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**Integration of financial and management accounting  
systems: the mediating influence of a unified financial  
language on controllership effectiveness**

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## **Abstract**

To provide accounting information for management control purposes, two fundamental options exist: (a) The financial records can be used as a database for management accounting (integrated accounting system design), or (b) the management accounting system used by controllers can be based upon a so-called third set of books besides the financial and tax accounting records. Whereas the latter approach had been typical for firms in German-speaking countries until the 1980s, since then an increasing number of them has been changing towards a (partially) integrated accounting system design.

In accounting literature, a debate is still on whether this change is for the better or for the worse, especially as from a normative theory perspective no dominant standard exists that provides appropriate information for any given accounting problem which would support a separate accounting system design. Our paper adds to this debate by empirically analyzing the impact of an increasingly integrated accounting system design on controllership effectiveness. Our analysis is distinctive for two reasons. First, we use a dyadic research design surveying both controllers and representatives of general management which allows us to include management's perspective into our analysis in a valid fashion. Second, we do not restrict our model to the technical or supply-side characteristics of management accounting system design, but expand our approach to the user perspective of management accounting information as a financial language.

By using structural equation modeling for a sample of 149 dyads surveyed from the German Top-1500 firms in 2007, we identify no statistically significant direct effect of the technical accounting system design, but a fully mediating influence of a unified financial language on controllership effectiveness. Our results imply amongst others that consistency of management accounting with financial reporting, which results from an integrated accounting system design, is an important property of management accounting information. Especially in the context of a financially oriented management control system, controllers therefore should take special care to align their internal reporting with the financial accounting reports provided to investors.

# **Integration of financial and management accounting systems: the mediating influence of a unified financial language on controllershship effectiveness**

*"It has always struck me as odd that there is such a large distinction made between management accounting and financial accounting in academia [...]. Yet at the conceptual level there is a tremendous amount of overlap between the two."*

*(Lambert, 2007, p. 265)*

## **1 Introduction**

Even though the strategic as well as operational impact of managerial action is directed at non-financial goals like productivity level, sales volume, market share or stakeholders' potential for consumption, most firms use accounting information for control purposes. Literature on management control systems provides several arguments for this prevalence (*Selto/Malina, 2004, p. 8; Merchant/van der Stede, 2007, p. 440*). For example, accounting data are provided in a timely, precise, reliable and objective fashion. They are congruent with the organizational goal of profit maximization and can be tailored to the control problems on each hierarchy level in a straightforward way. The accounting model of a firm's transactions is to a large extent causally related to the business's economic success, so that accounting information supports result controls. The predominant use of accounting information as a control mechanism is reflected in management's bonus contracts, which usually include at least one accounting-based measure, e.g., residual income or ratio measures (*Murphy, 1999, p. 2501; Ittner/Larcker/Rajan, 1997, p. 240*).

To provide accounting information for management control purposes, two fundamental options exist.

- On the one hand, the financial accounting records can be used as the main database for management accounting techniques (e.g., product costing or budgeting), reporting and performance measurement. We denote such a design, which is typically observed in Anglo-American firms, as 'integrated'. Two major advantages can be found with an integrated accounting system design. First, management accounting information is provided at low incremental cost. Second, internal and financial performance measures are easily reconciled on all

hierarchy levels, providing management as well as investors with ‘one version of the truth’. This point is of special importance in capital-market oriented firms in which clear links between investors’ targets and management accounting information are needed. Nevertheless, the financial accounting data may not in all cases be suitable for management control purposes, as the underlying accounting regulation is not designed for internal decision-making and/or decision-influencing purposes in the first instance.

- On the other hand, the management accounting system can be based upon a so-called separate third set of books beside the financial and tax accounting records. Such a design, which is denoted as ‘separate’ or ‘dual’ (*Jones/Luther, 2005, p. 165*), has traditionally been used in continental European, mainly German-speaking, countries. An integral feature of a separate management accounting system design is the use of non-GAAP-based accruals for operational performance measurement. Such accruals may be imputed costs (e.g., depreciation or cost of material based on replacement values, lump-sum risk provisioning, or opportunity costs for owners’ assets, capital, or labor input). A major argument supporting a separate accounting system design is the high degree of case-by-case flexibility in measuring resource consumption and output with respect to control problems at hand – a philosophy that can be described as ‘different costs for different purposes’. *Jones/Luther (2005, p. 186)* claim that the benefits of being able to freely design financial controls under a separate accounting system design might even outweigh the disadvantage of not being able to reconcile internal and external performance measures at top-management or business-segment level. Additionally, the use of cost-based operational controls allows for tight management control structures as the local cost data are aggregated and monitored by top management. In integrated accounting systems, however, local controls are based on non-financial information, with middle management ‘shielding’ local managers from financial corporate goals (*Euske/Lebas/McNair, 1993, p. 288*).

Since the 1990s, an increasing number of German firms have been changing their accounting systems from a separate to an integrated design for management control purposes. Today, professional practice uses pure types of integrated or separated accounting systems as well as hybrid forms, also denoted as ‘partially integrated’

(Angelkort/Sandt/Weißenberger, 2008, p. 15). In the latter case, the integration of financial and management accounting information is restricted, e.g., to the top hierarchy levels or to selected parts of the financial records' database.

The first company to openly challenge the tradition of using separate accounting systems at top management level was the German Top-30 technology firm *Siemens* in 1994. Referring to the need for a consistent accounting language for internal as well as external communication purposes, *Siemens* based its top-management control procedures on the financial accounting database (Ziegler, 1994, p.177-180), thus starting a highly controversial debate in German literature on whether this change has any effects on management control and if so, whether this change is for the better (e.g. Schildbach/Wagner, 1995; Schweitzer/Zielkowski, 1999).

From a U.S. perspective, immediate doubts on the effectiveness of integrated management accounting systems may arise as national practice represented by the *Institute of Management Accountants* (IMA) attributes a superior degree of sophistication to traditional German management accounting. *Sharman/Vikas* (2004) state:

*“Management accounting and controllership practices are more highly developed in German-speaking countries (Germany, Austria, and Switzerland) than in the rest of the world, partly because of the recognition that good management accounting practices are critical to the successful performance of the enterprise. Contrast this to the U.S. where there’s a dominant emphasis on financial accounting and regulatory reporting and a high degree of frustration on the part of CFOs and business managers with their lack of cost and management accounting information.”* (p. 28)

Even though the authors relate this statement mainly to the German system of standard costing and variance analysis (*Grenzplankostenrechnung*) and its potential amalgamation with activity-based costing, the separate system design combined with the use of imputed cost types still represents one of the integral features of the German accounting tradition. *Sharman* (2005) addresses this issue more directly by pointing out:

*“I think the German model is probably more sustainable, more appropriate, more balanced, and certainly more conservative than the American model. This sounds very critical of American financial accounting and it’s not intended to be; it’s more a matter of how to build a good robust business environment.”* (p. 326)

Our paper aims at adding some insights regarding the debate on separate vs. integrated accounting system design from an empirical perspective, analyzing the impact on controllership effectiveness. Until now, empirical research on this subject – mainly published in German – has focused on the mere observation of changes in management accounting practice and the role that IFRS play as a contextual factor (e.g. *Jones/Luther, 2005*). Our paper expands the existing body of research by exploring the consequence of this change on controllership effectiveness. Our research design is distinctive for several reasons. First, we explicitly link the accounting system design with controllership effectiveness in our study, which has not yet been attempted before. Second, we do not restrict our analysis to technical features of the management accounting system design, but include management's evaluation of the accounting information provided as a financial language, which relates to the construct of conceptual information use (*Menon/Varadarajan, 1992, p. 56*).

Though identified in one particular national context, the issues raised in our paper relate to the international discussion on management accounting and control and are therefore of interest outside German-speaking countries as well.

For example, multi-national corporations are confronted with a similar problem regarding their accounting system design if the headquarters operates under a different financial accounting regime than the majority of the firm's business units. This may be the case if, e.g., local minority interests, loan-giving institutions, or joint ventures are of relevance. Then the headquarters can either force the leading GAAP for all accounting and control purposes on top management (integrated accounting system design) or allow for diverse financial controls in the local business units, e.g., based on local GAAP and/or on imputed cost types (separate accounting system design).

A second topic of international interest is in how far the accruals used for value-based management control purposes are supposed to be based upon a third set of books independent from the (financial) accounting model. Among others, *Stewart (1999, p.112-117)* proposes this procedure to calculate Economic Value Added (EVA) as a residual profit measure.

Our paper is organized as follows. In section 2, we give a review of the relevant literature, focusing on an international body of literature (for a more detailed overview of the German literature, see *Weißberger/Angelkort, 2006; Simons/Weißberger, 2008*). In section 3, we develop our research model, which is based upon the

institutional framework for management control systems ('controllorship') in German-speaking countries. Section 4 describes the design of our study. In section 5, information on the measurement of both exogenous and endogenous variables is given. Section 6 presents our results, which have been derived by using covariance-based structural equation modeling (SEM). Finally, section 7 provides a discussion and concludes with some implications for future research.

