DESIGN:* The only unpredicted finding in this study is that SPMS-sophistication is positively related to the interdependence of business units. These companies exhibit a strong association with a pronounced sophistication in VALUEDRV, BUSIMOD, BONUSIMP, and BONUSBAS. This might be due to the fact that not in spite but because of their high interdependence, it is necessary to understand how (non-)financial value drivers, targets and the subsequent assessment bases for bonuses interact in order to account for the complexity caused by interdependence. The items used to measure these constructs lay great importance on the aspects of interdependence of financial and non-financial drivers, as well as the compatibility of targets with the overall company objectives. These findings correspond to Reid & Smith (2000) who find a relationship between higher MAS complexity and interdependence among business units. Furthermore, Chenhall & Morris (1986) find that managers of subunits with interdependent segments find integrated information useful. Similar, Chapman (1997) highlights that the harmonization of subunit goals with the overall objective of the company is implied in a pre-planned activity, in this case SPMS.

*COMPANY-SPECIFIC RISK:* As predicted, unsystematic risk measured by capital invested per employee (CAPINT) is associated with more sophisticated SPM-

subsystems relating to communication (USEINT, USEEXT, CULTURE) and compensation (BONUSIMP, BONUSBAS, BONUSTYP). This may imply stricter value-oriented controls for colleagues or other employees. Quite contrary, there are basically no effects on the SPMS-sophistication in terms of data *gathering* (i.e. the constructs related to Ittner & Larcker's (2001) steps 1-3: OBJECTIV, STRATEGY, VALUEDRV), which supports the basic idea of this hypothesis. It is noteworthy again how separated the *gathering* of SPMS-information is compared to its *use* for decision making and compensation. This suggests that the prevailing binary measures of SPMS may not be appropriate for in-depth analyses.

*UNCERTAINTY*: Companies perceiving their relevant environment as relatively unpredictable tend to have a lower SPMS-sophistication. Since value-based strategy evaluation (STRATEGY) demands exact forecasts in terms of cash, this overall finding is intuitive: Unpredictable competitors or consumers as well as constantly changing product requirements and production technologies (items 1-4 of PEU) make the identification of the concise drivers (VALUEDRV) underlying the cash prognoses (STRATEGY) complicated.

Consistent with Chenhall (2003), the number of employees eligible for variable pay as well as the ratio of variable to fixed salary (BONUSIMP) is significantly lower in unpredictable environments. The reason for this might be that employees in unpredictable environments are more likely to refuse variable pay since benchmarks and targets seem relatively arbitrary, and information quality for estimating the annual salary is lower. Overall, there may be a feeling of unfairness, since compensation is based on several factors beyond the employees' individual control. In order not to breach controllability, relatively high variable salaries are more common in predictable environments. In connection with this controllability argument, a more predictable environment may make it easier for employees to grow into the SPMS-mindset (CULTURE).

*CRISES*: The mixed evidence on the relationship of a corporate crisis and consequently higher SPMS-sophistication matches the ambiguous findings on the relationship between weak performance and CEO compensation (Ittner, Larcker & Rajan, 1997), EVA adoption (Garvey & Milbourn, 2000), or BSC-adoption (Hoque & James, 2000). Hoque & James (2000) explain that strong performers adopt the BSC to gain further insights into their business model, while weak performers equally adopt the BSC to initiate and communicate change. This is also a viable pattern of interpretation for these findings: E.g. *non-crises-companies* try to understand more of the value-

contribution of their pursued strategies, since the construct STRATEGY has a negative coefficient. Crisis-companies on the other hand have a positive correlation with SPMS-sophistication in other constructs: CULTURE is measured as a general mindset (items 1, 2, 4, 5) and training preceding this mindset (item 2). This result is also consistent with anecdotal evidence from Stern & Shiely (2001), as well as with the study of Simons (1994) who finds that new top managers in strategic turnarounds work extensively on changing basic beliefs and values of their employees. Moreover, new executives are able to criticize their failed predecessor more openly after a forced change by proclaiming a new strategic direction (e.g. OBJECTIV and USEEXT). Additionally, by stressing the value-oriented objective (OBJECTIV) more explicitly, shareholders are being signaled that their claims are taken seriously after the disappointment with the last CFO. And despite these companies exhibiting no significantly higher sophistication in any other subsystem, they utilize value-based information more intensely when communicating with shareholders (USEEXT; items 1-2) and supervisory board (items 3-4) compared to companies which didn't undergo a crisis. Hence, there may be a tendency of applying impression management after a financial crisis, which is accompanied by a fundamental approach to change basic corporate beliefs.

### 5.3.2 Control variables

Control variables are only dealt with in the individual regression analyses. Hence, their explanatory power is not as high as the variables dealt with in the more sophisticated MANOVA. For readers interested in delving more deeply into the issues related to the control variables, I will briefly comment on them:

As expected, market-specific risk (BETA) is hardly significant and seems to be offset by the conflicting interests of top executives and shareholders.

As conjectured before, companies in this sample are quite mature and may hence have already passed the threshold where size (SIZE) is an indicator of SPMS-sophistication. Interestingly, there are even significant *negative* correlations with SPMS-sophistication. Therefore, further determinants may foster the sophistication of SPMS, e.g. a higher impact of top management on the individual employees to implement SPMS in smaller organizations.

The most important finding on control variables relates to application experience (EXPIRNCE). The regression analyses show that more application experience is associated with higher SPMS-sophistication. But this is only true for those SPMS-constructs related to the steps 1-4 of Ittner & Larcker (2001), i.e. is the *gathering* of



SPMS-information. Sharply contrasted, higher application experience does not lead to a more sophisticated *use* of SPMS information (USEINT, USEEXT, BONUSIMP, BONUSBAS, BONUSTYP). In essence, this means that companies with more experience in applying SPMS gather more value-based information but do not use it more intensely. An explanation for this phenomenon could be that a more recent implementer may abstain from identifying e.g. all relevant value drivers at once (VALUEDRV) as this would cause high searching costs. Another company applying SPMS for 20 years may have automatically gotten to know all relevant value drivers through daily application, i.e. at nearly no searching costs. Hence, the latter is more sophisticated in this particular area. The fact that these two types of organizations do not have a different pattern of using SPMS-information could serve as an affirmation that static, persistent relationships between SPMS-sophistication and context are analyzed. This affirms the prior assumption of the selection approach that, at that point in time, the market was rather in equilibrium than in disequilibrium. Based on this finding, it would be hard to argue that all companies strive towards full implementation of SPMS, and that the different levels of SPMS-sophistication only exist because recent adopters did not have the time to complete their implementation. If this was true, more experienced users would make significantly more use of SPMS-information.

Firms with a high SPMS-sophistication tend to employ CFOs that are young (CFOAGE) or obtained a graduate business school education (CFOEDU). Determining cause and effect of this relationship may be an interesting issue in future research. Also, any change in the position of the CFO in the prior four years (CFOCHNGE) is associated with higher SPMS-sophistication. It is noteworthy that a forced release of the CFO (CRISCFO) seems to be associated with impression management which significantly affects the design of the key financial ratio and investor relations (OBJECTIV, USEEXT). Quite contrary, any change (CFOCHNGE) is associated with more ‘grassroots’-work on SPMS-sophistication, i.e. STRATEGY, VALUEDRV, and BONUSBAS.

## **6. Conclusion, limitations, and implications**

Despite the great interest on SPMS in the literature, and the numerous contingency studies on related MAS like cost driver techniques, empirical evidence on the contingencies of SPMS is scarce. The goal of this study is to identify contingency factors driving the sophistication of SPMS. The findings indicate that SPMS-sophistication is significantly determined by organizational and environmental factors, neglecting a ‘one-size-fits-all’ approach which assumes a full implementation to be most desirable.

Results first show that higher SPMS-sophistication is associated with companies pursuing a defender strategy. These organizations are traditionally known for their reliance on financially-oriented MAS. Second, an organizational design with high interdependence between subunits is related to SPMS. The reason might be that the integration of subunit-goals through SPMS becomes more important as interdependence increases. Third, company-specific risk measured as the assets invested per employee are related to SPMS-sophistication. The reason may be that executives enforce stronger value-oriented controls on their employees as the financial risk of individual decisions increases. Fourth, SPMS-sophistication is associated with low PEU, i.e. a high predictability of the companies' relevant environment. SPMS demand exact forecasts in terms of cash, which may not be possible under high uncertainty. Fifth, companies that underwent a financial crisis related to an involuntary change in the CFO-position during the last years exhibit a higher SPMS-sophistication. This may be an attempt to signal shareholders the company's good will to improve in financial terms.

This study is subject to several limitations. First, the sample size is relatively small: Since SPMS are an integrative MAS dealing with the overall maximization of a corporate goal, I could not use more than one observation per company. Given that the differences among adopters were to be investigated, the list of possible companies to contact was limited. Combined with the large number of variables used, more sophisticated statistical methods like structural equation modelling could not be applied.

Second, the employed selection approach is subject to critique: A standard concern is the absence of a performance measure and the implied assumption that the market is in equilibrium. The analysis of the application experience (EXPIRNCE) of SPMS yet supports this assumption by showing that experienced SPMS-adopters do not use SPMS-information more extensively than recent adopters – which they would if all organizations strived towards a full implementation. Nonetheless, this could also be considered to be too little evidence for equilibrium, or it is possible that no statistical difference exists because some more experienced organizations deem it optimal to partly reduce SPMS-sophistication again over time. Another problem arising from the selection approach is the exclusion of any interaction or indirect effects of contextual variables on SPMS. However, SPMS contingency research is in an early stage, and hypotheses on how performance should be influenced need to be built along with more empirical findings. Combined with the previous argument of limited statistical possibilities, more complex models may only deliver unsatisfactory results (Selto, Renner & Young, 1995).

Third, it should be borne in mind that no causality can be inferred from this paper since statistics only test for associations (Davila, 2005, Chenhall, 2005).

Fourth, the measurement of SPMS-sophistication can easily be criticized despite pre-testing, triangulation, and the satisfactory statistical results. I do not argue to have found an optimal measurement of these constructs, but I believe this measurement to be superior to the binary classifications based on external data in prior studies. Future studies can further refine the constructs.

This paper makes three primary contributions to research: First, it establishes a link from the contingency literature on cost-driver-techniques to contingencies on SPMS. Second, it proposes a model for SPMS measurement and tests the influence of popular contextual variables on its subsystems. The compilation of a measurement model for SPMS based on Ittner & Larcker (2001) addresses an existing gap in this area of research. The statistical independency of individual regressions suggests that future researchers are even able to focus on certain constructs of the SPM-subsystems, and can hence operate with less complex models than this. The third contribution is the transfer of prior contingency findings on SPMS. Evidence is presented that companies consider certain restrictions when deciding on the sophistication of their SPMS. It could also be shown that contextual variables influence SPM-subsystems differently, e.g. that firms following a defender strategy will implement other SPM-subsystems than prospectors. Future studies could test these models for adopters and non-adopters: There, the effects of the contingency variables should be even stronger. Another valuable contribution would be to test (parts of) this model with non-profit or public organizations (Cavalluzzo & Ittner, 2004): As integration of the subsystems is seen as a key element, it would be interesting to investigate if a non-value oriented objective alters the effects of the contextual variables. Furthermore, it could be explored if companies use SPMS differently if the sophistication in the subsystems is equal. I have only investigated the use of SPMS-information for simple controls and for challenging planning assumption. Moreover, it could be tested if SPMS information is used differently across functions or hierarchical levels (Van der Stede, Young & Chen, 2005). As statistical methods only show associations and not causalities, it would be valuable to understand these relationships more deeply, e.g. through comparative case studies. Taken the findings from this paper, it would also be interesting compare different measures of performance, since the often assumed correlation between perceptive measures, accounting figures and capital market data seems not to hold when judging the success of SPMS (Ittner, Larcker & Randall, 2003).

