IDEA GROUP PUBLISHING
701 E. Chocolate Avenue, Suite 200, Hershey PA 17033-1240, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com
ITB12757

This paper appears in the book, *Emerging Trends and Challenges in Information Technology Management, Volume 1 and Volume 2* edited by Mehdi Khosrow-Pour © 2006, Idea Group Inc.

Examining the Value of Management Control in IT Organizations

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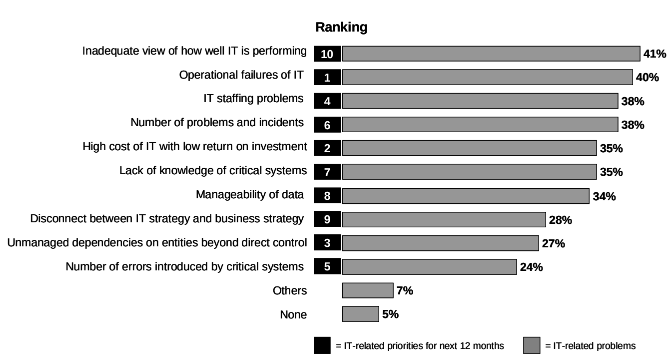
ABSTRACT
Control and governance of corporate IT departments have become quite critical in organizations due to enormous size of their expenditure. Surprisingly, this topic is rarely discussed in management accounting and IS literature. In this paper, we present a research model that examines the relationship between the design and use of management control systems and their direct or indirect impact on IT performance. Based on data from 59 organizations the model is tested using Partial Least Squares (PLS) analysis. As a result, we identify various types of management control information and controller capabilities that have a significant impact on IT performance.

INTRODUCTION
New competitive and technological challenges faced by companies have resulted in tremendous IT expenditures and increasing complexity in IT management (Johnston and Carrico 1988). Effective IT management requires a set of coherent coordination efforts associated with planning, controlling, costing, directing and decision-making concerning the implementation and use of IT resources within a firm (Verner et al. 1996). Therefore, management control in IT organizations have also changed drastically during the past two decades. The focus of management control shifted from being loose/informal, project and technically based to being more tight/refined and managerially based (Kirsch et al. 2002). Several management control practices have been introduced during the last years in IT management such as governance mechanisms, performance measurement (e.g. Balanced Scorecard), and chargeback arrangements (Martinsons et al. 1999; Ross et al. 1999; Van Grembergen 2002). But surprisingly, a recent study of the IT Governance Institute (ITGI) that covered 335 CEOs and CIOs in 21 countries, found out that "*while more than 91 percent of executives recognize that information technology (IT) is vital to the success of their businesses, more than two-thirds of CEOs are not comfortable answering questions about governance and control over their IT processes*." The study validates that the major problem keeps "*on being the inadequate view of on how well IT is performing*" (ITGI 2004). At the same time, the low priority ranking of this number one problem indicates the lack of hope in overcoming this problem and is therefore a serious mandate for Management Control and IS research.

Figure 1. Problems and priorities of CEOs and CIOs (ITGI 2004)



In this paper, we provide a framework to estimate the perceived value of management control in IT organizations. In order to create a common understanding of relevant terms and concepts, it is first necessary to review related literature. We also explore the direct and indirect relationships between the design of management control systems and information (MCSI), its use in decision-making and the resulting impact on IT performance. Hypotheses are developed based on a comprehensive literature review and tested by using data from 59 organizations. Partial Least Squares (PLS) analysis have been applied to test the causal model. Finally, we present some conclusions and further research recommendations. Our results indicate full and partial effects of the use of management control information on overall IT performance. This paper contributes to Management Control and IS research streams by analyzing the complex relationships between different types of management control information (MCI), use of MCI, coordination and communication capabilities of IT controllers and their impact on IT performance.