## 2 Literature review

The relevance of accounting system design for management control purposes is not a recent subject in business administration literature and has been taken up under different labels.

A basic argument on why a third set of books aside from the financial accounting records might be a necessary feature of the firm's management control system is given by *Joel S. Demski* in his seminal paper on normative accounting standards (*Demski, 1973*). His paper relates to US-American regulatory institutions aiming at identifying superior general accounting standards for financial accounting purposes (FASB) as well as for cost accounting and reporting for governmental contracts (CASB). *Demski* formally proves that no such standard can exist, i.e.:

*"In general, no set of standards exists that will single out the most preferred accounting alternative without specifically incorporating the individual's beliefs and preferences."* (p. 720)

*Gjesdal* (1981, p. 224) supports this notion from an agency perspective by showing that an investor's information need for decision-making purposes might call for different financial measurement rules compared to management's need for decision-influencing (stewardship) information to control decentralized agents.

This notion in favor of a separate accounting system design is also supported by the literature discussing the suitability of accrual vs. cash-based accounting for value-based performance measurement purposes in a stewardship setting (e.g., *Reichelstein, 1997; 2000*). Even though these papers show that accrual accounting per se is superior for achieving goal congruence, the specific goal-congruent accruals, such as those based upon a relative benefit depreciation schedule, may not be allowed under a given financial GAAP regime. This would once again call for a separate management accounting system for decision-making and decision-influencing purposes.

These deliberations are pursued on a more practical basis in the discussion on *Stern/Stewart's* EVA as a value-based measurement system. *Stern/Stewart* propose up to 164 adjustments to the financial accounting data to transform accounting profit into a so-called economic profit; in a survey of 29 EVA proponents *Weaver* (2001, p. 58) finds that the average EVA user implements 19 of these adjustments (minimum: 7, maximum: 34). Nevertheless, with an increasing number of adjustments, an EVA-based management control system is once again derived from a third set of books rather than from an integrated database.

In spite of all these arguments supporting a separate management accounting system design, it may still be an organization's favorite choice to implement an integrated design, e.g., if the comparatively high incremental cost of providing separated accounting information is not compensated by advantages in management control. This especially holds if the financial accounting standards are sufficiently suitable for management control purposes as well. Until now, several papers have identified such multi-purpose accounting standards with respect to given control problems mainly under IFRS, e.g., conservatism (*Wagenhofer*, 1996), fair value accounting (*Ewert*, 2006), or the valuation of inventories (*Dorfer*, 2005) and construction contracts (*Arnegger/Hofmann*, 2007). Still, these results are ambiguous as accounting system choices are not made on a case-by-case basis. This argument is also in line with *Ahrens/Chapman* (2007), who characterize management accounting as a practice shaping the interaction of the organization's members.

Additional insights into the use of accounting system design are provided by *Jones/Luther* (2005, p. 169), who discuss management accounting system design as a consequence of the underlying management control philosophy. They argue that the traditional continental-European management control system is rather 'technically oriented', i.e., centralized and using detailed operational controls even at top management levels. In that case, a separate accounting system allowing to incorporate operational goals into the firm's management accounting system at higher hierarchy levels would be superior.

However, since the 1990s the financial system in German-speaking countries has been changing towards investors as the primary stakeholder group (*Krahn/Schmidt*, 2004; *Benson et al.*, 2006, p. 110f.), which is indicated by the spreading use of IFRS as the financial accounting standard of choice even in small and medium-sized companies. In



this context, there is empirical evidence showing that the management control system in these countries is also becoming more financially oriented (*Jones/Luther, 2005, p. 169; Weißenberger/Sandt/Angelkort, 2008, p.12-16*). But to what extent changes towards a financially-oriented management control system also induce changes in the management accounting system has not been explored yet (*Ittner/Larcker, 2001, p. 402; Lambert, 2007, p. 265*). Nevertheless, evidence of management accounting being subject to change due to a broad array of contextual variables inside or outside the organization has been provided by *Libby/Waterhouse (1996)*. They find management accounting change in systems that support decision-making as well as in systems used primarily for decision-influencing purposes, even though the observation of change is less prevalent in the latter. This result is partially replicated by *Williams/Seaman (2001)* with respect to different industries.

As in financially-oriented management control systems the link between financial and management accounting information is of higher importance than under technically oriented management control systems, this would – once again – call for an integrated rather than a separate accounting system design.

The notion of management accounting change due to changes in the management control system is supported by *Burns (2000)* and *Burns/Scapens (2000)*, who highlight the importance of institutionalization, i.e., accounting routines becoming “an inherent feature of the management control process” (*Burns, 2000, p. 572*). This argument relates to yet another body of literature that focuses on the “conceptual use” (*Menon/Varadarajan, 1992, p. 56*) of accounting information as a language for business communication (*Otley/Berry, 1980, p. 242; Boland/Pondy, 1983, p. 228*). *Lavoie (1987)* points out:

*“Both before and after the purely calculative component of accounting takes place, are to be found interpretive aspects which involve a process of interpersonal communication.” (p. 599)*

In contrast to the literature discussed first, these publications do not emphasize the technical aspects of providing accounting information (supply-side perspective), but rather focus on the organizational or user perspective. This construct was first introduced by *Beyer/Trice (1982)* relating to the use of social science research results. With respect to accounting information, this implies that information demand

characteristics, e.g., management's perspective on the information provided, should be considered.

Our research model draws on all these strands of literature. We start with the assumption that even though in a formally generalized theory setting a separate accounting system design must prevail, integrated accounting structures for management control purposes can be found in professional practice. Whether such a system design has a positive impact on controllership effectiveness has to be tested empirically. We include in our research design technical aspects as well as the managerial user perspective, but without focusing on specific control problems or accounting standards to enhance generalizability of our empirical results.

### **3 Research background and hypothesis development**

Empirical accounting research is always embedded in a given institutional and/or regulatory setting. For this reason, before presenting the hypotheses underlying our research model, we will give a short overview of the organization of management accounting and control in typical German firms in contrast to the Anglo-American structure of the firm's finance function.

#### **3.1 Controllership in German vs. Anglo-American practice**

In German-speaking countries, accounting-based result controls are typically provided by a corporate function whose tasks are summarized as 'controllership', with the person holding this function being denoted as 'controller'. The controller is uniquely positioned as a provider and interpreter of management accounting information and is also supposed to act as a trusted advisor to management in the field of management control (*Weber/Schäffer, 2008, p. 12*). With respect to the firm's accounting and finance organization, the German controller either reports to the Chief Executive Officer (CEO) or – more recently – to the Chief Financial Officer (CFO) whose tasks also comprise financial and tax accounting, treasury, and internal auditing (*Weber/Schäffer, 2008, p. 156*).

Comparing German to Anglo-American practice, the controller's position – denoted as such – seems to be less prominent in US firms. This is reflected by literature, as there are only few major textbooks for graduate education on management control systems (e.g., *Anthony/Govindarajan, 2004; Merchant/van der Stede, 2007*) and none on

controllershship. Anglo-American controllers also report to the CFO. Beside operating the management control system, the scope of controllership comprises tasks related to day-to-day financial accounting (*Merchant/van der Stede*, 2007, p. 631; *Anthony/Govindarajan*, 2004, p. 105; *Roehl-Anderson/Bragg*, 2004, p. 16), placing a higher emphasis on historic reporting and financial reporting requirements than on business analysis or modeling for management control purposes (*Sharman*, 2005, p. 322).

Compared to its counterpart in Anglo-American firms, then, German controllership comprises only a limited set of tasks, which nevertheless are highly sophisticated. Traditional German management accounting practice reflects this organizational design of controllership, as the institutional isolation of controllers from the financial accounting function favored the development of accounting techniques based on a separate management accounting system.

### **3.2 House of Controlling as organizational structure of the German controlling function**

Controllership as a task bundle within the controlling function is typically embedded in a 'House-of-Controlling'-like organizational structure in German firms (*IGC*, 2006, p. 21; *Lutz*, 2007, p. 104; see Figure 1).

The objective of the controlling function consists in operating the firm's management control system with a focus on accounting-based result controls. As a result, management control activities comprise tasks like planning, coordinating, communicating, evaluating, deciding, and influencing people (*Anthony/Govindarajan*, 2004, p. 7).