## 7. Appendix

Table 12: Descriptive statistics on the questionnaire

Latent constructs and survey items (R) = reverse coded 1 = does not apply at all, 7 = fully applies	Factor load- ing	N	Min	Max	Item mean	Std. Dev.
<b>OBJECTIV: Value orientation of the company (step 1)</b> ( $\alpha = 0.60$ , Eigenvalue = 2.004, % of variance = 40%)						
1 The final goal of our company is the long-term maximization of company value	0.73	60	2	7	6.2	0.97
2 Does a key financial ratio exist in your company? Please specify! [Measures if the key financial ratio does incorporate (rated '3') or does not incorporate (rated '2') the cost of capital, as well as the absence of such a ratio (rated '1'), e.g. if multiple ratios are maximized simultaneously.]	0.63	59	1	3	2.3	0.49
3 Our Key Financial Ratio is designed in a way that... ...it exhaustively represents the value creation of the past business year.	0.83	58	2	7	5.2	1.60
4 ...technically, it can be utilized in every area of our company for planning purposes.	0.47	59	1	7	5.5	1.65
5 .. long-term (3-5 years), a change in our Key Financial Ratio correlates very strongly with our stock market performance.	0.40	57	1	7	4.8	1.42
<b>STRATEGY: Portfolio management and adjustment of organizational design (step 2)</b> ( $\alpha = 0.79$ , Eigenvalue = 2.757, % of variance = 55%)						
1 Within strategy development (analysis, modelling, valuation, and selection), our top management initiates the following distribution of resources: - Maintenance of existing resources in business units which currently yield returns above the hurdle rate.	0.76	59	3	7	5.7	1.07
2 - Allocation of new resources to business units which are likely to yield returns above the hurdle rate in the future.	0.84	60	2	7	5.7	1.30
3 - Divestment of resources from business units which currently or in the immediate future yield returns below the hurdle rate. Our top management initiates the adaptation of...	0.68	59	1	7	4.8	1.44
4 ...the capital structure according to strategy.	0.69	51	1	7	5.5	1.40
5 ...the organizational structure according to strategy.	0.73	58	1	7	5.6	1.34

Latent constructs and survey items (R) = reverse coded 1 = does not apply at all, 7 = fully applies	Factor load- ing	N	Min	Max	Item mean	Std. Dev.
<b>VALUEDRV: Existence of a value driver analysis (step 3)</b> ( $\alpha = 0.85$ , Eigenvalue = 3.691, % of variance = 53%) The following information is supplied to top- and middle management for their respective areas of authority:						
1 - Forecasted duration of every investment project.	0.60	58	1	7	5.6	1.55
2 - Invested capital.	0.46	60	1	7	5.6	1.55
3 - Specific cost of capital (e.g. for business areas of investment projects).	0.82	60	1	7	4.5	1.99
4 - Influence of financial value drivers on one another.	0.89	57	1	7	4.1	1.76
5 - For every financial value driver, non-financial value drivers are identified.	0.75	57	1	7	4.8	1.68
6 - The impact of every non-financial value driver on any other value drivers has been identified.	0.75	58	1	7	4.2	1.61
7 - If significant changes occur in the environment (e.g. in strategy or the general market), non-financial value drivers are adjusted.	0.73	57	1	7	4.8	1.63
<b>BUSIMOD: Existence of business modelling based on the value drivers (step 4)</b> ( $\alpha = 0.84$ , Eigenvalue = 4.518, % of variance = 38%) The following statements apply for all KPIs of your company (Key Performance Indicators):						
1 - Based on the value driver analysis. those KPIs are selected which influence the Key Financial Ratio the most.	0.72	60	1	7	5.2	1.43
2 - If significant changes occur in our value drivers, KPIs are adjusted, added or removed.	0.66	56	1	7	5.1	1.50
3 - For every KPI (e.g. customer satisfaction), actions plans are identified (e.g. increase the number of customer-visits per quarter).	0.69	57	1	7	4.4	1.47
4 - If significant changes occur in our KPIs, the related actions plans of all relevant employees are adjusted.	0.75	54	1	7	4.4	1.40
5 - All employees possess the necessary decision-rights to resolve non-standard-problems on the spot (empowerment).	0.63	55	1	7	4.2	1.56
The following statements apply for all set targets of your company						
6 - All targets are set on the basis of KPIs.	0.31	60	2	7	5.3	1.45
7 - If targets are based on accounting data, the relevant data is adjusted to the context, e.g. revision of accruals.	0.42	54	1	7	5.1	1.65
8 - All targets are set relative to benchmarks.	0.59	57	1	7	4.2	1.64
9 - Evaluation considers if set targets are influenced by unforeseen factors.	0.35	60	3	7	5.6	1.01
10 - Targets provide consistent links between the short-term performance of each business unit and the long term strategies of the business unit.	0.67	60	2	7	5.5	1.08
11 - Targets link together all business unit activities / projects to the Key Financial Ratio	0.56	60	1	7	5.1	1.27
12 - Targets show how activities of each business unit / project affect other units / projects within the organization	0.79	58	1	7	4.4	1.74

Latent constructs and survey items (R) = reverse coded 1 = does not apply at all, 7 = fully applies		Factor load- ing	N	Min	Max	Item mean	Std. Dev.
<i>CULTURE: Diffusion of SPMS in the mental models of all employees (step 5-A1)</i>							
<i>(<math>\alpha = 0.71</math>, Eigenvalue = 2.450, % of variance = 49%)</i>							
Decision makers from all levels are on the opinion that...							
1	... the final goal of our company should be the maximization of company value.	0.82	60	2	7	5.6	1.17
2	...they were sufficiently informed about VBM by trainings.	0.55	57	1	7	3.9	1.44
3	...everyone is obliged to increase company value according to his possibilities.	0.82	60	3	7	5.4	1.12
4	...resources need to be employed productively all the time; else our company destroys its own equity.	0.75	60	3	7	5.4	1.09
5	...risky investment projects require a higher rate of return than secure investment projects.	0.50	59	2	7	5.6	1.23
<i>USEINT: Use of SPMS-information for general management decisions (step 5-A2)</i>							
<i>(<math>\alpha = 0.87</math>, Eigenvalue = 3.694, % of variance = 62%)</i>							
Value-oriented information is frequently used to...							
1	...control progress and achievements of objectives. This applies to the entire top management	0.74	56	1	7	5.4	1.64
2	...critically scrutinize the ongoing validity of the assumptions made during the planning process. This applies to the entire top management	0.89	57	1	7	5.3	1.49
3	...convince others of one's own opinion. This applies to the entire top management	0.70	53	1	7	4.8	1.85
4	...control progress and achievements of objectives. This applies to the entire middle management	0.72	59	1	7	4.9	1.70
5	...critically scrutinize the ongoing validity of the assumptions made during the planning process. This applies to the entire middle management	0.88	57	1	7	5.2	1.50
6	...convince others of one's own opinion. This applies to the entire middle management	0.75	55	1	7	4.3	1.78

Latent constructs and survey items (R) = reverse coded 1 = does not apply at all, 7 = fully applies	Factor load- ing	N	Min	Max	Item mean	Std. Dev.
<b>USEEXT: Use of SPMS-information for external parties (step 5-A3)</b> ( $\alpha = 0.63$ , Eigenvalue = 2.340, % of variance = 39%)						
1 Our investor relations argue primarily based on information with a reference to the VBM-system to communicate with investors and analysts (e.g. about results or strategic planning).	0.79	58	1	7	4.3	1.76
2 Our investor relations use the feedback of investors and analysts to critically scrutinize the ongoing validity of assumptions made by our top management for the planning process.	0.79	59	1	7	5.0	1.72
3 Our top management argues primarily based on information with a reference to the VBM-system to communicate with the members of the supervisory board (e.g. about results or strategic planning).	0.81	54	1	7	4.6	1.71
4 Our top management uses the feedback of the supervisory board to critically scrutinize the ongoing validity of their own assumptions for the planning process.	0.66	55	2	7	5.5	1.37
<b>BONUSIMP: Impact of incentive system on the organization (step 5-B1)</b> ( $\alpha = 0.57$ , Eigenvalue = 1.741, % of variance = 53%)						
1 The participation in the bonus program includes all members of top management	0.69	60	6	7	7.0	0.22
2 The participation in the bonus program includes all members of middle management	0.64	60	4	7	6.6	0.79
3 The target bonus in terms of fixed salary is approximately... [Top management] – please specify in %	0.61	52	12	150	51.0	20.8
4 The target bonus in terms of fixed salary is approximately... [Middle management] – please specify in %	0.69	52	10	70	27.5	12.9
<b>BONUSBAS: Assessment base for bonuses KPI (step 5-B2)</b> ( $\alpha = 0.90$ , Eigenvalue = 1.815, % of variance = 90%) For the calculation of the bonuses, we use the following assessment bases:						
1 - Key Performance Indicators (Top management)	0.95	57	1	7	4.9	2.19
2 - Key Performance Indicators (Middle management)	0.95	58	1	7	4.7	2.05
<b>BONUSTYP: Mode of payment for bonuses (step 5-B3)</b> ( $\alpha = 0.69$ , Eigenvalue = 2.146, % of variance = 53%)						
1 Bonuses are composed nearly completely of stock(options) [Top Management]	0.79	57	1	7	3.0	2.05
2 Bonuses are composed nearly completely of stock(options) [Middle Management]	0.82	58	1	7	2.3	1.73
3 Caps exist for all bonuses (R) [Top management]	0.54	52	1	7	5.7	2.15
4 Caps exist for all bonuses (R) [Middle management]	0.74	55	1	7	5.7	2.14

Latent constructs and survey items (R) = reverse coded 1 = does not apply at all, 7 = fully applies		Factor load- ing	N	Min	Max	Item mean	Std. Dev.
<i>PEU: Perceived environmental uncertainty (contextual factor)</i>							
<i>(<math>\alpha = 0.63</math>, Eigenvalue = 1.940, % of variance = 48%)</i>							
How predicable is the environment in which your company operates?							
1	- The rate at which products and services are getting obsolete in the industry is very slow (e.g. commodities like oil). (R)	0.74	56	1	7	4.1	1.86
2	- The production/service technology is not subject to very much change and is well established (e.g. steel production). (R)	0.81	56	1	7	3.8	1.78
3	- Actions of competitors are quite easy to predict (e.g. pure price competition). (R)	0.36	58	1	7	4.2	1.48
4	- Demand and consumer tastes are fairly easy to forecast (e.g. milk industry). (R)	0.78	58	1	7	3.7	1.39



## **D The impact of the sophistication of Value-based Management on corporate performance**

### **1. Introduction**

While much has been written about Value-based Management (VBM), there is only scarce empirical evidence whether VBM can keep its main promise of improving corporate performance. Up to date, there have been many papers investigating how well economic value measures correlate with stock returns. Other studies have interpreted market reactions to the announcement that shareholder value was a new priority. And there are plenty descriptions of how value-driver techniques have been applied in certain organizations. But few of the studies addressed the key question of VBM as proposed by Ittner & Larcker (1998, p. 211):

“[...] the key question is not whether economic value measures are more highly correlated with stock returns than traditional accounting measures, but whether the use of economic value measures for internal decision making, performance measurement and compensation purposes improves organizational performance.”

And when this question was addressed, the studies generally contained several methodical flaws like model-under-specification: Applying VBM includes more than just a key financial ratio, or the existence of an investor relations section on the corporate website. VBM proponents argue that VBM is a management system linking the strategic objective of value maximization to a coherent set of performance measures and compensation through cause-and-effect-chains (Chenhall, 2005; Ittner & Larcker 2001). Hence, they argue that VBM must contain several steps and subsystems such as strategy selection, value driver analysis, compensation, performance measurement, value-based culture, and aggregating, processing, interpreting and communicating information (Chenhall, 2003; Gates, 2000; Young & O’Byrne, 2000; Milunovich & Tsuei, 1996; Stewart, 1991).

The answer to the question whether the implementation of VBM improves performance is not self-evident, since there are many good reasons from the implementation literature to believe the opposite (Anderson, Hesford & Young, 2002; Ittner & Larcker, 2001; Hoque & James, 2000; Stern & Shiely, 2001; Kleiman, 1999; Ittner & Larcker, 1997; Westphal & Zayac, 1994): Empirical evidence showed that a full

VBM-implementation as recommended by its proponents often took years to complete and consumed considerable corporate resources. Researchers often observed that the direct and indirect costs of implementing value-driver techniques exceed the benefits reaped, e.g. through bureaucracy, resistance from unions, or boycotting customers. Possibly, consultants could talk management into the newest fad, and then chose to over-implement. Another possibility is that questioning every major decision by its value added may be not value-enhancing in all organizations. Hence, these 'net'-performance effects of VBM remain a critical issue.

This paper makes two contributions: It investigates how various VBM-subsystems enhance different measures of organizational success. Findings showed that most measures were significantly improved when VBM-subsystems were refined over time. Alongside, this paper provides executives with a simple set of questions to challenge research which affirms either VBM's success or failure. Comprehensible examples help to avoid deceiving interpretations of VBM-performance studies, which may seem very convincing at first sight. In detail, this paper offers four insights current VBM-research is not clear about:

1. This paper is the first to propose quantifiable constructs to measure the sophistication of all VBM-subsystems including compensation. This fosters a more realistic understanding beyond the over-simplified, binary 'implemented-or-not'-variables.
2. This study can show that VBM drives stock returns. It also delivers empirical evidence on the theoretical claim that the 'right' performance measures for VBM are *abnormal* shareholder returns, not *absolute* shareholder returns. Furthermore, accounting figures as well as success 'perceived' by top management disqualify as indicators of performance as they are found to be unrelated to stock returns.
3. It can be shown that not the *level* of VBM-sophistication but the *changes* in VBM-sophistication best explain performance. This finding questions the research designs of several prior studies on VBM.
4. Evidence is presented which particular VBM-subsystems drive abnormal stock returns. The four most important success factors are value-oriented strategy, a sound understanding of value drivers, a high portion of employees receiving significant variable salary, and stock-based compensation. Nevertheless, these factors only have an effect if supported by well-developed investor relations.

These four insights will be explained in the following four sections 2-5. The last section will summarize the implications of this study.