\LITERATURE REVIEW AND HYPOTHESES

Clarification of Terms and Definitions
A number of definitions about "management accounting and control" have been publicized in literature. Horngren (1996) re-emphasized that management accounting's focus should be on decisions and thus on decision-support. He reminds researchers and professionals to start each evaluation by looking at the grand total, especially to "back off and look at it in large" (Horngren et al. 1996). Management controllers are forced to concentrate on basics, which are decisions and decision-support. In general, management control systems have two roles: First, the transmission of information to help reach wise economic decisions (decision-facilitating role) and second, the motivation of users to aim and strive for organizational objectives or goals (decision-influencing role). The literature describes management control systems as mechanisms that provide managerial relevant information to decision-making, ultimately to enhance the performance outcomes. We adopt this view of management control as part of the informational support process in the firm that ensures effective decision-making.

Effective Design and Use of Management Control Systems
How does management control influence the efficiency and effectiveness of IT organizations? Based on recent studies relating to management control and its impact on firm performance, we aim to understand and evaluate what type of and how much management control lead to overall performance improvements within an IT organization. Much of the management control literature (broadly defined) proposes new management control systems (e.g. activity-based costing, IT balanced

scorecard), recommends various design principles and focuses on contingencies between organizational factors and their impact on management control practices. Typically, it is argued that new management control systems are better than existing systems. What is remarkably absent from the research literature is any systematic analysis of what better means, how better should be measured, and what challenges are encountered in making these measurements. IT executives and board directors have a demand for quantifying the net benefits from implementing management control systems such as chargeback arrangements, performance measurement systems or incentive schemes. In management control theory, it was Feltham (1968) who first mentioned the value of information while providing "payoff relevant" attributes for managerial accounting system (Feltham 1968). He distinguished relevance, timeliness and accuracy as key determinants of information value. Other researchers extended his three criteria by e.g. scope, fineness, flexibility, and costs (Barua et al. 1989; Bruns and McKinnon 1993; Mendoza and Bescos 2001; Schäffer and Steiner 2004). Management control – or more precisely better management control – can be considered like any other asset that is costly to maintain and provides benefits to decision-making authorities. The challenge is to identify the settings and attributes in which implemented or upgraded management control systems are likely to yield the greatest net benefit. From an economic standpoint, management control information have little intrinsic value. Management control information generates value when it facilitates or influences decision-making processes. Therefore, management control can create value by supporting decision-makers and changing actions, which themselves create value. Our framework includes following information attributes: relevance, accuracy, fineliness, broadness and timeliness. These attributes have been identified within a comprehensive study of several journals and text books. In addition, we have have also integrated the impact of the controller skills on the production and use of management control information. Subsequently, we have investigated the impact of these constructs on outcome measures, such as managers' satisfaction or perceived IT performance (Mendoza and Bescos 2001). The attributes and their relations to other variables (hypotheses) are described below:

- Relevance was suggested by Feltham (1968) as an important criterion for evaluating managerial information. An ex post viewpoint of information relevance (or signal relevance as defined by Feltham) is that its receipt changes the decision. From an ex ante perspective we assume that the implementation or upgrade of management control systems needs to provide additional or different signals that correlate with occurring events and that some of these differences lead to differences in the decisions made. In general, decision makers will ignore new management control systems unless they estimate improvements in decisions or deliver additional predictive signals (Feltham 1968).
- Although it is difficult to define accuracy quantitatively or qualitatively, it contains of two components: information systems error and information perception errors (Merchant and Van der Stede 2003). Errors in monitoring systems (e.g. service level monitoring) can be caused by measurement or by errors in processing and transmitting key performance indicators. These errors cause additional uncertainty about past events, therefore additional uncertainty about future events, and probably lead to poorer decisions. An information perception error arises if the decision maker does not completely understand the performance measures of management control systems. Perceptions can be improved significantly by improved presentation of data, additional background information and explanations (such as decision-facilitating comments), switching from technical terms to business terms, and his training.
- Fineliness describes the vertical richness (granularity) of managerial information, such as level of details in IT reports (drill down options) and represents the availability of performance measures across different hierarchical layers within an IT organization, from employee level to firm level.
- Timeliness describes reporting intervals and reporting delays that result because information gathering functions are typically separated from information-using functions within IT organizations. Reporting delay and reporting intervals are affecting the expected payoff in two ways. First, they increase the uncertainty about past events, thereby increasing un-certainty about future events. Second, IT executives or business area managers may hesitate with their decisions until the information has received. This can lead to lost opportunities because relevant measures or reports are received too late to adjust any input.
- Broadness refers to the horizontal richness of managerial information. It enhances the scope of information flows and reports by shifting the time horizon encapsulated in IT reports from short-term to long-term, by adding non-financial metrics to IT reports (Ittner and Larcker 1998), by comparing the IT performance with internal and external benchmarks.