The German understanding of the controlling function's objective is summarized in controllers' mission statement that has originally been developed by the *International Group of Controlling* (IGC), an umbrella organization which is dominated by the main German-speaking professional institutions, i.e., the German *Internationaler Controller Verein*, the Austrian *Controllers' Institute* and the Swiss *Controller-Zentrum St. Gallen*. According to this mission, which has been reprinted in English by *Weber/Schäffer* (2008),

“controllers design and accompany the management process of defining goals, planning and controlling and thus have a joint responsibility with management to reach their objectives.” (p. 19)

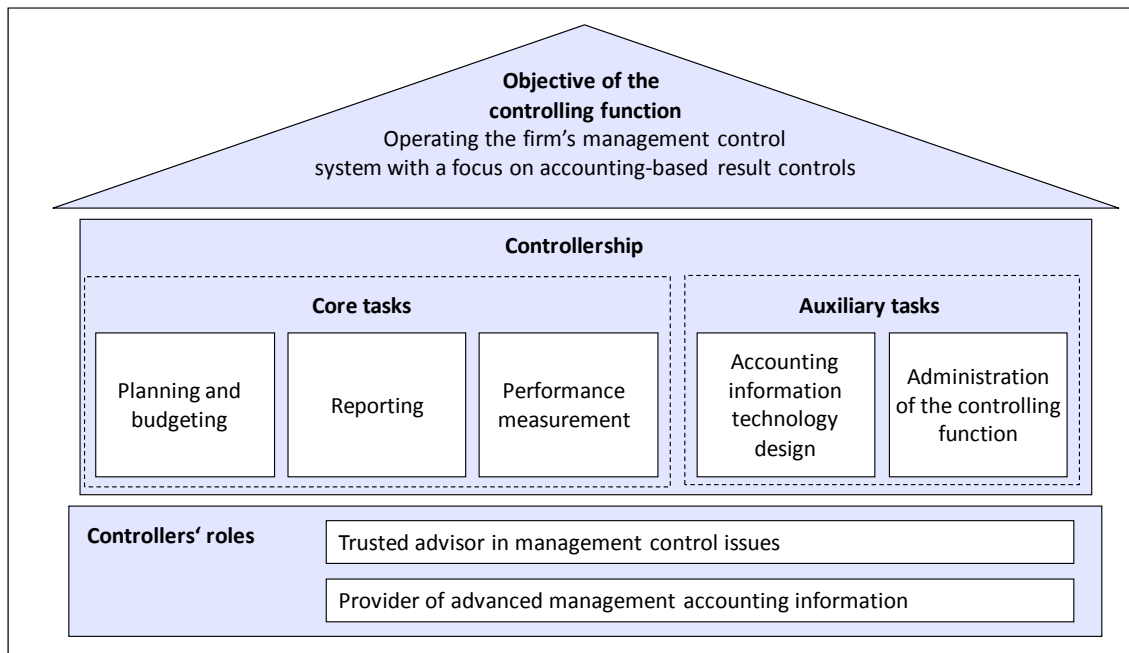


Figure 1: House of Controlling as organizational structure for controllership

Positioning the controller as a counterpart to management is a crucial notion of this understanding. Thus, two roles are attributed to controllers. First, they have to provide advanced management accounting information for operating as well as capital budgeting decision-making and control. Second, controllers have to advise managers, seeing to an adequate use of this information for the management control issues at hand. Nevertheless, it is important to note that all decision-making power still remains with the management function and is not delegated to the controlling function.

Recent empirical research indicates that both controllers' roles are still valid today, but with a shifting focus. Surveying 50 corporate controllers of Austrian IFRS adopters in 2006, *Angelkort/Sandt/Weißberger* (2008, p.16) find an additional role emerging that relates to financial accounting and reporting tasks and takes up 17% (current) / 16% (aspired) of the controller's workload. The same survey indicates that the role of providing management accounting information takes up a higher workload compared to the role of trusted advisor today (current: 45% vs. 38%), but that the average corporate controller wants this relation to be reversed (aspired: 32% vs. 52%). As the professional practice of controllers and financial accountants in Austria is more or less similar to the one in Germany, this result not only supports the conjectures of *Jones/Luther* (2005) on

the German management control system becoming more financially oriented. It also suggests that the main value added of the controlling function is supposed to stem from active participation in managerial control issues.

The pivotal element linking both controller roles and the controlling function is controllership, which can be differentiated into core and auxiliary tasks. An increasing level of integration in accounting system design first affects the core tasks (planning and budgeting, reporting, and performance measurement), as they all use instruments based upon management accounting information. Nevertheless, the auxiliary tasks are also affected as a result of technical (accounting information technology design) or organizational reasons (administration of the controlling function), the latter may be due to the related changes in the firm's finance function.

### **3.3 Hypothesis development**

Our deliberations on the arguments in favor of integrated versus separate management accounting systems with respect to the specifics of the German controlling function lead to the following four hypotheses.

*H1: An increased level of integration in the accounting system design leads to an increased level of output quality attributed to the controller's services to management.*

H1 captures the technical or supply-side aspect of controllers providing accounting information to management. The integration of financial and management accounting affects core tasks as well as auxiliary tasks executed by controllers to support management control. As pointed out in sections 1 and 2, there are arguments in favor of a separate as well as an integrated accounting system design. Due to the fundamental changes in the German financial system since the 1990s, we assume increasing pressure on the management control system triggered by management's need for consistent internal and external accounting information, which can only be provided under an integrated design. We therefore suppose that management satisfaction – measured by the level of output quality attributed to the controller's services – increases with the level of integration in the accounting system design.

*H2: An increased level of integration in the accounting system design leads to an increased unification level of financial language as perceived by management.*

H2 aims at the managerial perception of the management accounting system as a part of the financial language used for business communication. We assume that management and financial accounting are not taken as separate systems used for unrelated purposes by management. Rather, both are taken as part of the overall accounting system describing the firm's business from a financial perspective.

*H3: An increased unification level of financial language leads to an increased level of output quality attributed to the controller's services.*

H3 focuses on the user side or organizational perspective of the controlling function. It implies that managers are not necessarily aware of single tasks or functions within the scope of controllership, but rather perceive the support controllers provide as a whole, with accounting information as 'financial language' for business communication being an integral part of this support. This relates to the role of controllers as trusted advisors to management, which underscores the exchange between both manager and controller regarding the decision-making and control problems at hand. We assume that for their day-to-day business managers prefer the 'internal' financial language provided by controllers to be – at least to a large extent – consistent with the financial accounting information used for outside communication, e.g., with investors. For example, a unified financial language facilitates outside communication and is more understandable as well as less error-prone compared to a separate accounting system based upon a third set of books.

*H4: An increased level of output quality attributed to the controller's services by management leads to an increased impact of controllership on management decisions.*

H4 summarizes the conception of controllership effectiveness based on the organizational structure of the German controlling function. Controllership output quality represents the evaluation of the controller's output from a management perspective, whereas the impact on management decisions stands for outcome, i.e., the degree to which the output is used by management. On top hierarchy levels, these decisions comprise decision-making elements (i.e., abstracting from stewardship problems) as well as decision-influencing elements (i.e., with respect to setting the decision-framework for lower hierarchy levels). From our perspective, controllership effectiveness depends on both output and outcome, as only a combination of high output quality and high impact contributes to reaching the objective of the controlling function,

which mainly consists in providing financial result controls for operating the firm's management control system.

#### **4 Research design**

Data for our study were collected in the period from September to November 2007 by means of a questionnaire-based survey. Our starting point was a database that included contact details of German Top-1,500 companies with regard to sales volume from all industries except financial institutions, which were excluded due to their specific business models and accounting requirements. In the course of data collection, another 231 companies had to be excluded for various reasons (e.g., the lack of a controlling department), so that finally 1,269 companies remained in our population.

To capture both the technical aspects of the controllers' tasks in providing accounting information for management control purposes as well as the managerial user perspective, we decided to adopt a dyadic research design. This means that in each company we addressed both a controller and a general manager (i.e., a member of upper management like the CEO, managing director, or division manager) to fill out a functionally customized questionnaire. Whereas the variable *'integration level of accounting systems'* was surveyed with the controllers, the other three variables *'unification level of financial language'*, *'controllership output quality'*, and *'controllership impact on management decisions'* were assessed by the managers' answers. Each dyad, i.e., controller and manager from the same company, thus forms a unit of observation. Compared to a research setting in which only controllers' ratings are surveyed, this enables us to draw valid conclusions with respect to the management perspective on controllership effectiveness. Hence, a possible common method bias (Podsakoff et al., 2003; Homburg, 2007, p. 43f.) is reduced as the respective key informants are addressed.

The full research design arising from the dyadic approach is depicted in Figure 2. It is based on the hypotheses developed in section 3.3 and displays the four variables used with respect to the group of respondents from which they were surveyed.