## 2. How to measure changes in VBM-sophistication?

### 2.1 The theoretical model

At first, I offer a quantitative measurement of the sophistication of a VBM-system. Findings in prior VBM-studies have been so diverse because different definitions of VBM have been used. Consequently, precisely defining VBM is more than an academic exercise if one wants to obtain reliable results. Unfortunately, the practitioner literature does not offer such a comprehensive definition: Consulting firms who developed VBM-systems want to sell their specific solution to clients; hence they insist their tools to be fundamentally different from the ones of their competitors. This plight was already addressed in the article “Metric Wars” over ten years ago (Myers, 1996). Turning to the academic literature however, Ittner & Larcker (2001) have succeeded in drafting a VBM-framework congruent with both the most popular VBM-approaches as well as prevalent academic theories. I conducted a comprehensive literature review to find concise and pragmatic indicators of each of their steps. Figure 8 in the appendix lists all questionnaire items used for the constructs as well as the relevant statistical reliability indicators. I now present the five-step-model of Ittner & Larcker (2001), and explain how the 11 related subsystems are measured (cf. figure 6, the names of the constructs are always in parentheses in the text):

Five-step VBM-framework by Ittner & Larcker (2001)	VBM-subsystems
1 Overall objective: Increase shareholder value & identify specific organizational objectives	▶ OBJECTIV
2 Develop strategies and select organizational design	▶ STRATEGY
3 Identify value drivers	▶ VALUEDRV
4 Develop action plans, select measures, set targets	▶ BUSIMOD; QUALITY
5 Evaluate performance	▶ CULTURE; USEINT; USEEXT; BONUSIMP; BONUSBAS; BONUSTYP

Figure 6: VBM- framework and related VBM-subsystems

1. **“Overall objective: Increase shareholder value & identify specific organizational objectives”**: This involves choosing a key financial ratio which takes into account the cost of capital, and can be used for company-wide-planning and performance measurement (OBJECTIV).

2. **“Develop strategies and organizational design”**: This illustrates that strategies with a positive net-present-value (NPV) have to be chosen, that unprofitable business areas have to be divested, and that organizational design and capital structure have to be adjusted to these circumstances (STRATEGY).
3. **“Identify value drivers”**: This step suggests identifying all relevant financial and non-financial drivers, as well as their interaction effects. This supports sub-units to act towards the common goal of value maximization (VALUEDRV).
4. **“Develop action plans, select measures, and set targets”**: This step comprises translating value-drivers into manageable key performance indicators, setting the targets for employees on all levels, and defining how to achieve these targets (e.g. by following strict action plans for standard procedures, and empowerment for non-standard procedures) (BUSIMOD). It may be argued that this subsystem resembles a Balanced Scorecard. Ittner & Larcker (2001) also indicate the importance of highest quality standards for the produced information, represented by information quality (QUALITY).
5. **“Evaluate performance”**: First, this step addresses the creation of a value-oriented culture (CULTURE), which accompanies the use of value-oriented information for all relevant management decisions (USEINT). They go both along with the communication of this information to investors, the supervisory board, analysts or other stakeholders (USEEXT). Second, this step covers the compensation system. VBM-proponents suggest introducing substantial variable pay for virtually all employees (BONUSIMP), to connect this pay to the key-performance-indicators mentioned above (BONUSBAS), and to pay these bonuses with a long-term-perspective, e.g. with uncapped stock options (BONUSTYP).

The study uses this five-step-framework to quantitatively measure the sophistication of VBM-systems. The 11 subsystems are measured by factors based on 58 scaled questionnaire items (cf. figure 8 in the appendix). Details of the statistics are further explained in the next subsections.

Ittner & Larcker (2001) assume that companies will revise their VBM system regularly and hence undergo these five steps repeatedly. This may result in different sophistication levels within the subsystems as the subsystems do *not* necessarily build on each other. As a practical example, a company may employ a highly sophisticated key financial ratio (OBJECTIV, step 1) and stock option plans (BONUSTYP, step 5), while at the same time, this company has clearly underdeveloped definitions of actions plans for its employees (BUSIMOD, step 4). This suggests that the options to design a

VBM-system are plentiful, and that binary classification of companies into ‘VBM implemented’ and ‘VBM not implemented’ is not appropriate in this study. On the one hand, researchers have shown several times that two companies claiming to use the same accounting instrument apply it quite differently (Malmi & Ikäheimo, 2003; Speckbacher, Bischof & Pfeiffer, 2003; Gosselin, 1997). On the other hand, it is a fact that management accounting systems with different brand-names can induce similar corporate practices. E.g. one company calls its management accounting system Economic Value Added (EVA), the other one Economic Profit: Yet effectively, the organizations’ decision-making processes function more alike than the different names of their management systems may forebode. These concise differences and similarities only become apparent if the VBM-subsystems are scrutinized. In the next subsection, the measurement of these subsystems is explained.

## **2.2 The empirical sample and data treatment**

Data for the variables on VBM-sophistication stemmed from a questionnaire used in a larger research project, which observed the application of VBM in practice over the period from 2003 to 2006. The questionnaire was directed towards top executives of the companies listed in the HDAX. These are the 110 largest listed organizations in Germany, which comprise about 80% of daily turnover at Frankfurt Stock Exchange (for the full list, cf. figure 9 in the appendix). Hence, this sample is comparable to the largest listed companies in the U.S., the U.K., and Japan. 60 of the 110 companies responded to that request, which resulted in a relatively high response rate of 54.5%. Details on companies and respondents can be found in table 17 in the appendix. As it can be seen from the high average scores across all scaled indicators (5.0 of 7.0 possible points), the VBM-sophistication of the HDAX-companies can be considered as quite profound on average.

Germany was chosen because of facilitated access to top executives. The reliability of the data obtained from the key informants can be trusted for two reasons: First, many of the respondents were known to the faculty from past research projects. Second, most suggested pilot tests and follow-up-procedures were applied that are suggested by leading academic journals. This generally increases response rates and rules out different types of respondent biases. In effect, none of the tests for such biases were significant (Dillmann, 2007; Van der Stede, Young & Chen, 2005; Podsakoff & Organ, 1986; Huber & Power, 1985).

Factor analysis was used to identify 58 items for the 11 constructs. These constructs correspond to the subsystems of the five-step VBM-framework presented above. Positive factor scores indicated high VBM-sophistication, and negative scores low sophistication. Factor scores for each construct were calculated for the years 2003 and 2006, and then subtracted to see if the sophistication of the respective subsystems had changed between 2003 and 2006. This was done because changes in VBM-sophistication should influence performance, not absolute levels. The basic argument is that the present VBM-sophistication is impounded into the current stock price. If changes in the stock price are to be understood, the corresponding change in the VBM-sophistication also needs to be taken into account: Stock prices only change upon the arrival of new information to the market, i.e. changes in the VBM-system. However, this thought will be elaborated later in the paper in more detail.

In order to simplify further investigation, implementers were intended to be grouped by cluster analysis according to the 11 subsystems. This attempt did not succeed, which supports the first insights that VBM-systems have to be complexly measured by its individual subsystems. Therefore, results of studies employing simple ‘implemented-or-not’-variables need to be interpreted with care.

### **3. Performance: Why is it adjusted-stock-returns?**

The second finding is twofold: First, improvements in VBM-sophistication increase performance. Second, this is best measured by risk-adjusted stock returns. Let us start with a basic question: What constitutes ‘good’ performance for a company? An obvious answer would be to measure a firm’s success by the achievement of its goals: If the purpose of a firm is to ensure public health, the performance measure should somehow deal with health. Performance measurement is different of course for publicly traded multinationals setting their goal explicitly at increasing shareholders’ wealth through VBM. In this case, it would be hard to justify not measuring the increase of firm value from shareholders’ perspective to determine if the VBM implementation actually added value.

A natural choice for increases in company value may seem to be total shareholder return (TSR), measured as stock appreciation plus dividends. But according to the capital asset pricing model (CAPM) – upon which nearly all VBM-proponents rely – shareholders care about one additional factor: Risk. Risk associated with this return is commonly measured in terms of volatility. In order to compare the performance of two investments with different risk profiles, it is crucial to adjust TSR for volatility. Popu-

lar risk-adjustments are the Sharpe Ratio (adjusts for the asset's or portfolio's volatility) as well as the Treynor Ratio (adjusts for the volatility relative to the market portfolio). Once adjusted, these measures give an estimate of abnormal returns (cf. figure 10 in the appendix to see how the performance variables were calculated). VBM-proponents argue that an increase in firm value can be estimated from the differences in the valuation of equity at the stock exchange over a time period (Bacidore et al., 1997). Even though this measurement may not reflect the 'intrinsic' value of an organization, it is the current valuation of the firm from the point of view of the shareholders. And by definition, this is what should matter to a VBM-oriented executive.

Nevertheless, some researchers who investigated VBM argue that accounting data or perceptive measures can be used as well to estimate performance. Accounting data has even been used to estimate performance if stock-market data was available for the relevant companies. An argument against the use of accounting figures is that the key financial ratios of VBM (e.g. EVA) were created due to the shortcomings of traditional accounting measures in indicating performance (Copeland & Dolgoff, 2006). On a theoretical basis, it would hence only be feasible to use accounting data as a substitute for stock market returns if the companies were not publicly traded.

The majority of studies traditionally relied on perceptions of performance, probably because these variables are easy to measure, e.g. once an executive participates in a survey. These measures include an estimate of stock market performance through executives, or researchers' rating of the VBM-sophistication. Often, 'good performance' was simply reduced to the question if the company used the system. As shown in this paper and by other researchers (Ittner, Larcker & Randall, 2003), the use of accounting data and perceptive measures is critical, as they are largely unrelated to the stock returns VBM targets to increase.

This is the essence of the second finding: Readers should be aware that that accounting data or perceptive measures can constitute statistically correct models that seem very persuasive – but they do not measure value creation, and are therefore inappropriate for assessing a VBM-system from a shareholder's perspective. To show this, several performance variables are compared over the time period from 2003-2006: Plain TSR (TSR), the Sharpe Ratio (SHARPE) and the Treynor Ratio (TREYNOR) are used as stock returns. Accounting figures are represented by return on investment (ROI), return on sales (ROS) and return on book-value-equity (ROE). The perceptive measure

(RAISE) is a factor based on the questionnaire items of Ittner, Larcker & Randall (2003) asking for *perceived* stock performance, and a cost-benefit-analysis of VBM. Bivariate correlations confirm earlier findings that stock returns, accounting data and perceptive measures are not related (table 13). It would hence be problematic to treat them as if they all measured VBM performance. By definition of VBM-proponents, stock returns do. Therefore, accounting data and perceptive measures seem to disqualify as substitutes:

	TSR	SHARPE	TREYNOR	ROI	ROS	ROE	RAISE
TSR (n = 52)	1						
SHARPE (n = 52)	<b>0.639**</b>	1					
TREYNOR (n = 52)	<b>0.858**</b>	<b>0.847**</b>	1				
ROI (n = 60)	0.067	0.136	0.057	1			
ROS (n = 60)	0.081	0.116	0.143	<b>0.619**</b>	1		
ROE (n = 60)	0.119	0.178	0.081	<b>0.663**</b>	<b>0.437**</b>	1	
RAISE (n = 60)	0.053	0.169	0.106	0.034	0.071	0.05	1

† p<0.1; \* p<0.05; \*\* p<0.01 (two-tailed)

Table 13: Accounting data and perceptive measures do not correlate with stock returns

Results show that stock returns are highly correlated among each other, and so are accounting returns. Management's perceptions of VBM-performance (RAISE) are unrelated to either type. It will be shown later how this affects the performance analysis of VBM. ROI will be the only accounting measure further investigated, since it correlated most strongly with both ROS and ROE. Using only ROI did thus not alter the subsequent findings. Next, the relationship of changes in VBM-sophistication and performance variables is shown.

The variable OTHERSYS is added to the 11 VBM-subsystems. This variable controls for the possibility that performance was driven by anything else than changes in VBM-sophistication: Top executives were asked if any other system outside VBM's scope changed significantly during the last three years. If the models are well-specified, this control variable will not be significant, since the 11 VBM-subsystem should include everything that is relevant to value creation.

For the remaining five performance measures (TSR, SHARPE, TREYNOR, ROI, RAISE), five stepwise regression models were drafted:



*Performance variable=f(OBJECTIV, STRATEGY, VALUEDRV, BUSIMOD, QUALITY, CULTURE, USEINT, USEEXT, BONUSIMP, BONUSBAS, BONUSTYP, OTHERSYS)*

In a stepwise regression, first, all VBM-system-design-variables are entered to explain the respective performance variable. Consequently, the statistics software SPSS automatically eliminates the least significant variable beyond the p-value of 0.1, and then repeats the entire processes until only variables are left that are at least significant at  $p < 0.1$ . This allows for a parsimonious model where effects can be seen more clearly than in a model where all variables are entered irrespective of their significance.