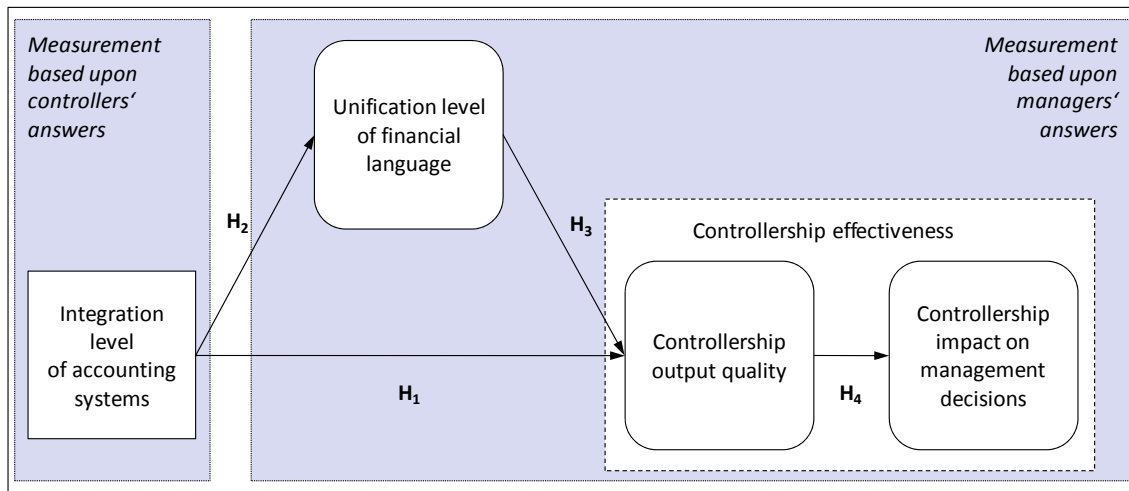


Figure 2: Full research design

To ensure ex ante completeness and understandability and following the recommendations of *Dillman (2007)*, the questionnaires were pilot-tested by six executives from business practice and six academic researchers before sending them out.

In total, 149 dyadic sets of completed questionnaires were obtained, which equals a return rate of 11.7 %. Whereas this response rate seems to be rather low at first glance, especially compared to an average of 55% in typical empirical management accounting studies (*Van der Stede/Young/Chen, 2007, p. 465f.*), a closer look shows that our return rate is similar to studies with a comparable sample size (*Bright et al., 1992; Luther/Longden, 2001*). Additionally, the return rate is smaller than average due to the special challenge of obtaining dyadic survey data.

The sample is predominantly composed of (intermediate) holdings (64%), but also comprises subsidiaries (34%) and non-affiliated companies (2%). Regarding the leading financial GAAP used by the responding firms, the sample mainly consists of IFRS users (52%), followed by companies applying German GAAP according to *Handelsgesetzbuch* (40%), and those using US-GAAP (8%). 26% of the sample companies are listed on the stock exchange. Summary statistics regarding the sample companies' size are given in Table 1.

Variable	N	Mean	Std. Dev.	Lower Quartile	Median	Upper Quartile
Sales (Million EUR)	146	4,015	9,761	530	978	2,254
Total assets (Million EUR)	126	4,503	13,834	350	795	2,211
Number of employees	148	16,137	51,799	1,556	3,825	9,375

Table 1: Summary statistics on company size measures



Using the software program Amos 7.0 (Arbuckle, 2006; Blunch, 2008), we adopt covariance-based structural equation modeling (SEM) as the statistical method for hypothesis testing. SEM offers substantial advantages over more traditionally applied techniques like multiple regression and path analysis. Particularly, SEM allows (a) to incorporate both unobserved (i.e., latent) and observed variables, (b) to account for the effects of estimated measurement error of latent variables, (c) to adopt a more holistic approach to model building, including indirect effects, (d) to take a confirmatory (rather than an exploratory) approach to data analysis, and (e) to provide measures of fit to assess entire models (Byrne, 2001, p. 3f.; Smith/Langfield-Smith, 2004, p. 59f.).

Despite these advantages, the use of SEM in management accounting research has lagged behind that in other related disciplines, as Smith/Langfield-Smith (2004, p. 60f.) point out. In their review for the period 1980 to 2001, they find that only 20 management accounting papers that used SEM were published across ten leading (management) accounting journals and conclude:

*“Given the similarities in the nature of variables and in research methods employed in OBHRM [i.e., organizational behavior and human resource management], psychology, marketing and management accounting, it might be expected that more use would have been made of SEM techniques in MA [i.e., management accounting] research.”* (p. 61)

Furthermore, the authors expect:

*“The greater use of SEM in MA research [...] will enable the discipline to move beyond the restrictions imposed by more limited modeling techniques such as multiple regression and path analysis.”* (p. 79)

However, the technique needs to be used appropriately by adhering to some key recommendations on using and reporting SEM. Typical shortcomings identified by Smith/Langfield-Smith (2004, p. 61-69) specifically with respect to SEM are issues e.g. regarding model fit, small sample sizes, or the use of non-normal data. Several other reservations regarding the use of survey data are expressed in accounting literature more generally. They refer to inadequate pre-testing, response rates, and application of econometric methods (e.g., Ittner/Larcker, 2001, p. 395-402; Zimmerman, 2001, p. 419-423; Van der Stede/Young/Chen, 2007, p. 461-470). In our research design as well as in performing our tests, we heed these warnings appropriately.

## 5 Variable measurement

Measurement of the four latent variables included in our research model is either based on self-developed instruments utilizing questions drawn from the relevant literature or on scales already validated in prior studies. All underlying survey items are measured on a 6-point rating scale with an available range from 0 to 5, with some items being reverse-coded.

### 5.1 Exogenous variable

The exogenous variable, denoted as '*integration level of accounting systems*', indicates the extent to which management accounting systems used by controllers are technically integrated with the financial accounting systems. We assume that its underlying character is not categorical but continuous, as hybrid forms of integration ('partial integration') can be observed in practice. As there is no comparable prior research providing a validated scale with respect to such a variable, a new scale that concisely measures the integration level of management and financial accounting as a theoretical construct had to be developed. Conceptually drawing on the understanding of controlling and management accounting, special care was taken during the pretest to use terminology reflecting the respondents' terms of reference, thus avoiding misunderstandings and measurement errors that may result from them.

Latent variables can be operationalized either by formative or by reflective measurement. Conventional empirical research uses the latter approach, which, according to classical test theory, implies that the observed measures (i.e., indicators) are manifestations of the latent variable and thus dependent on it. Consequently, any changes in the latent variable are supposed to result in changes in all indicators included in the scale as well (*Bollen/Lennox*, 1991, p. 306; *Diamantopoulos/Winklhofer*, 2001, p. 269; *Diamantopoulos*, 2008, p. 1201). By contrast, a formative measurement approach assumes that the latent variable is formed by the indicators. Hence, changes in the indicators cause changes in the latent variable itself, which is consequently modeled as a linear combination of its indicators plus a disturbance term (*Bollen/Lennox*, 1991, p. 306; *Diamantopoulos*, 2008, p. 1201). Due to the assumption that they all equally reflect changes in the latent variable, reflective indicators are thus interchangeable, whereas formative indicators are not (*Diamantopoulos/Winklhofer*, 2001, p. 271). *Bollen/Lennox* (1991) point out with respect to formative measurement:

*“Omitting an indicator is omitting a part of the construct.”* (p. 308)

Although formative measurement has recently gained increasing attention, key issues regarding its properties, advantages, and limitations are not yet well understood. As a consequence, its use in empirical studies is still rare (*Diamantopoulos, 2008, 1201; Diamantopoulos/Riefler/Roth, 2008, p. 1203*). Nevertheless, as several studies have revealed (e.g., *Jarvis/Mackenzie/Podsakoff, 2003; Fassot, 2006*), measurement models are often affected by misspecification. *Diamantopoulos/Riefler/Roth (2008)* refer to this issue by emphasizing:

*“Most researchers apply scale development procedures without even questioning their appropriateness for the specific construct at hand [...]. Consequently, misspecification commonly concerns the adoption of reflective indicators where formative indicators (and thus index construction approaches) would be appropriate.”* (p. 1208)

In our opinion, the variable *‘integration level of accounting systems’* is of formative rather than reflective nature, as the underlying controllers’ core and auxiliary tasks resulting in providing accounting information for management control purposes are not substitutes but complements. The variable is therefore conceptualized by using 17 indicators, each reflecting the controllers’ (sub-)tasks with respect to management accounting. In order to cover all core aspects of integration, we reverted to the five controller tasks according to the House-of-Controlling-structure (discussed in section 3.2) as a guideline for a comprehensive conceptualization. Thus, for each task all relevant linkages of financial and management accounting were identified and incorporated into the analysis. As all 17 indicators cover different aspects of accounting system integration, they are not interchangeable. Also, any variation in the overall level of integration is caused by variations in one or several of these indicators and not the other way round. As *Diamantopoulos/Winklhofer (2001, 274)* show, formative measurement is feasible within covariance-based SEM. As a formative latent variable has to be statistically identified, it is required that it emits at least two paths towards dependent variables that are uncorrelated (*Bollen/Lennox, 1991, 312; MacCallum/Browne, 1993, 539f.*). In the case of our model, this prerequisite is not met as the variables *‘unification level of accounting systems’* and *‘controllership output quality’* are linked by hypothesis H3. Thus, formative measurement is not applicable in its pure form.

To solve this econometric problem, we instead measure the variable ‘*integration level of accounting systems*’ by means of an index averaging the scores of the underlying items. According to *Bollen/Lennox* (1991, p. 310), using a pre-summed composite is nearly equivalent to a special case of the formative indicator model in which all items are equally weighted and the residual variance of the composite is constrained to zero.

Descriptive summary statistics on all 17 indicators used to compose the accounting integration index are reported in the appendix. Additionally, the indicators are grouped with respect to the five different controller tasks to derive a number of sub-indices (for summary statistics see Table 2) that will be used for an in-depth analysis in section 6.2.

Accounting integration index	N	Mean	Std. Dev.	0 ≤ index ≤ 1.5: (very) low level of integration	1.5 < index < 3.5: moderate level of integration	3.5 ≤ index ≤ 5: (very) high level of integration
Planning and budgeting	149	3.83	0.90	2.01 %	28.86 %	69.13 %
Reporting	149	3.74	0.78	1.34 %	30.2 %	68.46 %
Performance measurement	148	3.66	1.30	8.78 %	26.35 %	64.86 %
Accounting information technology design	149	3.55	1.11	5.37 %	38.26 %	56.38 %
Administration of the controlling function	149	4.19	0.76	0.67 %	15.44 %	83.89 %
Overall	149	3.80	0.56	0.00 %	26.85 %	73.15 %

*Table 2: Summary statistics on the ‘accounting integration index’*

## 5.2 Endogenous variables

With respect to the three endogenous latent variables, ‘*unification level of financial language*’, ‘*controllership output quality*’, and ‘*controllership impact on management decisions*’, a reflective measurement approach is appropriate, as the respective underlying items are supposed to be interchangeable and dependent on the latent variables.

The first endogenous variable, ‘*unification level of financial language*’, reflects the extent to which information provided by financial and management accounting is perceived as coherent and consistent by management. Thus, allowance is made for the fact that accounting information is used as a language for business communication.

As no validated scale for this variable exists in empirical research, it is measured by means of a carefully self-developed instrument that comprises three reflective

indicators. Summary descriptive statistics underlying the operationalization are reported in Table 3.

Survey Item	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
Controllers and financial accountants have the same understanding of business performance. (0 = definitely false, ..., 5 = definitely true / N=149)	3.78	1.11	0.00	5.37	8.05	18.12	40.27	28.19
Information provided by the controllers is consistent with accounting information based on financial GAAP. (0 = definitely false, ..., 5 = definitely true / N=149)	3.46	1.26	1.34	7.38	12.08	25.50	30.20	23.49
Information provided by controllers and financial accountants adds up to a consistent view on the firm's business. (0 = definitely false, ..., 5 = definitely true / N=149)	3.88	1.11	1.34	3.36	6.71	14.77	42.28	31.54

Table 3: Summary statistics on ‘unification level of financial language’

‘*Controllershship output quality*’, the second endogenous latent variable, measures the quality of the controlling department’s output in terms of, e.g., scope, timeliness, or accuracy as perceived by management. It is a modified version of an instrument developed by Bauer (2002, p. 216-218) and consists of six reflective indicators. Five (out of eight) indicators – originally measured on a 7-point-rating scale – were adopted from Bauer, whereas one newly-formulated question was added. Summary descriptive statistics for the underlying survey items are reported in Table 4.

Survey Item	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
The management reports cover all important fields of business activity. (0 = definitely false, ..., 5 = definitely true / N=149)	3.94	1.04	0.67	4.03	3.36	15.44	45.64	30.87
The management information system provided by controllers reflects actual circumstances in a comprehensive and valid fashion. (0 = definitely false, ..., 5 = definitely true / N=149)	3.90	0.84	0.00	2.68	2.68	16.78	57.72	20.13
Information provided by controllers is very precise. (0 = definitely false, ..., 5 = definitely true / N=149)	3.91	0.83	0.00	1.34	5.37	15.44	57.05	20.81
Information provided by controllers is up-to-date. (0 = definitely false, ..., 5 = definitely true / N=149)	3.77	1.06	0.67	4.70	4.70	20.81	45.64	23.49
Controllers use comprehensible methods and techniques. (0 = definitely false, ..., 5 = definitely true / N=149)	3.94	0.90	0.00	2.68	2.68	19.46	48.32	26.85
Information content and explanatory power of management reports are both high. (0 = definitely false, ..., 5 = definitely true / N=149)	3.78	0.95	0.67	2.68	4.03	23.49	48.99	20.13

Table 4: Summary statistics on ‘controllershship output quality’

‘*Controllershship impact on management decisions*’ represents the outcome of controllers’ efforts by reflecting the extent to which controllers influence the organizational process of decision-making and decision-influencing at the top management level as perceived by management. It is measured by means of a well-

established instrument adopted from *Spillecke* (2006, p. 161-164) and comprises three reflective indicators. Summary descriptive statistics for the underlying survey items are reported in Table 5.

Survey Item	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
Controllers play a very important role in the decision-making process of our organization. (0 = definitely false, ..., 5 = definitely true / N=149)	3.84	0.98	1.34	0.00	7.38	21.48	44.30	25.50
Management sets a high value on the controllers' opinion in the decision-making process. (0 = definitely false, ..., 5 = definitely true / N=149)	3.81	0.91	0.67	1.34	4.03	25.50	47.65	20.81
Controllers have a strong influence on management decisions. (0 = definitely false, ..., 5 = definitely true / N=149)	3.51	1.00	2.01	2.01	8.05	30.20	46.31	11.41

Table 5: Summary statistics on ‘controllershship impact on management decisions’

## 6 Results

Following the recommendation of *Homburg/Klarmann* (2006, p. 736), we base our SEM analysis on Maximum Likelihood (ML) estimation. Although this method requires multivariate normality of data (*Byrne*, 2001, p. 267), several simulation studies (e.g., *Boomsma/Hoogland*, 2001; *Lei/Lomax*; 2005) have shown that it is apparently quite robust against the violation of the normality assumption, leading to only marginally biased parameter estimates. However, standard errors may be underestimated, thus leading to spurious results regarding the statistical significance of regression weights (*Byrne*, 2001, p. 268). Therefore, we additionally perform bootstrapping – a technique that has recently received increasing attention (*Cheung/Lau*, 2008, p. 317) – as an aid to non-normal data (*Byrne*, 2001, p. 267; *Shrout/Bolger*, 2002, p. 440; *Cheung/Lau*, 2008, p. 301).

### 6.1 Reliability and validity of data

Reliability refers to the internal consistency of a given scale, implying that there are but small measurement errors found with the underlying indicators. Reliability is a necessary prerequisite for measurement validity which describes its conceptual accuracy and is one of the most central concepts in psychometrics today (*Schäffer*, 2007, p. 2). Both concepts can be applied only to reflective measurement (*Bagozzi*, 1994, p. 333), but are not feasible with a quasi-formative measurement approach as used with the exogenous variable ‘*integration level of accounting systems*’. Therefore, the assessment of reliability and validity can only refer to the three endogenous variables in our model.

In the following, we will draw on the commonly used reliability and validity criteria as described in Table 6.

Criterion	Critical value	Reference
Cronbach's alpha	≥ 0.7	<i>Nunnally</i> (1978, p. 245)
Item to Total-Correlation	≥ 0.5	<i>Bearden et al.</i> (1989, p. 475)
$\chi^2/df$	≤ 2.0	<i>Byrne</i> (1989, p. 55)
p-value	> 0.05	<i>Homburg/Giering</i> (1996, p. 10)
RMSEA	≤ 0.05	<i>Browne/Cudek</i> (1993, p. 144)
SRMR	≤ 0.05	<i>Schermelleh-Engel/Moosbrugger/Müller</i> (2003, p. 38)
GFI	≥ 0.9	<i>Homburg/Baumgartner</i> (1995, p. 168)
AGFI	≥ 0.9	<i>Bagozzi/Yi</i> (1988, p. 82)
CFI	≥ 0.97	<i>Schermelleh-Engel/Moosbrugger/Müller</i> (2003, p. 42)
TLI	≥ 0.97	<i>Schermelleh-Engel/Moosbrugger/Müller</i> (2003, p. 41)
Indicator Reliability	≥ 0.4	<i>Bagozzi/Baumgartner</i> (1994, p. 402)
t-statistic of factor loading	≥ 1.645	<i>Homburg/Giering</i> (1996, p. 11)
Factor reliability	≥ 0.60	<i>Bagozzi/Yi</i> (1988, p. 82)
Average variance explained	≥ 0.50	<i>Bagozzi/Yi</i> (1988, p. 82)

*Table 6: Critical values for assessing reliability and validity of reflective measurement*

The first two of these criteria (Cronbach's alpha and Item to Total-Correlation) are also denoted as reliability criteria of the first generation. As they have several shortcomings, e.g. Cronbach's alpha being positively correlated with the number of items (*Malhotra/Birks*, 2003, p. 314), they have to be complemented by second-generation criteria. These are derived from confirmatory factor analysis allowing for simultaneous evaluation of the variable itself as well as the errors of measurement. Detailed information on the first and second generation criteria is given in the respective literature cited in Table 6.