The results presented in table 14 are quite revealing: While the finding that these three types of measures (stock returns, accounting, perceptible) are not significantly correlated is far from being new, the interesting insight is that all three types of performance measures constitute significant statistical models employing other subsystems. If performance measures are not clearly compared to each other, the reader of a study could easily be misled into believing in a misspecified model. Findings are now discussed in detail:

	Capital market measures			Accounting measure	Perceptive measure
	TSR	SHARPE	TREYNOR	ROI	RAISE
Intercept	<b>1.309**</b>	<b>1.635**</b>	<b>0.199**</b>	<b>0.088**</b>	-0.825
<i>prob(t)</i>	0.000	0.000	0.000	0.000	0.117
OBJECTIV				<b>-0.286†</b>	
<i>prob(t)</i>				0.057	
STRATEGY		0.256			
<i>prob(t)</i>		0.160			
VALDRV					-0.083
<i>prob(t)</i>					0.494
BUSIMOD		-0.290		<b>-0.444**</b>	-0.125
<i>prob(t)</i>		0.109		0.003	0.313
QUALITY					<b>0.682**</b>
<i>prob(t)</i>					0.000
CULTURE					0.138
<i>prob(t)</i>					0.247
USEINT				<b>0.472**</b>	-0.179
<i>prob(t)</i>				0.001	0.104
USEEXT	<b>0.361**</b>	<b>0.451**</b>	<b>0.469**</b>		
<i>prob(t)</i>	0.009	0.004	0.000		
BONUSIMP				-0.228	
<i>prob(t)</i>				0.107	
BONUSBAS				<b>0.541**</b>	
<i>prob(t)</i>				0.001	
BONUSTYP					
<i>prob(t)</i>					
OTHERSYS					0.153
<i>prob(t)</i>					0.115
<b>R2</b>	13.0%	24.0%	22.0%	32.3%	51.2%
<b>Adj. R2</b>	11.3%	19.3%	20.4%	26.1%	45.7%
<b>p-value</b>	0.009	0.004	0.000	0.001	0.000
<b>N</b>	52	52	52	60	60

† p<0.1; \* p<0.05; \*\* p<0.01 (two-tailed)

Table 14: Changes in investor relations drive stock returns

First, accounting returns are explained by several VBM-subsystems. It is yet a puzzling finding that some correlations are positive while others are negative. The regression model of ROI is statistically significant and explains 32.3% of the variance. It can be observed that ROI increased for those companies which *decreased* the sophistication of the subsystems OBJECTIV and BUSIMOD. Delving into the item-level of these constructs, this finding might not be all that surprising: Companies that have a negative score for OBJECTIV are organizations that used to be managed by a value-

based concept like EVA (high score in the VBM-philosophy for 2003) and are now managed by a traditional accounting number like ROI (low score in 2006, i.e. the difference is negative). Therefore, it is not surprising that those companies deciding to maximize a figure like ROI have a significant statistical relationship to three-year-ROI ( $p < 0.10$ ) (i.e. a negative correlation for OBJECTIV). Balachandran (2006) gives similar empirical evidence how value-oriented behavior (i.e. within a VBM-subsystem) adjusts if an organization changes its key financial ratio. This interpretation assumes that different behavior is necessary to maximize e.g. either residual income or ROI. In accordance with that, it is sensible to argue that companies switching from VBM to traditional measures also abolish typical VBM-behaviors as described by the 12 items of the VBM-subsystem BUSIMOD, e.g. the definition of KPIs, value-oriented target setting and the development of action plans.

Yet, this result is only sensible on a stand-alone basis. It is hardly explainable why organizations would reduce value-oriented behavior in the subsystems OBJECTIV and BUSIMOD, while simultaneously increasing USEINT and BONUSBAS (significant positive correlations with ROI). A vivid example of this paradox would be that EVA is abandoned in one company (negative coefficient for OBJECTIV), while at the same time, decision making based on EVA-information increases (positive coefficient for USEINT). Another one would be that the definition of KPIs has significantly decreased (negative coefficient for BUSIMOD) while at the same time, bonuses were linked more profoundly to these KPIs (positive coefficient for BONUSBAS). It may of course be possible to construct a case when this would make sense, e.g. if too many KPIs existed in a company and too few links to compensation. But for this sample, these contravening changes are hardly explainable: As visible in table 15, the four subsystems OBJECTIV, BUSIMOD, USEINT and BONUSBAS are all significantly positively correlated across the sample, i.e. companies expanding their subsystems USEINT and BONUSBAS do not decrease the subsystems OBJECTIV and BUSIMOD at the same time. Considering this raw data as displayed in the correlation matrix, a joint interpretation of these positive and negative coefficients is therefore not possible despite the fact of the statistical model being highly significant. If only ROI had been used in this study as a performance variable, the interpretation would most likely be that VBM does not have a clear impact on performance. But since it was shown that ROI does not correspond to the relevant performance variables (i.e. stock returns), it can be concluded that studies testing for performance of a VBM-system with accounting data should be interpreted with caution. The presented ROI-model as a whole does not provide a meaningful pattern of interpretation.

	I.01	I.02	I.03	I.04	I.05	I.06	I.07	I.08	I.09	I.10	I.11
OBJECTIV	I.01										
STRATEGY	I.02	1									
VALUEDR	I.03	<b>0.586**</b>	1								
BUSIMOD	I.04	<b>0.456**</b>	<b>0.521**</b>	1							
QUALITY	I.05	0.004	<b>0.297*</b>	<b>0.420**</b>	1						
CULTURE	I.06	<b>0.309**</b>	<b>0.398**</b>	<b>0.411**</b>	<b>0.379**</b>	1					
USEINT	I.07	<b>0.484**</b>	<b>0.371**</b>	<b>0.412**</b>	0.177	<b>0.338**</b>	1				
USEEXT	I.08	<b>0.411**</b>	<b>0.510**</b>	<b>0.430**</b>	0.007	<b>0.345**</b>	<b>0.333**</b>	1			
BONUSIMP	I.09	<b>0.366**</b>	<b>0.294*</b>	0.134	0.199	0.178	0.107	<b>0.436**</b>	1		
BONUSBAS	I.10	<b>0.420**</b>	<b>0.262*</b>	<b>0.305*</b>	<b>0.547**</b>	0.154	0.138	<b>0.367**</b>	<b>0.548**</b>	1	
BONUSTYP	I.11	-0.165	-0.073	-0.215†	-0.095	-0.001	0.117	0.128	0.044	0.205	1

† p<0.10; \* p<0.05; \*\* p<0.01 (2-tailed).

Table 15: Most changes in subsystems correlate positively

Second, the perceptive measure RAISE is driven by changes in VBM-sophistication. The results are excellent: The subsystems explain over 50% of the variance ( $R^2$ ) of the performance variable RAISE, and the model is highly significant at  $p < 0.001$ . Still, these findings do not support the view that VBM increased performance since it has already been shown that RAISE is unrelated to stock returns. Hence, it is safe to say that the RAISE-model does not measure the impact of VBM on performance. But why is the statistical model so excellent then? The reason is likely to be the ‘common-method-bias’: It means that the observed variance in this model stemmed from the measurement method (questionnaire) rather than from the ‘real’ economic performance the perceptive measure RAISE was supposed to represent. This bias was induced because the *descriptive* data on VBM-sophistication and the *judgmental* data on VBM-performance were collected from the same key informant. Informants tend to answer consistently: If the informant believes that the VBM-sophistication has increased, she is likely to believe that performance increased as well. This can be seen (table 14) in the fact that QUALITY is the strongest and most significant driver of RAISE (correlation coefficient 0.659 and significant at  $p < 0.001$ ): I.e. if top executives perceive the quality of VBM-information to increase, they may believe to have performed better at the stock market – while they actually did not. Researchers list many other possible sources of this bias that apply to this type of research (Podsakoff et al., 2003). It is hence well known that researchers should not design their studies this way, but gather data with different methods from different sources as done in this study with stock returns. It needs to be pointed out that these flaws are not necessarily caused by a lack of knowledge of the key informants. This is rather a didactic example of how not to structure research designs: Had I only used RAISE as a performance variable, I would have made an ‘alpha error’, i.e. acknowledging a relationship that is actually nonexistent. VBM-performance (i.e. stock returns by definition) is driven by other factors than QUALITY. Yet, it is a neat example for practitioners on how to challenge studies methodically: Studies relying on perceptive performance data that was collected from the same source need to be interpreted with utmost caution. The common-method-bias is one of the first questions to address when interpreting study results.

Third, stock returns were used to measure performance as prescribed by VBM-proponents. Findings for these three models are interesting: First and as predicted, changes in the VBM-sophistication is nearly twice as good for explaining risk-adjusted returns ( $R^2 = 24\%$  and  $22\%$ ) than unadjusted TSR ( $R^2 = 13\%$ ), and the correlation coefficients are higher for the former ones as well. This observation is consistent with the

prior assumption that investors do not only care about the TSR, but also about the risk that is associated with it. But in any case, these  $R^{2s}$  are quite satisfactory in comparison to variance explained the general finance-literature, which is usually around 10%.

A further noticeable finding is that stock returns are (nearly) exclusively driven by USEEXT, representing investor relations. This seems intuitive since investors get lots of information they need to correctly value stocks from investor relations. Further details on the role of this relationship are revealed later by finding four.

It is furthermore noteworthy that returns are *not* directly driven by the key financial ratio (OBJECTIV) like EVA or the stock option plan (use of uncapped options, BONUSTYP). This is so interesting because most studies that classified firms into adopters and non-adopters did this by investigating archival sources for the use of EVA or stock option plans. As these two variables do *not* directly drive stock returns, the findings of studies relying on such classifications need to be questioned for model under-specification. If a model is under-specified, researchers fail to observe the existing link between VBM and stock returns; the link may be there, but researchers looked for it in the wrong places.

Findings three and four will be explained only on the basis of stock returns, because they are the relevant performance measure for VBM.

#### **4. Why are stock-returns driven by changes – and not levels – of VBM-sophistication?**

The third finding in this paper is that changes and not absolute levels of VBM-sophistication best explain risk-adjusted stock returns. This was taken as given when the first two findings were reported. Now the theoretical basis is described why the use of levels is critical. The empirical findings support this rather complex hypothesis.

It is very seldom in the literature to test for the effects of management accounting systems (VBM, Balanced Scorecards, Activity-based Costing etc.) on stock returns (Chenhall, 2003). The first reason for this is that it is hard to isolate the effects of a management accounting system from other effects on stock return. These effects could also stem from other management accounting systems, or from general market movements. The effect of other management accounting systems can be ruled out for the special case of VBM: Its proponents use the clever claim that everything that drives stock returns should have been identified as a value-driver. This postulate was just supported empirically by showing that the control variable OTHERSYS is not significant for explaining stock returns (table 14). General market movements like a change in the price of crude oil influencing an individual firm's stock return can also be elimi-

nated: The CAPM, upon which VBM-proponents rely, differentiates risk into firm-specific risk and market risk (measured by beta). Adjusting TSR for beta (i.e. the Treynor Ratio) eliminates the market's influence on stock returns. The Treynor Ratio only leaves abnormal returns generated through the management of firm-specific risk, i.e. the benefits of VBM. Hence, VBM may actually be the only management accounting system that can – by definition – be assessed with risk-adjusted stock returns without regard to these discussed problems that apply to virtually all other management accounting systems.

The second problem why management accounting systems and performance are seldom compared is the correct match between cause and effect. E.g. it is hard to argue that a company implemented VBM 20 years ago and still reaps a huge abnormal profit every month off that: Investors would start anticipating these extra returns, which would make the abnormal profit vanish.<sup>10</sup> Compared to the first problem, this one is a quite challenging issue applying to all event studies in finance: If stock returns from 2003 to 2006 are to be explained, what information about the VBM-system should be attached as the 'trigger' of these returns?

Three possibilities come to mind: The sophistication in 2006, the sophistication in 2003, or the growth (decline) in sophistication between 2003 and 2006. The first one (2006) can be dropped immediately since a system that was adopted in November 2006 will under normal circumstances not have influenced stock-returns in January 2004. Still, numerous studies used this research design in the past. Option two (2003) is applied even more often in research: Based on a specific date like December 2003, firms are grouped into e.g. EVA-adopters and non-adopters. Subsequently, researchers compare if the returns of the following years are different for the groups. This design is indeed very easy to replicate, but unfortunately, the world is not either black or white: Companies that by December 2003 had adopted EVA might have abandoned it just month later, while non-adopters may have decided in 2004 to adopt EVA. If researchers do not take into account these *changes*, they will have adopters in their non-adopter-group and non-adopters in their adopter group by the time they reach the end of their time frame. Statistical results are then impaired because they are based on polluted control groups. In addition to this, and as already pointed out, there is also more to VBM than just the adoption of a key financial ratio like EVA. Based on the 11 sub-

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<sup>10</sup> As Dobbs & Koller (2005, p. 1) put it: "Companies that consistently meet high performance standards can thus find it hard to deliver high TRS: the market may think that management is doing an outstanding job, but this belief has already been factored into share prices." And the CEO of Deutsche Bank Ackermann (2007) reported: "It is crazy how fast expectations adjust. When we had 4 percent return and set our goal at 25, many people said that this was unachievable. Now we are at 45 percent, where 25 would be a big disappointment. The pressure to succeed increases along with rising expectations."

systems derived to measure a full VBM-implementation, it became clear that e.g. an EVA adoption (OBJECTIV) is only a little part of a fully integrated VBM-system. This makes it necessary to check for changes in all 11 subsystems.

Now, are changes in VBM-sophistication the ‘trigger’ for stock returns during the same time period? While the sophistication-‘change’-measurement in this study may be far from being perfect, it can still be seen as a superior model to the sophistication-‘level’-measurement in prior research: Professional investors and analysts were likely to possess some relevant information on the sophistication of VBM by December 2003. All of these pieces of information were hence impounded in the share price of December 2003 (Paulo, 2002; Zimmerman, 1997).<sup>11</sup> Consistent with the efficient market hypothesis (EMH) on which VBM-proponents rely, there should not be any change in abnormal stock returns if no new information reaches the market, i.e. if no changes in the VBM system take place. As the Treynor Ratio is adjusted for beta, market movements and external shocks (which are represented by beta) cannot influence the abnormal returns. Hence it is reasonable to assume that by December 2006, investors have again impounded the (maybe changed) sophistication of the VBM-system in the share price. If VBM has become more (less) sophisticated, abnormal returns should be positive (negative), or zero in case the sophistication did not change at all.

Of course, one could argue that by December 2006, investors already anticipated all changes in VBM-sophistication during the year to come based on announcements of top executives. In that case, they had impounded future expectations different from the

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<sup>11</sup> There are many VBM-subjects on which analysts and investors are knowledgeable. Nix & Wolbert (2005) describe the most common topics of the German investor relation departments. According to them, analysts and investors are informed about the key financial ratio (OBJECTIV), and can closely follow corporate strategy (STRATEGY), e.g. if the organization seeks to skim new, unsaturated markets. Market participants also understand the most important value drivers (VALUEDRV), e.g. an innovation or if the lobbyists of an organization succeed in gathering billion-Euro-subsidies from the national government for job creation measures or certain products. Just as well, analysts and investors are able to obtain quantifiable data about the executive bonus-system via public and corporate sources, e.g. outstanding stock options (BONUSTYP etc.). All of these topics concern important cash-relevant parts of the VBM-system, which help to appreciate the value of stocks. There is also information which might be classified as not publicly available and might be hard to access for analysts and investors, e.g. how value-oriented the mindset (CULTURE) of middle managers is, or how internal decision making process work at production plants (USEINT). This is also one of the reasons why this paper uses a questionnaire. Nevertheless, Nix & Wolbert (2005) find personal meetings with top executives to be the most popular instrument for listed German firms to communicate with important shareholders, while impersonal instruments like investor-newsletters are deemed to be rather unimportant for investment decisions. Therefore, a small group of important investors and top-notch analysts may be able to access this rather qualitative information. Fama (1976) states that for a market to be efficient, it has to reflect all available information. Grossman & Stiglitz (1980) point out that it does not contradict the EMH if this information is asymmetrically distributed across market participants. Therefore, gathering this time-consuming and hence costly information can pay off for the leading investors and analysts: The informed traders will outperform the noise traders in the long run (Black, 1986). It is hence not unlikely that this rather qualitative information, e.g. on CULTURE, is used by market participants for the valuation of stocks.



VBM-sophistication in December 2006. This is indeed a possible but inevitable error, manifested in the fact that the  $R^2$  will never be anywhere close to 100%. Still, there is little reason to believe that this impaired the presented results too much. First, it is not likely that investors have prominent further expectations about the willingness of top executives to implement VBM: Researchers showed that many announcements of implementations either never take place or are executed rather superficially (Anderson & Young, 1999; Krumwiede, 1998; Pricewaterhouse Coopers, 1998). Hence, there are no reasons why investors should build up expectations on the wishful thinking of top executives. Second, measuring changes in VBM-sophistication is theoretically superior to measuring levels in any case.

In table 16, two kinds of models are compared: The first kind attempts to explain the performance variables by the changes of the VBM-sophistication (as seen above in table 14). The second kind attempts to explain exactly the same performance variables with the VBM-sophistication as of end 2003. It can be observed by the  $R^2$  that *changes* explain performance better than *levels*:

	Capital market measures (CHANGES 2003-2006)		Capital market measures (LEVELS 2003)	
	SHARPE	TREYNOR	SHARPE	TREYNOR
Intercept	<b>1.635**</b>	<b>0.199**</b>	<b>1.382**</b>	− 0.048
<i>prob(t)</i>	0.000	0.000	0.000	0.817
OBJECTIV			<b>0.285†</b>	
<i>prob(t)</i>			0.081	
STRATEGY	0.256		− <b>0.362*</b>	− 0.181
<i>prob(t)</i>	0.160		0.028	0.199
VALDRV				
<i>prob(t)</i>				
BUSIMOD	− 0.290			
<i>prob(t)</i>	0.109			
QUALITY				
<i>prob(t)</i>				
CULTURE				
<i>prob(t)</i>				
USEINT				
<i>prob(t)</i>				
USEEXT	<b>0.451**</b>	<b>0.469**</b>		
<i>prob(t)</i>	0.004	0.000		
BONUSIMP				
<i>prob(t)</i>				
BONUSBAS				
<i>prob(t)</i>				
BONUSTYP				
<i>prob(t)</i>				
OTHERSYS				0.149
<i>prob(t)</i>				0.287
<b>R2</b>	24.0%	22.0%	10.2%	3.5%
<b>Adj. R2</b>	19.3%	20.4%	6.5%	1.5%
<b>p-value</b>	0.004	0.000	0.072	0.186
<b>N</b>	52	52	52	52

† p<0.1; \* p<0.05; \*\* p<0.01 (two-tailed)

Table 16: Changes in risk-adjusted stock-performance are best explained by changes in the VBM-subsystems, and not by absolute levels

Findings are as expected: The models for the Treynor Ratio and the Sharpe Ratio employing the change in VBM-sophistication from 2003 to 2006 are known from table 14. The two models explaining these ratios with levels of sophistication as of 2003 are new (the two on the right side). Compared to the models employing changes, it is remarkable that the level-models are either hardly significant (SHARPE p<0.10), or not at all (TREYNOR p>0.10). Also, the variances explained (adjusted R<sup>2s</sup>) of the level-

models are only 6.5% and 1.5% compared to the around 20% of the two change-models. This demonstrates the high relevance of the EMH for VBM research: The employment of level-models violates the EMH and hence VBM-theory. As shown above, their statistical validity is consequently inferior to the change-models employed earlier.<sup>12</sup> Hence, if this study had employed VBM-sophistication levels only, the result would be that VBM does not influence abnormal stock returns. Yet it changes in these levels are employed, it becomes apparent that about 20% of abnormal stock returns can be explained by VBM, and that VBM does improve performance.

Another point observed is that signs are flipping in the models employing levels which again would be hard to interpret (OBJECTIV and STRATEGY). These flipping signs can be first due to the fact that absolute levels of sophistication do not indicate the direction of development over the next three years following 2003. The change-models on the other hand do. Second, the correlation matrix (table 15) suggested for this particular set of organizations that changes were undertaken towards the same direction, because correlations in the correlation matrix are mostly positive. I.e. if a company raised the sophistication of the subsystem OBJECTIV, it is – in this sample – likely to raise the sophistication of STRATEGY as well. The flipping signs in the level-model for the Sharpe-ratio are therefore hard to interpret meaningfully.

Summarizing, it can be empirically observed that measurement models employing changes instead of levels in sophistication explain performance better. This is in accordance with the prior theoretical arguments of the EMH. As a result, the reader of a VBM-study should question whether levels or changes were used, as the former are more prone to oversee or misinterpret existing relationships.

## 5. What exactly drives stock returns?

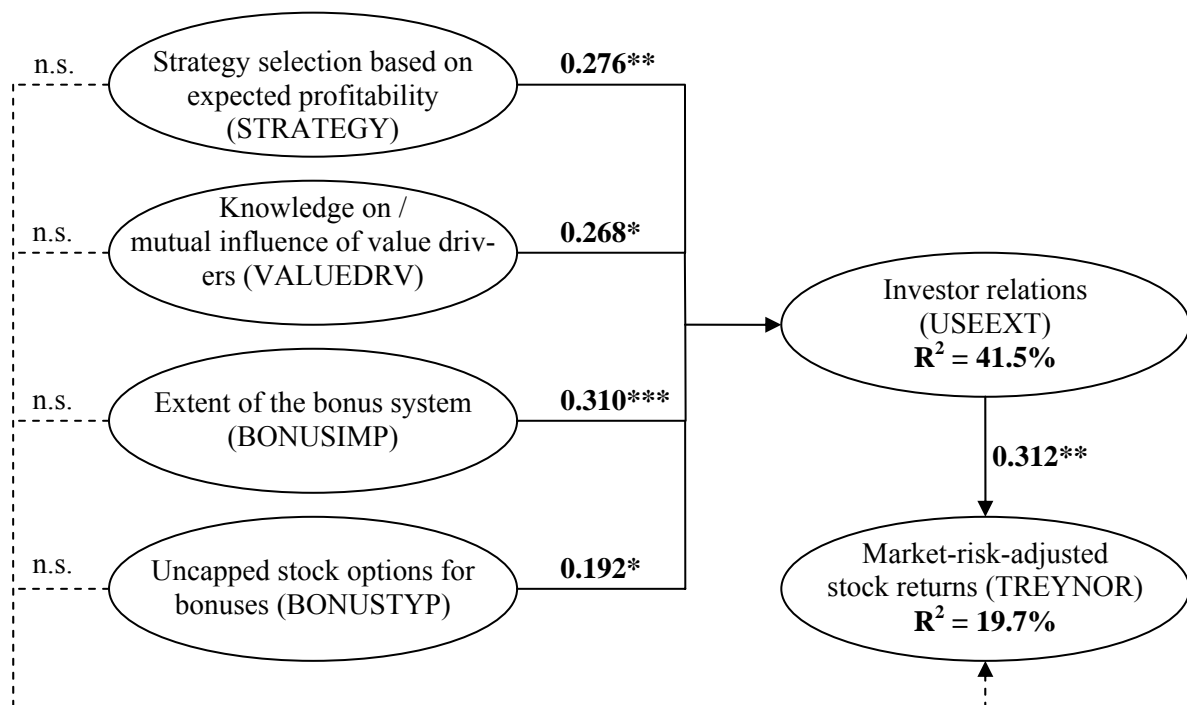
The fourth insight of this paper is that individual VBM-subsystems appear to drive stock returns. The finding from above that investor relations (USEEXT) influence abnormal returns may seem partly intuitive. Nevertheless, it is likely to be not the only factor influencing performance, given that investor relations only constitute a miniscule part of the workforce and daily value-creation of the organizations. I used structural equation modelling employing the partial least square algorithm (PLS) to explore those factors which again impact USEEXT (Wold, 1982). PLS is an ordinary-least-

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<sup>12</sup> Normally, one would expect that organizations with low VBM-sophistication in 2003 would have the largest improvements because they had more potential to improve than the 2003-best-practice-users of VBM. That would have suggested significant level-models with negative coefficients, because back in 2003, the sophistication was lower. Yet, this is not the case: The insignificant results of the level-models with their low explanatory power suggest that *any* organization can raise its VBM-sophistication, irrespective if the sophistication was low or high in 2006.

square-based procedure that minimizes the standard errors of the dependent variables. The model was calculated with the software SmartPLS version 2.0 (Ringle, Wende & Will, 2005). To estimate the equations, I used a bootstrapping procedure with 1,000 replacements. Since there was no evidence for a non-response bias for the questionnaire, 110 cases were chosen, which is the amount of HDAX companies. The selected performance variable was TREYNOR for the reasons argued above. The following model only contains the variables that exhibited significant relationships (figure 7).

Again, there are interesting insights. In this model, risk-adjusted stock returns (TREYNOR) are driven by the VBM-subsystems STRATEGY, VALUEDRV, BONUSIMP, and BONUSTYP. Yet, their influence is not significant in a direct relationship. These subsystems only positively enhance TREYNOR indirectly through improved investor relations (USEEXT). Hence, USEEXT is not only a driver itself but a mediator variable in this model. The message of these findings is that abnormal returns are driven by profound changes of VBM-sophistication within the company (STRATEGY, VALUEDRV, BONUSIMP, and BONUSTYP), but only if top management succeeds in communicating them to the external stakeholders. Overall, close to 20% of the abnormal returns (TREYNOR) can be explained by this model. This is consistent with the prior regression analysis, and again a quite satisfactory result.



\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; n.s.  $p > 0.1$  (two-tailed)

Figure 7: Abnormal returns are driven by changes in VBM-sophistication directly and indirectly (PLS model)

A further insight from the PLS-model is that the adoption of a VBM-key-financial-ratio like EVA (OBJECTIV), and the sophistication of the bonus system employing uncapped stock options (BONUSTYP) both have no significant direct effects on TREYNOR. This questions the practice of prior studies which have used these variables to classify adopters. This strengthens the prior argument that studies classifying VBM-adopters by these two categories may have under-specified their models. It is therefore possible that they could have overseen existing relationships between VBM and performance.

But can one conclude from this model that all other subsystems of VBM are not important as they are not significant in this PLS-model? Most likely not. A look at the correlation matrix of the subsystems (table 15) reveals that most subsystems correlate significantly already on a manifest level. E.g. the subsystem BUSIMOD that seems unimportant in the PLS-model exhibits a strong and significant correlation (0.604 significant at  $p < 0.001$ ) with the subsystem STRATEGY. As PLS operates with these variables on a latent level, the correlation coefficients are likely to be much higher, and multicollinearity problems arise. On a latent level, this is likely for any relationship with a coefficient above 0.4. Therefore, it is possible that the other subsystems contribute indirectly just as positively to TREYNOR as the variables listed in the model do. The other constructs may simply not become significant in the PLS-model due to multicollinearity problems.

Still, it is an interesting question why particularly these four constructs become significant. A first conjecture concerns the availability of data: Analysts and investors get publicly available information on these subsystems, e.g. from the financial statements (STRATEGY, VALUEDRV, BONUSIMP, BONUSTYP). Other statistically insignificant subsystems like BUSIMOD or CULTURE are subsystems strongly interwoven into internal processes, which cannot be observed directly. This discrepancy may be the reason why constructs related to rather internal process do not become significant. In any case, there is strong reason to believe that also the insignificant 'internal' subsystems are indispensable for the implementation of the significant subsystems: Existing research found e.g. organizational culture to be an important determinant of management systems (Henri, 2006; Baird, Harrison & Reeve, 2004; Chanchani & MacGregor, 1999; Dent, 1991; Markus & Pfeffer 1983).