As indicated in Table 7, the latent variable 'unification level of financial language' predominantly complies with the feasible criteria mentioned above. The first indicator is the only exception; it marginally fails to exceed the threshold of 0.40 regarding indicator reliability. However, given that the factor loading of the item is statistically significant and that this instrument has been developed from scratch, it is legitimate not to omit this indicator.

<b>Information on individual indicators of the factor 'unification level of financial language'</b>			
<i>Description of indicators</i>	<i>Item to Total-Correlation</i>	<i>Indicator Reliability</i>	<i>t-statistic of factor loading</i>
Controllers and financial accountants have the same understanding of business performance.	0.57	0.38	7.81
Information provided by the controllers is consistent with accounting information based on financial GAAP.	0.71	0.69	10.84
Information provided by controllers and financial accountants adds up to a consistent view on the firm's business.	0.74	0.78	11.58
<b>Information on the factor 'unification level of financial language'</b>			
<i>Descriptive Statistics</i>			
Cronbach's alpha	0.82		
<i>Results of Confirmatory Factor Analysis</i>			
$\chi^2$ -Value	-	RMSEA	-
df	-	SRMR	-
$\chi^2$ /df	-	GFI	-
p-Value	-	AGFI	-
Factor reliability	0.83	CFI	-
Average variance explained	0.62	TLI	-

Table 7: Reliability and validity of 'unification level of financial language'

Measurement of the variable 'controllershship output quality' can be characterized as reliable as well as valid because all criteria are met without exception (see Table 8).

<b>Information on individual indicators of the factor 'controllershship output quality'</b>			
<i>Description of indicators</i>	<i>Item to Total-Correlation</i>	<i>Indicator Reliability</i>	<i>t-statistic of factor loading</i>
Management reports cover all important fields of business activity.	0.69	0.54	10.10
Information provided by controllers reflects actual circumstances in a comprehensive and valid fashion.	0.81	0.75	12.95
Information provided by controllers is very precise.	0.75	0.65	11.50
Information provided by controllers is up-to-date.	0.74	0.60	10.88
Controllers use comprehensible methods and techniques.	0.63	0.45	8.91
Information content and explanatory power of management reports are both high.	0.78	0.68	11.98
<b>Information on the factor 'controllershship output quality'</b>			
<i>Descriptive Statistics</i>			
Cronbach's alpha	0.90		
<i>Results of Confirmatory Factor Analysis</i>			
$\chi^2$ -Value	7.44	RMSEA	0.00
df	9	SRMR	0.02
$\chi^2$ /df	0.83	GFI	0.99
p-Value	0.59	AGFI	0.97
Factor reliability	0.90	CFI	1.00
Average variance explained	0.61	TLI	1.00

Table 8: Reliability and validity of 'controllershship output quality'



The latent variable ‘*controllership impact on management decisions*’ fully complies with the feasible criteria (see Table 9), once again indicating sound operationalization.

<b>Information on individual indicators of factor 'controllership impact on management decisions'</b>			
<i>Description of indicators</i>	<i>Item to Total-Correlation</i>	<i>Indicator Reliability</i>	<i>t-statistic of factor loading</i>
Controllers play a very important role in the decision-making process of our organization.	0.80	0.87	12.72
Management sets a high value on the controllers' opinion in the decision-making process.	0.80	0.88	12.81
Controllers have a strong influence on management decisions.	0.76	0.82	11.69
<b>Information on the factor 'controllership impact on management decisions'</b>			
<i>Descriptive Statistics</i>			
Cronbach's alpha	0.89		
<i>Results of Confirmatory Factor Analysis</i>			
$\chi^2$ -Value	-	RMSEA	-
df	-	SRMR	-
$\chi^2$ /df	-	GFI	-
p-Value	-	AGFI	-
Factor reliability	0.89	CFI	-
Average variance explained	0.73	TLI	-

Table 9: Reliability and validity of ‘*controllership impact on management decisions*’

The second generation criteria used in Tables 7 to 9 indicate convergent validity, i.e., whether the indicators attributed to a given scale measure the conceptual construct in an appropriate fashion. To capture discriminant validity, i.e., the degree to which indicators underlying one latent variable vary independently from those underlying another latent variable, the *Fornell-Larcker-Criterion* (1981, p. 40f.) is used. It tests whether both average variances explained by each pair of factors exceed the squared correlation between the two factors. If this requisite is met, discriminant validity can be assumed. As is shown in Table 10, all three latent variables satisfy the requirement of discriminant validity.

<b>Discriminant validity: Fornell-Larcker-Criterion</b> (average variances explained > squared correlation)				
Latent variable		Unification level of financial language	Controllership output quality	Controllership impact on management decisions
	Average variance	0.62	0.61	0.73
Unification level of financial language	0.62	squared correlations		
Controllership output quality	0.61	0.46		
Controllership impact on management decisions	0.73	0.09	0.31	

Table 10: Discriminant validity according to the *Fornell-Larcker-Criterion*

## 6.2 Structural equation model

In the following, hypotheses H1-H4 developed in section 3.3 are tested using SEM. The statistics regarding the global criteria of model fit provided in Table 11 exceed the minimum requisites indicated in Table 6 by far and without exception. Thus we can conclude that the hypothesized model fits the empirical data very well.

Criterion	Critical value (for reference see Table 6)	Results
$\chi^2/df$	$\leq 2.0$	59/62 = 0.95
p-value	$> 0.05$	0.58
RMSEA	$\leq 0.05$	0.00
SRMR	$\leq 0.05$	0.04
GFI	$\geq 0.9$	0.94
AGFI	$\geq 0.9$	0.92
CFI	$\geq 0.97$	1.00
TLI	$\geq 0.97$	1.00

Table 11: Global fit of the empirical data with the causal model

Figure 3 indicates the coefficient values of the causal paths connecting the four variables as well as the explained variance ( $R^2$ ) derived from the empirical data.

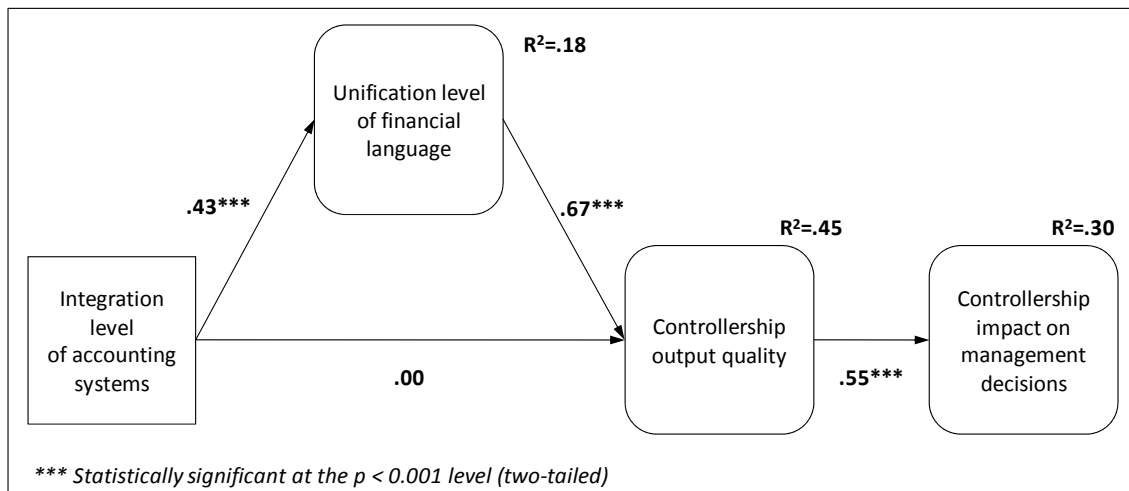


Figure 3: Empirical SEM results

As the SEM parameter estimates depicted in Figure 3 reveal, there is no significant direct effect of the integration level of accounting systems on controllership output quality. Hence, hypothesis H1 cannot be corroborated. On the other hand, as stated in hypothesis H2, the unification level of financial language is positively influenced by the integration level of accounting systems. This impact accounts for 18% of the variance of the former variable. The unification level of financial language has a positive impact on controllership output quality, as stated in hypothesis H3, explaining 45% of the latter

variable. Furthermore, as stated in hypothesis H4, controllership impact on management decisions is positively influenced by controllership output quality. This influence accounts for 30% of the variance of the former variable.