A second conjecture is related to the degree of noise in case the information is available to the leading analysts and investors as argued above: These market participants

may still decide to cling to the quantifiable parts of VBM when valuing a firm. There may be some consensus how to judge if the bonus-system of an organization is state-of-the-art, e.g. instant cash-bonuses vs. stock options. The concise components determining the 'optimal' corporate culture may not be as obvious. Even if different information on this is available, it may be selected and interpreted quite differently by each market participant. Therefore, this high degree of noise can be a good reason to rely less strongly on this information for valuation purposes (Black, 1986). From the perspective of a top executive however, these 'soft' factors are nevertheless associated with an improvement of the 'hard' parts of VBM, as it can be seen in the correlation matrix (table 15). Analyst and investors may hence be able to afford ignoring these subsystems for valuation, but this does not imply that top executives can do the same for administrative purposes.

Case studies could shed further light on the necessity and interaction of these subsystems (Malmi & Ikäheimo, 2003). The causality of these issues, of course, cannot be assessed from a questionnaire. But there is reason to believe that one *cannot* conclude from the PLS-model that further subsystems are negligible.

## 6. Conclusion, limitations, and implications

This paper aimed at explaining if the implementation of VBM influences firm performance, and how the reader of such VBM-studies can judge the quality of this VBM-related research. To investigate these questions, information was gathered from top executives from 60 of the 110 largest listed companies in Germany, as well as from archival sources.

This research is subject to several limitations. Three of them are pointed out here: First, asking key-informants about complex developments in their company over several years is of course a critical matter. Nevertheless, this is an accepted practice in leading academic journals (Naranjo-Gil & Hartmann, 2007; Van der Stede, Young & Chen, 2005; Baines & Langfield-Smith, 2003; Gates, 2000; Chenhall, 1997). Second, I defined the event responsible for triggering the abnormal returns to be the changes in VBM-sophistication between 2003 and 2006. This can easily be criticized. Still, this concept is theoretically superior to the use of levels, which have been employed in diverse other studies. In addition to that, the empirical results are quite satisfactory for this event-definition in comparison to the general finance literature. Third, the relationship between changes in VBM-sophistication and performance may not be linear.

It is rather likely that benefits increase on a diminishing scale. More complex models than mine are necessary to test for this eventuality.

Despite the limitations, there are four stable mayor findings: 1) There are various ways to implement VBM. Hence, it cannot be measured by a simplified ‘implemented-or-not’-variable. 2) Both theoretically and empirically, abnormal stock returns are a superior performance measure in order to gauge benefits and costs of a VBM-implementation from the shareholders’ point of view. 3) In accordance with the EMH, changes in VBM-sophistication explain performance better than static levels of VBM-sophistication. 4) Sophisticated VBM implementers *do* outperform less sophisticated implementers. Abnormal returns are driven by five VBM-subsystems. Indirect effects stem from four sources: A strategy selecting projects rigorously based on expected profitability, an excellent understanding of executives of the value drivers as well as their interaction effects, an extensive system of variable salary for all employees, and the company-wide implementation of bonuses employing stock(-options). Investor relations are the fifth factor. It has a direct influence on stock returns, and is a mediator variable as well. This finding does yet *not* proclaim that other factors like a value-oriented culture are unimportant.

For top executives, this research has two major implications:

1. Increasing VBM-sophistication improves performance. So assess your VBM-sophistication and identify possible implementation gaps. This study showed that stock returns are driven by five of 11 VBM-subsystems (USEEXT, STRATEGY, VALUEDRV, BONUSIMP, BONUSTYP). Yet, do not ignore the remaining, rather qualitative subsystems like culture and information quality: they are significantly correlated with the ones driving your stock return. Analysts may ignore them when valuing your company, but your executives do need them for managerial purposes.
2. Findings on the performance effects of VBM-systems should always be challenged in three ways: Are VBM-subsystems exhaustively investigated? What type of performance (abnormal returns) does the study refer to? How are returns and the VBM-system logically connected (i.e. the use of ‘changes’)? This will reveal quickly how much consideration that research design needs to be given.

## 7. Appendix

Figure 8: The questionnaire to measure VBM-sophistication

Items were generally measured with 7-point-Likert-scales (three exceptions are specified). The statistical results are satisfactory: All constructs were adequately identified, with Cronbach's (1951) alphas ( $\alpha$ ) exceeding the 0.60 level with one exception in 2006 (average 0.75). For the factor analysis, statistics for the Bartlett's test of sphericity are significant at  $p < 0.001$  for all factors but one (significant at  $p < 0.01$ ), and Kaiser-Meyer-Olkin measures of sampling adequacy were at least 0.50 for all factors (average: 0.66). The average variance explained by the constructs is 55%. Non-response on single questions that were necessary to calculate factor scores were imputed with the statistical software NORM. This is the standard procedure for questionnaire research (cf. Schafer 1999). '(R)' stands for reverse coded items. Reported values are for 2006 (2003 in squared parentheses):

**OBJECTIV:** ( $\alpha = 0.60$  [0.64], Eigenvalue = 2.004 [2.144], % of variance = 40% [43%])

(1) The final goal of our company is the long-term maximization of company value. (2) Does a key financial ratio exist in your company? Please specify! [Measures if the key financial ratio does incorporate (rated '3') or does not incorporate (rated '2') the cost of capital, as well as the absence of such a ratio (rated '1'), e.g. if multiple ratios are maximized simultaneously.]. (3) Our Key Financial Ratio is designed in a way that ...it exhaustively represents the value creation of the past business year. (4) ...technically, it can be utilized in every area of our company for planning purposes. (5) ...long-term (3-5 years), a change in our Key Financial Ratio correlates very strongly with our stock market performance.

**STRATEGY:** ( $\alpha = 0.79$  [0.75], Eigenvalue = 2.757 [2.508], % of variance = 55% [50%])

(1) Within strategy development (analysis, modelling, valuation, and selection), our top management initiates the following distribution of resources: ...Maintenance of existing resources in business units which currently yield returns above the hurdle rate. (2) ...Allocation of new resources to business units which are likely to yield returns above the hurdle rate in the future. (3) ...Divestment of resources from business units which currently or in the immediate future yield returns below the hurdle rate. (4) Our top management initiates the adaptation of ...the capital structure according to strategy. (5) ...the organizational structure according to strategy.

**VALUEDRV:** ( $\alpha = 0.85$  [0.83], Eigenvalue = 3.691 [3.552], % of variance = 53% [51%])

(1) The following information is supplied to top- and middle management for their respective areas of authority: ...Forecasted duration of every investment project. (2) ...Invested capital. (3) ...Specific cost of capital (e.g. for business areas of investment projects). (4) ...Influence of financial value drivers on one another. (5) For every financial value driver, non-financial value drivers are identified. (6) The impact of every non-financial value driver on any other value drivers has been identified. (7) If significant changes occur in the environment (e.g. in strategy or the general market), non-financial value drivers are adjusted.

**BUSIMOD:** ( $\alpha = 0.84$  [0.85], Eigenvalue = 4.518 [4.244], % of variance = 38% [35%])

(1) The following statements apply for all KPIs of your company (Key Performance Indicators): ...Based on the value driver analysis, those KPIs are selected which influence the Key Financial Ratio the most. (2) ...If significant changes occur in our value drivers, KPIs are adjusted, added or removed. (3) ...For every KPI (e.g. customer satisfaction), actions plans are identified (e.g. increase the number of customer-visits per quarter). (4) ...If significant changes occur in our KPIs, the related actions plans of all relevant employees are adjusted. (5) All employees possess the necessary decision-rights to resolve non-standard-problems on the spot (empowerment). (6) The following statements apply for all set targets of your company ...All targets are set on the basis of KPIs. (7) ...If targets are based on accounting data, the relevant data is adjusted to the context, e.g. revision of accruals. (8) ...All targets are set relative to benchmarks. (9) ...Evaluation considers if set targets are influenced by unforeseen factors. (10) ...Targets provide consistent links between the short-term performance of each business unit and the long term strategies of the business unit. (11) ...Targets link together all



business unit activities / projects to the Key Financial Ratio. (12) ...Targets show how activities of each business unit / project affect other units / projects within the organization.

**QUALITY:** ( $\alpha = 0.77 [0.79]$ , Eigenvalue = 2.372 [2.456], % of variance = 59% [61%])

(1) The recipients of KPIs could explain them to a third party without any struggle. (2) It can be relied upon 100% that all KPIs are computed correctly. (3) Further decision-relevant information is provided alongside the KPIs (justifications, forecasts, tables, figures or explanatory text). (4) Requested KPIs arrive immediately upon request.

**CULTURE:** ( $\alpha = 0.71 [0.84]$ , Eigenvalue = 2.450 [3.045], % of variance = 49% [61%])

(1) Decision makers from all levels are on the opinion that ... the final goal of our company should be the maximization of company value. (2) ...they were sufficiently informed about VBM by trainings. (3) ...everyone is obliged to increase company value according to his possibilities. (4) ...resources need to be employed productively all the time; else our company destroys its own equity. (5) ...risky investment projects require a higher rate of return than secure investment projects.

**USEINT:** ( $\alpha = 0.87 [0.91]$ , Eigenvalue = 3.694 [3.746], % of variance = 62% [75%])

(1) Value-oriented information is frequently used to ...control progress and achievements of objectives. This applies to the entire top management (2) ...critically scrutinize the ongoing validity of the assumptions made during the planning process. This applies to the entire top management. (3) ...convince others of one's own opinion. This applies to the entire top management. (4) ...control progress and achievements of objectives. This applies to the entire middle management. (5) ...critically scrutinize the ongoing validity of the assumptions made during the planning process. This applies to the entire middle management. (6) ...convince others of one's own opinion. This applies to the entire middle management.

**USEEXT:** ( $\alpha = 0.63 [0.79]$ , Eigenvalue = 2.340 [2.412], % of variance = 39% [60%])

(1) Our investor relations argue primarily based on information with a reference to the VBM-system to communicate with investors and analysts (e.g. about results or strategic planning). (2) Our investor relations use the feedback of investors and analysts to critically scrutinize the ongoing validity of assumptions made by our top management for the planning process. (3) Our top management argues primarily based on information with a reference to the VBM-system to communicate with the members of the supervisory board (e.g. about results or strategic planning). (4) Our top management uses the feedback of the supervisory board to critically scrutinize the ongoing validity of their own assumptions for the planning process.

**BONUSIMP:** ( $\alpha = 0.57 [0.57]$ , Eigenvalue = 1.741 [2.236], % of variance = 53% [56%])

(1) The participation in the bonus program includes all members of top management. (2) The participation in the bonus program includes all members of middle management. (3) The target bonus in terms of fixed salary is approximately... [Top management] – please specify in %. (4) The target bonus in terms of fixed salary is approximately... [Middle management] – please specify in %.

**BONUSBAS:** ( $\alpha = 0.90 [0.88]$ , Eigenvalue = 1.815 [1.783], % of variance = 90% [89%])

(1) For the calculation of the bonuses, we use the following assessment bases ...Key Performance Indicators (Top management) (2) ...Key Performance Indicators (Middle management).

**BONUSTYP:** ( $\alpha = 0.69 [0.57]$ , Eigenvalue = 2.146 [1.786], % of variance = 53% [45%])

(1) Bonuses are composed nearly completely of stock(options) [Top Management]. (2) Bonuses are composed nearly completely of stock(options) [Middle Management]. (3) Caps exist for all bonuses (R) [Top management]. (4) Caps exist for all bonuses (R) [Middle management].

**RAISE:** ( $\alpha = 0.73$ , Eigenvalue = 1.570, % of variance = 78%)

(1) VBM led to an increase in our market value during the last three years. (2) Even if one accounts for all costs incurred by the VBM-system during the last three years (e.g. external consultants, time), its employment paid off.