Evidently, the technical features underlying controllers’ services are not directly relevant for management’s judgments regarding controllership effectiveness. Instead, our findings indicate that the dominant impact on controllership effectiveness results from controllers being able to report a business model that is consistent with the financial accounting model.

To examine the interplay between the four variables included in the model, we conduct an analysis of the direct, indirect (i.e., mediating) and total effects. In our model, the mediating (or intervening) variable is ‘*unification level of financial language*’, as it explains the causal effect of the exogenous variable on controllership effectiveness (Shrout/Bolger, 2002, p. 422).

We test the effects included in our model for statistical significance by means of bias-corrected bootstrap confidence intervals, as Cheung/Lau (2008) reveal that, using SEM,

*“the bias-corrected bootstrap confidence intervals perform best in testing for mediation [...] effects.”* (p. 296)

Standardized direct, indirect, and total effects are reported in Table 12.

Dependent variables \ Independent variables	Direct effects			Indirect effects			Total effects		
	Unification level of financial language	Controllership output quality	Controllership impact on management decisions	Unification level of financial language	Controllership output quality	Controllership impact on management decisions	Unification level of financial language	Controllership output quality	Controllership impact on management decisions
Accounting integration index	0.43**	0.00			0.29***	0.16***	0.43**	0.29**	0.16***
Unification level of financial language		0.67***				0.37***		0.67***	0.37***
Controllership output quality			0.55***						0.55***

\*\* Statistically significant at the p < 0.01 level (two-tailed; bias-corrected bootstrap confidence intervals)  
 \*\*\* Statistically significant at the p < 0.001 level (two-tailed; bias-corrected bootstrap confidence intervals)

Table 12: Standardized direct, indirect and total effects

The unification level of financial language fully mediates (0.29) the relation between the integration level of accounting systems (measured by means of the overall

accounting integration index) and controllership output quality, as the direct path between the two latter variables (0.00) is statistically insignificant (Wood *et al.*, 2008, p. 287). Thus, resulting from the significant influence of controllership output quality on controllership impact on management decisions (0.55), the total effect of the level of integration of accounting systems on controllership impact on management decisions is 0.16 (= 0.55 \* 0.29). Hence, there is a positive impact of the level of integration of accounting systems on controllership effectiveness based on the full mediating effect of the unification level of financial language.

To gain a better understanding of whether the impact of the integration of accounting systems on controllership effectiveness differs with respect to controllers' tasks, we conduct an in-depth analysis by replacing the overall accounting integration index consecutively with each of the derived sub-indices within our structural equation model. We thus obtain five separate models that all comply with the criteria of model fit specified above. Table 13 provides a summary of the standardized direct, indirect, and total effects of the respective sub-indices on the three endogenous variables.

Dependent variables \ Independent variables	Direct effects			Indirect effects			Total effects		
	Unification level of financial language	Controllership output quality	Controllership impact on management decisions	Unification level of financial language	Controllership output quality	Controllership impact on management decisions	Unification level of financial language	Controllership output quality	Controllership impact on management decisions
Sub-index 'planning and budgeting'	0.17*	-0.05			0.12*	0.04	0.17*	0.07	0.04
Sub-index 'reporting'	0.41**	-0.04			0.29***	0.13***	0.41**	0.24**	0.13***
Sub-index 'performance measurement'	0.15	-0.10			0.10*	0.00	0.15	0.01	0.00
Sub-index 'accounting information technology design'	0.23*	0.06			0.15*	0.12*	0.23*	0.21*	0.12*
Sub-index 'administration of the controlling function'	0.16	0.13			0.10	0.13***	0.16	0.23**	0.13***

\* Statistically significant at the p < 0.05 level (two-tailed; bias-corrected bootstrap confidence intervals)

\*\* Statistically significant at the p < 0.01 level (two-tailed; bias-corrected bootstrap confidence intervals)

\*\*\* Statistically significant at the p < 0.001 level (two-tailed; bias-corrected bootstrap confidence intervals)

Table 13: Standardized direct, indirect and total effects of the five sub-models

As the decomposition of effects reveals, only the models based on the sub-indices 'reporting' (0.24; 0.13), 'accounting information technology design' (0.21; 0.12), and

*'administration of the controlling function'* (0.23; 0.13) indicate statistically significant total effects on controllership output quality and controllership impact on management decisions, respectively. Thus, it can be concluded that the integration of financial and management accounting within the areas of planning and budgeting as well as performance measurement as defined in this study have no significant impact on controllership effectiveness as perceived by management.

## **7 Discussion**

Our results add a new flavor to the discussion of whether the integration of financial and management accounting makes sense. First, we show that a purely instrumental approach to controllers' tasks, i.e., just taking the supply-side of producing management accounting information into account, ignores an important driver for controllership effectiveness from a management perspective.

Thus, even though the idea of 'different costs for different purposes' under a separate accounting system design has been deemed preferable from an information theory perspective, it does not fully meet management's overall needs regarding a consistent view on business activities, i.e., 'one version of the truth' provided by the overall accounting system.

Our results are in line with behavioral research indicating that human beings strive for consistency in the individual decision-making process. One of the seminal works in this field is *Festinger's* (1957) theory of cognitive dissonance with the following two core hypotheses:

- "1. The existence of dissonance, being psychologically uncomfortable, will motivate the person to try to reduce the dissonance and achieve consonance.*
- 2. When dissonance is present, in addition to trying to reduce it, the person will actively avoid situations and information which would likely increase the dissonance."* (p. 3)

Relating these hypotheses to our research subject, the management accounting information provided by controllers is judged better and used to a greater extent in the managerial decision-making process if it is consistent with the financial reports. If managers perceive inconsistencies between these two sets of information, they will actively avoid using management accounting data as the voluntary part of the overall accounting system, thus rendering the controllers' services ineffective.

Our findings therefore show that ‘good’ management accounting information is not only characterized by relevance, accuracy, timeliness, or technical reliability with respect to a given control problem, but also by consistency from a user-side perspective. When advising management, controllers should therefore take special care not only to establish an understandable link between the accounting information provided for managerial decision-making and financial accounting information, but also to emphasize this link in communicating with management. This is of importance not only for controllers in German-speaking countries, but also for their Anglo-Saxon counterparts drawing on German accounting system know-how.

In professional practice, it may be difficult to achieve such consistency, i.e., a unified financial language under an integrated accounting system, if the relevant financial GAAP system is not appropriate for management control purposes (e.g., if it is mainly driven by tax or legal considerations, as has been the case with German GAAP). Even though our study clearly indicates the relevance of consistency, this property of management accounting information is not a comprehensive substitute, but rather – at least partially – a complement to other properties of ‘good’ accounting information, e.g. information content or relevance for a given decision-making or control problem. As financial accounting standards under IFRS or US-GAAP are more suitable for internal decision-making and/or decision-influencing compared to German, Austrian or Swiss GAAP, an integration of accounting systems is therefore probably easier and more successful (*Simons/Weißenberger, 2008, p. 140-143*).

Our results can also be applied to the field of value-based performance measurement. Even though theory recommends several adjustments to the accounting data to derive informative performance measures from an economic point of view, the number of adjustments reduces the performance measures’ consistency and therefore also their effectiveness. Hence, taking management’s view into account, value-based measures should not be too sophisticated, but rather clearly relate to the underlying financial accounting database.

The notion of consistency is also of importance with respect to the design of management control systems in multi-national companies whose business units act under local financial GAAP regimes. Even though the headquarters will probably implement financial result controls based on the firm’s leading GAAP, the relevance of consistency in financial language in the business units might call for separate, i.e.,

individual, management accounting system designs with respect to the local GAAP regimes.

The in-depth analysis regarding the impact of the controllers' tasks shows that a consistency between financial and management accounting information is not to be achieved in a naive fashion by simply using the financial accounting numbers for controllership purposes as well. For example, neither with planning and budgeting nor with performance measurement is there a statistically significant total effect via the mediating variable '*unification level of financial language*'. Evidently, there are parts of the management accounting system in which consistency does not seem to matter as strongly as the adaptation of information to control purposes.

Consistency on the other hand does matter with respect to the firm's internal accounting reports. It is not only established by the controllers' reports themselves (indicated by the significant total effects regarding the controllers' tasks 'reporting' and 'accounting information technology design' as the underlying auxiliary function), but also by a close cooperation between the controllers themselves and the financial accountants. We assume that our results in this respect can even be expanded to the implementation of IFRS 8 / SFAS 131 on segment reporting. Under the management approach, the segment result has to correspond to the performance measure reported to the segment's chief operating decision-maker. If, for example, a firm's segments use different performance measures for segment results, which might be the case for historical reasons, this may also be perceived as inconsistent, thus reducing the information impact of segment reports.

Similar to most studies, our findings are subject to limitations. First, it is important to note that our research approach is comprehensive with respect to the controlling function, so that the quality of the accounting information provided by controllers in the 149 dyads with respect to the specific decision problems at hand has not been established. Hence, our results are not a recommendation to controllers to relax with respect to information quality per se, but rather to take special care to present the relevant management accounting information in a consistent fashion.

Furthermore, our analysis is based on data regarding companies' top-management level. Therefore, our results have to be interpreted carefully with respect to lower hierarchy levels, even though our theoretical model does not suggest contradicting results in this respect. Nevertheless, as local managers' information needs typically differ from those

of top management, their frame of reference for judging accounting information consistency might be different, calling for other solutions than an integrated accounting system to achieve such consistency. If, for example, non-financial performance measures are used locally, they might be more consistent with a separate management accounting database, using imputed or standardized costs and revenues for performance measurement. In that case, the business unit controller has to shield the local manager from financial accounting information provided to top hierarchy levels by using a separate management accounting database for operational purposes. Such a separate database would, on the other hand, not be reported in a company-wide, aggregated fashion to top management anymore either. These considerations might also partly explain the existence of hybrid forms of integrated accounting system design in larger firms.

Other limitations of our study concern the statistical side. First, due to our non-random sample of firms, findings are limited in terms of representativeness. However, our analysis can be considered representative with regard to the underlying population, which comprises 1,269 of the biggest companies in Germany concerning sales volume. As we draw on cross-sectional data, our findings may not hold for a given type of industry. On the other hand, there are no indications in our theoretical model that accounting information consistency, or – more specifically – unification of financial language, may differ in relevance with respect to specific industries.

Another limitation results from the quasi-formative measurement of the variable '*integration level of accounting systems*' by means of an index. As this index is measured as a manifest variable, it lacks an error term that regular formative latent variables usually have. This error term represents the impact of all remaining causes other than those represented by the indicators included (Diamantopoulos, 2006, p. 11). Using the composite thus assumes that the underlying indicators completely capture the construct, which in most cases is inappropriate (Diamantopoulos/Riefler/Roth, 2008, p. 1215). However, as Diamantopoulos (2006, p. 11f.) points out, this approach is legitimate if all possible indicators of a construct can be conceivably specified. Due to the applied comprehensive measurement drawing on the House-of-Controlling-structure, this requirement is probably met to a large extent in the case of our composite. Future research should address the design of integrated accounting systems on different hierarchy levels. Additionally, longitudinal studies should be conducted to analyze the



consequences of variation in the level of integration of accounting systems on controllership effectiveness. In addition, taking into account that this is a crucial issue regarding controllership effectiveness, more effort should be made to identify and analyze other variables that influence the unification level of financial language and/or the consistency of accounting information for specific groups of users.

## Appendix

The appendix contains summary statistics on the 17 indicators underlying the accounting integration index with respect to the five sub-indices referring to the five tasks constituting controllership.

Integration of accounting systems:  <b>Planning and budgeting</b>	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
			(very) low integration		moderate integration		(very) high integration	
To which extent is short-term planning and budgeting based on valuation methods in accordance with financial GAAP on top management level? (0 = very low, ..., 5 = very high / N=149)	4.08	1.21	2.01	4.70	4.70	6.71	35.57	46.31
			6.71		11.41		81.88	
To which extent is valuation within medium-term planning and budgeting based on valuation methods in accordance with financial GAAP on top management level? (0 = very low, ..., 5 = very high / N=147)	4.05	1.22	2.72	3.40	4.76	9.52	34.69	44.90
			6.12		14.28		79.59	
What is the level of congruence between management control structure and legal structure for planning and budgeting purposes? (0 = very low, ..., 5 = very high / N=149)	3.34	1.44	5.37	10.74	9.40	10.74	46.31	17.45
			16.11		20.14		63.76	

Integration of accounting systems:  <b>Reporting</b>	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
			(very) low integration		moderate integration		(very) high integration	
To which extent are deadlines for management reporting and financial reporting harmonized? (0 = very low, ..., 5 = very high / N=149)	4.28	1.03	1.34	1.34	4.03	9.40	29.53	54.36
			2.68		13.43		83.89	
How many workdays are required to report monthly financial key performance indicators (KPI) to top management in accordance to financial GAAP? (0 = KPIs are not calculated in accordance with financial GAAP 1 = >20 workdays 2 = 13-20 workdays 3 = 7-12 workdays 4 = 4-6 workdays 5 = 1-3 workdays / N=149)	2.91	1.33	11.41	4.03	6.04	46.31	25.50	6.71
			15.44		52.35		32.21	
To which extent are imputed or opportunity cost and revenue types used for management control purposes? (reverse coded item) (0 = very high, ..., 5 = very low / N=149)	3.62	1.51	4.03	10.74	8.05	10.74	29.53	36.91
			14.77		18.79		66.44	
To which extent can single line items/sums in the internal management reports be reconciled with corresponding items in the income statement? (0 = very high, ..., 5 = very low / N=149)	3.86	1.31	2.01	5.37	10.07	10.07	32.21	40.27
			7.38		20.14		72.48	
To which extent is the internal measure for operating income in accordance with the operating income published in the financial statements? (0 = very low, ..., 5 = very high / N=149)	4.20	1.06	0.00	4.03	4.70	9.40	30.87	51.01
			4.03		14.10		81.88	

Integration of accounting systems:  Reporting (continued)	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
			(very) low integration		moderate integration		(very) high integration	
How many adjustments are necessary for reconciling the operating income based on financial GAAP to the financial KPI used for internal management control purposes? (reverse coded item)  <i>(0 = &gt;10 adjustments 1 = 8-10 adjustments 2 = 5-7 adjustments 3 = 3-4 adjustments 4 = 1-2 adjustments 5 = 0 adjustments / N=144)</i>	3.44	1.37	6.25	2.08	13.89	20.14	34.72	22.92
			8.33		34.03		57.64	
To which extent differs the operating income based on financial GAAP in volume from the financial KPI used for internal management control purposes? (reverse coded item)  <i>(0 = very high, ..., 5 = very low / N=146)</i>	3.90	1.18	0.68	4.79	6.85	18.49	30.14	39.04
			5.47		25.34		69.18	

Integration of accounting systems:  Performance measurement	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
			(very) low integration		moderate integration		(very) high integration	
To which extent is overall top management compensation based on financial GAAP based profit measures? <i>(0 = very low, ..., 5 = very high / N=148)</i>	3.66	1.30	3.38	5.41	6.76	19.59	35.81	29.05
			8.79		26.35		64.86	

Integration of accounting systems:  Accounting information technology design	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
			(very) low integration		moderate integration		(very) high integration	
In our company, only one set of accounts (books) is used for both financial and management accounting purposes. <i>(0 = definitely false, ..., 5 = definitely true / N=149)</i>	4.16	1.27	2.01	5.37	4.70	6.71	24.83	56.38
			7.38		11.41		81.21	
In our company exists one ore more company-wide accounting databases containing actual and planning data that are used for both financial and management accounting purposes. <i>(0 = definitely false, ..., 5 = definitely true / N=149)</i>	3.83	1.55	8.72	2.68	5.37	10.07	26.17	46.98
			11.40		15.44		73.15	
In our company, an integrated IT system (e.g. SAP-SEM) is available that provides a basis for both internal management reporting and consolidated financial statements. <i>(0 = definitely false, ..., 5 = definitely true / N=149)</i>	2.66	1.87	21.48	11.41	10.74	16.11	16.78	23.49
			32.89		26.85		40.27	

Integration of accounting systems:  Administration of the controlling function	Mean	Std. Dev.	Relative Frequency Distribution (in %)					
			0	1	2	3	4	5
			(very) low integration		moderate integration		(very) high integration	
In our company, controllers and financial accountants report to the same member of the executive board. (0 = definitely false, ..., 5 = definitely true / N=149)	4.72	0.94	2.01	1.34	1.34	1.34	5.37	88.59
			3.35		2.68		93.96	
In our company, there is a mutual professional exchange between controllers and financial accountants. (0 = definitely false, ..., 5 = definitely true / N=149)	4.03	1.00	0.00	2.68	5.37	16.11	37.58	38.26
			2.68		21.48		75.84	
In our company, the financial accountants are briefed by controllers on management reporting issues. (0 = definitely false, ..., 5 = definitely true / N=149)	3.83	1.17	0.00	5.37	9.40	18.12	31.54	35.57
			5.37		27.52		67.11	

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