Figure 9: List of all 110 HDAX-companies as of 31 December 2006

1. Aareal Bank AG	42. Fresenius AG	77. Pfeiffer Vacuum
2. adidas AG	43. Fresenius Medical Care	Technology AG
3. ADVA AG Optical	AG & Co. KGaA	78. Pfeleiderer AG
Networking	44. GAGFAH S.A.	79. Praktiker Bau- und
4. Aixtron AG	45. GEA Group Aktienge-	Heimwerkermärkte
5. Allianz SE	sellschaft	AG
6. Altana AG	46. GPC Biotech AG	80. Premiere AG
7. AMB Generali Holding	47. Hannover Rückversi-	81. ProSiebenSat.1 Media
AG	cherung AG	AG
8. AT&S Austria Tech. &	48. HeidelbergCement AG	82. Puma AG
System. AG	49. Heidelberger Druck-	83. Q-CELLS AG
9. AWD Holding AG	maschinen AG	84. QIAGEN N.V.
10. BASF AG	50. Henkel KGaA	85. QSC AG
11. Bay. Hypovereinsbank	51. HOCHTIEF AG	86. Rheinmetall AG
AG	52. Hypo Real Estate Hold-	87. RHÖN-KLINIKUM
12. Bayer AG	ing AG	AG
13. BB Biotech AG	53. IDS Scheer AG	88. Rofin-Sinar Tech-
14. Bechtle AG	54. IKB Dt. Industriebank	nologies Inc.
15. Beiersdorf AG	AG	89. RWE AG
16. Bilfinger Berger AG	55. Infineon Technologies	90. Salzgitter AG
17. BMW AG	AG	91. SAP AG
18. Boss (Hugo) AG	56. IVG Immobilien AG	92. Schwarz Pharma AG
19. Celesio AG	57. IWKA AG	93. SGL Carbon AG
20. Commerzbank AG	58. Jenoptik AG	94. Siemens AG
21. Conergy AG	59. Kali + Salz AG	95. Singulus Technologies
22. Continental AG	60. Karstadt Quelle AG	AG
23. DaimlerChrysler AG	61. Kontron AG	96. Software AG
24. DEPFA BANK plc	62. Krones AG	97. SolarWorld AG
25. Deutsche Bank AG	63. LANXESS AG	98. SOLON AG für So-
26. Deutsche Börse AG	64. Leoni AG	larteknik
27. Deutsche EuroShop AG	65. Linde AG	99. STADA Arzneimittel
28. Deutsche Lufthansa AG	66. MAN AG St	AG
29. Deutsche Post AG	67. Merck KGaA	100. Südzucker AG
30. Deutsche Postbank AG	68. METRO AG	101. techem AG
31. Deutsche Telekom AG	69. MLP AG	102. TELE ATLAS N. V.
32. Deutz AG	70. mobilcom AG	103. ThyssenKrupp AG
33. Douglas Holding AG	71. MorphoSys AG	104. TUI AG
34. Drägerwerk AG	72. MTU Aero Engines	105. United Internet AG
35. E.ON AG	Holding AG	106. Volkswagen AG
36. EADS N.V.	73. Münchener Rück AG	107. Vossloh AG
37. EPCOS AG	74. Norddeutsche Affinerie	108. Wacker Chemie AG
38. ErSol Solar Energy AG	AG	109. WINCOR NIXDORF
39. EVOTEC AG	75. Nordex AG	AG
40. Fraport AG	76. PATRIZIA Immobilien	110. Wirecard AG
41. freenet.de AG	AG	

Table 17: Information on the responding 60 HDAX-companies as of 31 December 2006

<b>Employees</b>		<b>Sales (mill. EUR)</b>		<b>Market capitalization (mill. EUR)</b>		<b>Industry (1-digit-SIC)</b>		<b>Respondents (by function)</b>	
<500	2	<500	2	<500	8	Manufacturing	33	Accounting,	34
<1,000	7	<1,000	13	<1,000	7	Finance,	8	Control &	
<5,000	11	<5,000	18	<5,000	21	insurance, real		Finance	
<10,000	10	<10,000	7	<10,000	6	estate		Investor	13
<50,000	14	<50,000	15	<50,000	14	Services	7	Relations	
<100,000	8	<100,000	4	<100,000	4	Trade	6	Corporate	8
<250,000	4	<250,000	1			Transportation &	6	Development	
<500,000	4					public utilities		Executive Board	5
<b>n =</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>		<b>60</b>		<b>60</b>

Figure 10: Calculation of performance variables

Perceptive measures of success (RAISE) stemmed from the questionnaire. Capital market data and accounting data came from Thomson Financial Datastream, Hoppenstedt Company Database, and corporate audited financial statements. Values are calculated for each company from 31 Dec 2003 until 31 Dec 2006. Since not all companies were publicly traded in 2003, capital market data was only available for 52 companies. Perceptive measures and accounting figures were available for the entire 60 firms during the three-year period.

The Sharpe Ratio and the Treynor Ratio were calculated based on monthly returns. Beta was calculated with daily returns. As the relevant market portfolio, the Datastream-500-index for Germany was chosen. The risk free rate was estimated at 5.0% based on the relevant 3-year German government bonds.

**RAISE** (Cronbach's alpha = 0.725, Eigenvalue = 1.570, % of variance explained = 78%):

(1) VBM led to an increase in our market value during the last three years. (2) Even if one accounts for all costs incurred by the VBM-system during the last three years (e.g. external consultants, time), its employment paid off.

**TSR**

$$TSR = \frac{TSR_{29Dec2006}}{TSR_{31Dec2003}} - 1$$

**SHARPE**

$$SHARPE = \frac{\bar{D}}{\sigma_D}$$

with

$$\bar{D} = \frac{1}{T} \sum_{t=1}^T (TSR_t - r_t^f)$$

and

$$\sigma_D = \sqrt{\frac{\sum_{t=1}^T (D_t - \bar{D})^2}{T - 1}}$$

**TREYNOR**

$$TREYNOR = \frac{\bar{D}}{\beta_D}$$

with

$$\bar{D} = \frac{1}{T} \sum_{t=1}^T (TSR_t - r_t^f)$$

and

$$\beta_D = \frac{Cov(TSR, IndexDatastream)}{Var(IndexDatastream)}$$

**ROI (Return on investment)**

$$ROI = \frac{\frac{1}{T} \sum_{t=3}^{2006} EBIT}{\frac{1}{T} \sum_{t=4}^{2006} TotalAssets}$$

**ROS (Return on sales)**

$$ROS = \frac{\frac{1}{T} \sum_{t=3}^{2006} EBIT}{\frac{1}{T} \sum_{t=3}^{2006} Sales}$$

**ROE (Return on equity [book values])**

$$ROE = \frac{\frac{1}{T} \sum_{t=3}^{2006} EarningsAfterTaxes}{\frac{1}{T} \sum_{t=4}^{2006} Equity(book)}$$

## **E Summary**

### **1. General conclusions**

The purpose of this dissertation is the investigation of the determinants and performance effects of VBM. A contribution to the existing literature is made from three different angles: An analysis of current research gaps (*objective 1*), as well as consequent empirical investigations of the determinants (*objective 2*) and performance effects (*objective 3*) of VBM. The results can be summarized as follows:

*Objective 1:* The analysis of existing VBM-studies leads to an improved understanding of existing research, as well as to the development of guidelines for improved hypothesis testing. The VBM-literature as a whole cannot definitely provide an answer if and how VBM improves performance because most studies exhibit severe conceptual and methodological flaws in four areas. First, neither a common definition nor established constructs exist for the measurement of VBM itself (independent variables). Second, the definition of performance effects (dependent variables) varies largely among the studies, with perceptive measures being the dominant choice. This is more than a little imperfection as the main promise of VBM is to increase corporate value ‘objectively’. Third, contextual variables (moderating and mediating variables) influencing performance effects are widely neglected, despite the fact that related research on other MAS has found this an additional source of explanation for performance. Fourth, the methodology to associate these three types of variables reveals deficiencies, the most common being the correct match of the event of a VBM implementation and the causally linked changes in performance.

Based on these findings, the first research question (RQ) of the first paper attempts to identify the most relevant performance studies on SPMS. Factor analysis and cluster analysis suggest an interpretation of four different study types: First, there are the ‘Pragmatic Classifiers’ with deficiencies in the measurement of both the VBM-system and the performance variable. The second group of ‘Correlation Testers’ is quite sophisticated in measuring performance, but has potential for improvement in determining the sophistication of a VBM-system. The other way around, the third group of ‘System Analysts’ demonstrates a profound understanding of VBM-sophistication, but does not relate these findings to financial performance. The fourth group containing only four studies is named ‘Performance Measurers’, and encloses the most relevant performance studies for VBM. Consequently, the paper attempts to understand the

verdict of the literature on the performance effects of VBM (RQ2), i.e. based on the researchers of the fourth cluster who adhere to the basic theoretical requirements of VBM-proponents and performance studies: Despite the fact that these four all report significantly positive effects of VBM, it has to be borne in mind that they also point out some mixed results, and represent overall a miniscule part of all identified 120 studies. The identified research gaps (RQ3) are dealt with by objective 2 and 3.

*Objective 2:* Building on those previous findings, the second paper examines contextual factors determining the sophistication of VBM-systems. Using a selection-approach, associations between different SPMS-sophistication and several organizational and environmental factors are investigated. First, it is possible to draft 10 statistically feasible constructs describing different VBM-sophistication across organizations. Data was collected through questionnaires and interviews with top executives from companies in the largest German stock-index (HDAX), as well as from commercial databases and audited financial statements. Second, it can be shown that, under the assumption of market equilibrium, differences across companies are not arbitrary: Organizations choose different VBM-sophistication in order to perform optimally in their relevant environment. Regression models and MANOVA suggest that VBM-sophistication is associated with the pursuit of a defender strategy, organizational interdependence, capital intensity, low environmental uncertainty, and past financial crises. This implies that organizations may not deem a full implementation of VBM equally beneficial under certain circumstances.

*Objective 3:* Based on the findings of part B and a similar dataset as in part C, I found that VBM does increase corporate performance in terms of abnormal stock returns. First, there is evidence that stock returns, accounting data, and perceptual measures are unrelated and cannot serve as substitutes for each other. Hence, only stock returns need to be investigated since they are the major performance definition of VBM-proponents. Second, changes in performance are better explained theoretically and empirically by *changes* in VBM-sophistication – not absolute *levels*. Third, increases in VBM-sophistication do improve performance. Indirect effects stem from four sources: A strategy selecting projects rigorously based on expected profitability; an excellent understanding of executives of the value drivers as well as their interaction effects; the company-wide implementation of bonuses including high variable pay for employees at all levels; and the employment of stock(-options). Investor relations is both a mediator variable as well as the only direct driver of for abnormal stock returns.

Most likely, these variables are drivers of stock performance because investors can get publicly available, quantifiable data on them. This, however, may not lead the reader to the conclusion that other VBM-subsystems like a value-based culture (CULTURE) would be unimportant: CULTURE exhibits strong and significant correlations with the identified value-driving VBM-subsystems. One has to account for the possibility that an implementation of these latter VBM-subsystems relating e.g. to compensation may not be possible without a strong value-oriented mindset of all employees (CULTURE).

I need to clarify an issue relating to the overall understanding of this dissertation: How can I assume optimal performance for *all* organizations in part C and then use a similar dataset to measure *differences* in performance among the same organizations in part D? This pseudo-contradiction is rooted in the different perspectives of these two parts. Part C is an ex-ante analysis of VBM assuming equilibrium without the consideration of noisy information, taking the perspective of top-executives, and employing static data. Part D considers noise in between two equilibriums, is a dynamic analysis of VBM over time, and assumes the ex-post perspective of investors. I will explain why performance does (not) matter depending on each of the three assumptions:

*NOISE*: It is a fundamental and critical question how abnormal returns can exist in a semi-strong efficient market. This paradox is virtually never addressed in the accounting literature. Black (1986, p. 531) depicts the problem of noise:

“A person with information or insights about individual firms will want to trade, but will realize that only another person with information or insights will take the other side of the trade. Taking the other side’s information into account, is it still worth trading? From the point of view of someone who knows what both the traders know, one side or the other must be making a mistake.”

Paulo (2002, p. 500) relates this fundamental critique to VBM:

“In an EMH-world, where assets plot on the Security Market Line (SML) or Capital Market Line (CML), and asset prices (market prices) correspond to asset values (intrinsic values), it is not possible to meaningfully talk about measures as EVA. On the SML and CML, by definition net present value (NPV) equals zero and the required rate of return (RRR) or cost of capital equals the internal rate of return (IRR), in which case EVA must equal zero. Since EVA measures the difference be-

tween RRR and IRR, in an EMH-world EVA is attempting to measure a quantum that by definition cannot exist, except perhaps as noise.”

Black (1986) and Paulo (2002) basically describe the EMH-world of part C where performance is irrelevant because there is optimal fit between VBM-sophistication and the relevant context of the organizations. Top executives achieve this equilibrium because information on the optimal contingency fit is clearly identifiable as well as costless for them. These assumptions are not too far fetched: There is not likely to be any market participant having better information on the optimal contingency fit. Top executives do not have to rely solely on the publicly available information (semi-strong efficient market) but also have on average access to all existing insider information (strong efficient market; Fama, 1970). Based on the pre-interviews with the top executives and the statistical test for application experience (EXPIRNCE) in part C, the organizations deem themselves in an equilibrium, i.e. no restructuring of the VBM-systems was planned.

As already pointed out in the part C, it may well be that even if top executives choose VBM-sophistication to the best of their knowledge (ex-ante), years later it could turn out that some of the information they based their decisions on was noisy (ex-post). If there is noise in that sample, it results in a lower variance explained in the regression models and the MANOVA in part C. Yet, in a static equilibrium situation, this does not have an effect on the interpretation of results: By the time the top executives make the decision on VBM-sophistication, they cannot tell noise and correct information apart themselves. Hence, I cannot know either which amount of the unexplained variance is due to noise and which to measurement error. As part C is a point-in-time observation, there is no possibility for the noise to vanish or for the correct information to materialize.

Part D on the other hand can deal with differences in performance: The different *realized* market returns over three years are a noisy ex-post measure of the ex-ante risk-adjusted intrinsic returns, i.e. those *expected* by top-executives when they chose the optimal fit of VBM-sophistication and relevant context in 2003 (Fama, 1991). Therefore, part D assumes the exact same EMH-world. Yet this time, it is explored with the assumption that investors adjust their expectations about the assets until 2006, which they had – in their own average opinion – correctly priced the by the end of 2003.<sup>13</sup>

Theoretically, the costless information in this EMH-world does not allow for differences in expected risk-adjusted returns (TREYNOR; SHARPE) as noted by Grossman

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<sup>13</sup> The selection of this date was guided by the ability of the key informants to remember the VBM-sophistication investigated by the questionnaire – but, of course, is in effect still arbitrary.



& Stiglitz (1980). Nonetheless, ex-post returns deviate from this theoretical ex-ante equilibrium, causing differences in performance: As noted by Paulo (2002), one explanation for this could be that some traders rely on noisy information, e.g. they believed in 2003 that one organization in the sample would increase its VBM-sophistication until 2006, which it may not have done. Due to the existence of some uninformed investors (i.e. noise traders), Grossman & Stiglitz (1980) remark that it pays off for the remaining investors to acquire better but costly information, e.g. on the changes in VBM-sophistication through investor relations as described in part D. Over time, promises of top-executives translate into increased cash-flows (information) or they do not (noise). The differences in performance over the three-year time frame from 2003 until 2006 can be interpreted in a way that noise traders as a group lose money to the better informed traders, and that thereby the intrinsic values of the stocks converge with the market values of stocks (Black, 1986). No differences in performance would be interpreted by this theory that noise was irrelevant, e.g. as in part C.

Assuming equilibrium condition at the start of a research period is inevitable for any performance study – regardless of capital markets theory – as discussed in part B: If a researcher wants to judge if an ROI of e.g. 5.37% is an appropriate return for an organization over a year, the researcher needs to define a benchmark (equilibrium condition) against which this performance is measured, e.g. the rest of the industry or the prior performance of this organization.

*PERSPECTIVE:* Part C explores the decisions of top executives, i.e. which VBM-sophistication is chosen by them with respect to frequently mentioned contingency factors. These executives seem to believe at that point in time that – given their relevant environment – this VBM-sophistication equips them well in order to aim for optimal performance. As explained in part C, this does not mean that they will achieve this goal in the future. It is only assumed that these decision makers are reasonably qualified for their positions, and that they make the decisions to the best of their knowledge. Performance in their terms primarily means maximizing the *intrinsic* value of the company, while investors determine the *market* value by deciding on the demand for the stocks. Testing for performance does hence not make sense in the model of part C: First, in an EMH-world, intrinsic and market values will converge only over longer time frames (Black, 1986). Since part C is a point-in-time observation, it is not possible to observe this long-term process. Second, the intrinsic values of the organizations are not publicly available information which I could therefore not use. Third, if I wanted to test for performance, I would have to propose the hypothesis that deviation

from the optimal fit between context and VBM-sophistication leads to weaker performance. But for this, I would have to know *ex-ante* what the optimal fit for each organization is – which is what I am actually trying to explore.

Part D adopts the perspective of investors and analyzes their choices of assets over a time period. VBM-proponents claim that investors are willing to pay a premium (abnormal return) for organizations improving their value-oriented governance. This hypothesis is tested. Part D does not explore the reasons *why* the top executives choose to increase sophistication, and contingency factors are not part of the model. It can only be empirically observed that they choose to do so on average, and that those who do reap abnormal profits off that. There could be several reasons why HDAX companies improve their sophistication from 2003 to 2006: Maybe executives felt VBM to be under-implemented in 2003. Maybe contingency factors changed over time and made an adjustment necessary. Nevertheless, part D is written from the perspective of investors, so it does not allow conclusions on the motives of top executives.

*DATA:* Although the used VBM-constructs use the same items, the final data sets are different: Part C is a *static* analysis, where levels of VBM-sophistication are measured as of December 2006. Part D is a *dynamic* analysis, where changes in VBM sophistication are assessed between 2003 and 2006. I.e. part D starts with the dataset of part C (as of 2006), then conducts the same analysis for year 2003, and finally uses the arithmetic *difference* between the dataset of 2006 (paper 2) and 2003 for its statistical analyses.

Based on the presumptions of VBM-proponents, I argued in part B that it is hard to associate current capacities as in part C with historical performance outcomes: With respect to stock returns, the market has – on average – impounded all publicly available information (and noise) into the stock price, implying that no further information is available to predict future stock movements. Both informed investors as well as noise traders have agreed on the closing stock price on that particular day in December 2006. Hence, the data on VBM in part C can neither test the correct pricing of past stock returns, nor of those in the future, because no new information had arrived in the models of part C. The arrival of new information is however a precondition for differences in performance. Therefore, a performance test is not relevant for the analysis in part C if the EMH-world of VBM-proponents is assumed.

Quite contrary, part D offers this possibility of a test in an EMH-world. The VBM data in part D describes the event of a change in the VBM-subsystems over three years, not a static snapshot on one point in time. Consistent with the assumptions in part C, in-

vestors valuing the stock in 2003 based their expectations on all publicly available information. Market efficiency does however also allow for noisy information: E.g. it is not clear if the value-based strategies of certain organizations fulfill the performance prognoses executives gave in 2003. As parts of the information of 2003 materialize until 2006, the superiorly informed investors gain abnormal returns. Badly informed noise traders on the other hand lose money. This causes stock returns to change. These ex-post differences in performance based on noise exist *because* – and not *despite* – the market is efficient, i.e. market participants impound newly arriving information into stock prices. This advanced model is yet not applicable to the static data set of part C, because that model contains no new information.

## 2. General limitations

This dissertation is subject to several general limitations. They are rooted in the theories used for the interpretation of the data. I will comment on the ‘joint hypothesis’ dilemma of the CAPM, the chosen ‘positivistic’ perspective of this study, and the source and choice of data for this investigation:

The first major limitation is the reliance on the CAPM and the EMH when measuring performance in part D. Continuing the discussion of the last chapter, the originator of the EMH himself notes (Fama, 1991, p. 1575, 1589, 1590, brackets added):

“Ambiguity about information and trading costs [‘noise’] is not, however, the main obstacle to inferences about market efficiency. The joint-hypothesis problem is more serious. Thus, market efficiency per se is not testable. It must be tested jointly with some model of equilibrium, an asset-pricing model. [...] Depending on the emphasis desired, one can say that efficiency must be tested conditional on an asset-pricing model or that asset-pricing models are tested conditional on efficiency [...] The SLB [Sharpe, Lintner and Black, i.e. the CAPM] model is just a model and so surely false.”

Since criticism in the finance literature on the CAPM initiated by Roll (1977) has grown to a size beyond the scope of this dissertation, I only infer some findings onto this investigation: I can actually not tell whether VBM-sophistication leads to higher performance by using the CAPM. The CAPM assumes an efficient market where the returns of all assets are priced according to their risk. Any significant empirical results on the CAPM – as in this dissertation – can be interpreted in two ways. The way I did

it is that the stocks of the HDAX-companies have been priced correctly and market efficiency is at least semi-strong, i.e. more VBM leads to higher returns. For this, I need to assume that the Datastream500 portfolio represents all existing assets in this world (the ‘market’) – which, of course, it does not! Hence, results could just as well be interpreted the other way around: Assuming that the ‘market’ always prices all assets correctly, I have found the Datastream500 portfolio to be a perfect simulacrum for the entire ‘market’. Roll (1977) shows that correct pricing and market efficiency are two sides of the same medal, and are hence not independently testable with empirical data.

An instant reaction would be not to use the CAPM, which would yet pose further problems. First, there are few alternative in the literature, who are critical as well; and all of them use the CAPM as a benchmark (Fama, 1991). Second, VBM-proponents hypothesize that VBM is related to abnormal stock returns. Therefore, researchers challenging this hypothesis need to use the CAPM, else they do not test proposed claim correctly. Nevertheless, testing their hypothesis *correctly* does not imply that the *correct* hypothesis has been tested: For a considerable amount of time, researchers challenge the position of risk being the only determinant of returns. They deliver empirical evidence on other drivers of stock returns, e.g. price-to-earning-ratios or company size, which are irrelevant in the CAPM-world (Fama, 1991; Banz, 1981; Basu, 1977).

Second, I assume that organizations only have a choice in their degree of value-orientation. This philosophy is inherent to the ‘positivistic perspective’ on accounting, in this case contingency theory. Alternatively, this data could be interpreted from a ‘critical perspective’ on accounting. One example: VBM alias ‘shareholder value management’ favors the wealth of the shareholders and has been developed – harshly said – to enchain autocratic executives. While, of course, the increase in shareholder wealth should be aligned with the increase of executive wealth, the utility function of executives certainly incorporates other goals than their salary. Executives could also strive for leisure time, maximizing power, or their personal reputation under the disguise of VBM (Simons, 1994). If they act upon this and exert their ‘power over accounting’ (Wickramasinghe, 2006), this may happen possibly to the detriment of the shareholders. In that case, the assumption of aiming for optimal economic performance is not justifiable. Drawing upon this allegation, the prior regression analyses in part C show significant relationships between CFO-characteristics / CFO-changes and VBM-sophistication. As these factors add additional explanatory power to the model

besides the more economics-related contingency variables, I could have expanded or changed this genuine positivistic perspective.

The third major limitation is the use of data from key informants and simplified measurement of variables throughout this thesis. I described that many tests common in academia have been conducted to reduce related biases. Still, it remains an open question how robust the results are to common sense. I always use one key informant per company, and even if I used 100, it is hard to imagine that they would possess the mental capability to judge an entire organization: Some of the companies in the survey have around 500.000 employees. One may be able to estimate the average variable pay of middle management because figures are available. But the reader has to form an independent opinion on how one CFO can judge the mindset of half a million people in terms of value-based culture.

Closely related to this as well as to the second limitation, I sketch e.g. strategy, financial crises, or performance by single ratios like the market-to-book ratio, a CFO-change, or the Treynor ratio. Even though there is a large consensus among academics that these simple ratios measure the complexity of these phenomena, one has to bear in mind that they are only social constructs of a ‘hyperreality’ (Macintosh et al., 2000). They are biased because I explicitly *select* them to be a simulacrum of the described phenomena: A prospector strategy – however one likes to define it – is not likely to be exclusively captured by a simplistic market-to-book ratio; it could also be measured quite differently. Consequently, it remains questionable if the significant statistical relationships represents what they intend to measure. Ross, Westerfield & Jaffe (2002, p. 300) allude to this problem of empirical research with a sarcastic comment:

“[...] if you search long enough and have enough choices, you will find something even if it is not really there. It’s a bit like staring at clouds. After a while you will see clouds that look like anything you want, clowns, bears, or whatever, but all you are really doing is data mining.”

### **3. General implications for practice and future research**

This dissertation contains several implications for practitioners. A first implication is that any study claiming VBM to be a complete success or a failure should be interpreted with caution. Based on the investigation of the prior literature, it seems save to say that sophisticated research generally includes many ‘ifs’ and ‘buts’. There are also many strong, unambiguous statements celebrating or devastating VBM or its single components like EVA or the BSC. I found few of them beneficial to read because the

research design to obtain these results deviates from the current state-of-the-art, and variable measurement is inclined to be far-fetched. Moreover, it is nearly too obvious to mention that readers should analyze the motivation of the authors of such studies to interpret their results in an appropriate manner.

A second implication is that the way VBM is implemented does seem to depend on the environment surrounding the organization. Despite the fact that I could confirm the relevance of five popular factors for this sample, there may be more – or even different ones – for other companies. The important message is that the one-size-fits-all-VBM as suggested by many best-seller-authors does not exist. I tend to encourage managers to trust their gut-feeling about the optimal VBM-sophistication. Often, there is resistance against a full implementation of any MAS, be it unpredictability of the future, stakeholder conflicts, or corporate culture and politics. The investigation confirms prior research that it may be fruitful to analyze these issues in detail before determining the desired sophistication of VBM. Without getting into the depth of part C again, it appears that the optimal VBM-implementation is not necessarily the full implementation.

The third implication is that achieving this desired VBM-sophistication seems to be related to improved performance. This finding is reinforcing to those contemplating to increase the sophistication of their VBM-system. First, this dissertation is the first work that tests the performance-hypothesis for a full-fledged VBM-system applying an event-study methodology with abnormal returns. It takes a holistic view, which is a novelty in this literature stream. Prior to this work, other studies have only tested for the relationship of distinct VBM-subsystems and performance. Second, these results have been obtained by cooperating with the top executives of the largest listed organizations in Germany. They have provided significant insights into the way organizations implement VBM today. Hence, as this study is based on the view of high-ranked executives, its implications should be relevant for any of their colleagues.

There are further research areas which have not been addressed in the individual papers. First, this stream of research would profit from a holistic perspective of VBM, performance, and its contingency factors. Future studies applying empirical, quantitative methods could extend the ‘selection approach’ to a ‘systems approach’ and incorporate corporate performance into the contingency analysis. Due to the problems of circular reasoning referred to in the second paper (i.e. determining the optimal VBM-sophistication and the optimal fit with the environment at the same time), I could not

conduct such a study. The problem of circular reasoning would, however, be alleviated for any new sample if the findings of this dissertation are taken as a point of reference. Second, this study found a positive relationship between performance and increasing VBM-sophistication. This does not necessarily imply that this function will have a positive slope under any circumstances. It may be possible that e.g. VBM has no effect in early stages of its adoption. Alternatively, it could be possible that there is less room for improvement for mature VBM-systems, and that any increase in sophistication is an over-implementation causing stock returns to decrease. Future studies could take a closer look at the possible non-linearity of this relationship.

Third, most hypotheses that exist on VBM today are from management bestsellers. Despite the fact that VBM originated from capital-markets-theory, there are few well-founded, academic hypotheses to test. Genuine analytical studies could provide the base for future empirical tests by strengthening the theoretical link between financial markets and MAS.





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