Skills and Qualification of IT Controllers

As a reaction to the tremendous size of IT expenditure in firms and the progress in academic and professional knowledge in the domain of management control for IT activities, many firms have gone so far to create an entirely new functional role – a chief financial officer or IT controller for the IT department (May 2004). More than 20 percent of large businesses have established these hybrid financial-technology executives (e.g. Intel, DHL) Hence, we assume that an IT controller improves the communication between business and IT staff and increases transparency.

Management Control Systems, IT Controllers and Corporate IT Performance

The effective application of management control systems accompanied by IT controllers is critical for achieving higher organizational performance in IT departments. Management control information assists in the coordination within the IT unit or between business and IT units within an organization. Theoretically, we argue that the availability of useful management control information enhances directly managerial performance and affects indirectly corporate IT performance in organizations. We also conclude that IT controllers play an important role in coordinating intra- and inter-unit activities. Thus, we examine the relationship between these constructs in our research framework in the next section and test its validity with empirical data based on a PLS approach.

RESEARCH METHOD

Sample Selection and Data Collection

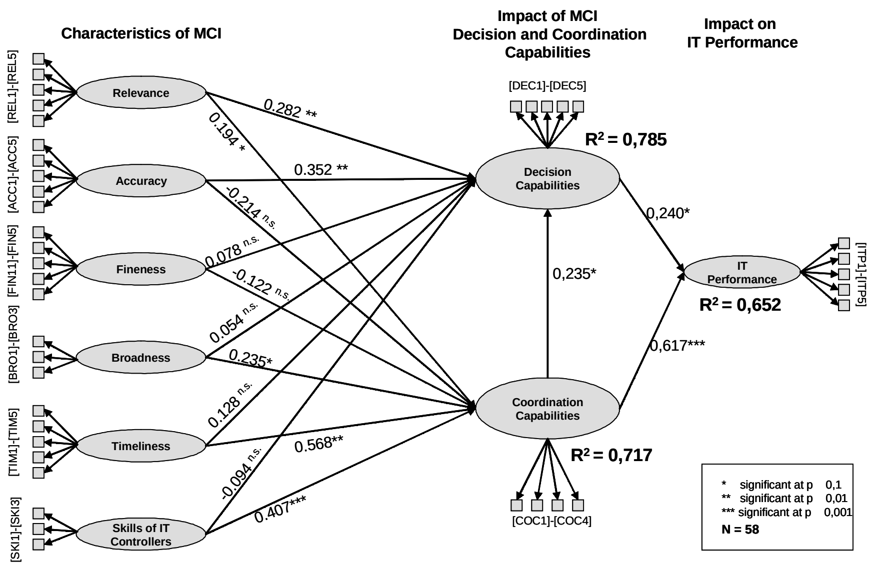
To test our hypotheses, a survey was conducted in Germany. A questionnaire was sent via dedicated mails to different work groups in Germany. The questionnaire was pre-tested with three professionals of different companies and additionally reviewed by research colleagues from another university (TU Munich). Minor changes were incorporated in order to increase the understandability of questions and to improve the overall response rate. The participating organizations were: *ISACA Germany, Internationaler Controller Verein, GI FG 5.7 IT-Controlling, Bitkom, and TÜV Rheinland*.

Although the response rate was relatively low (59 respondents), our descriptive statistics show that we have a balanced distribution of responds over following functional categories: 17% business managers, 17% IT managers, 17% auditors, 20% accountants and 27% other IT experts (e.g. consultants or business analysts).

Variables and Measures

Variables were measured by asking respondents to indicate on a 5-point Likert scale (1= strongly diagree to 5 = strongly agree) the extent to which each indicator are representative to their organizational context. For instance, IT performance was measured in terms of quality, efficiency, flexibility, customer orientation and business value contribution.

Figure 2. Structural equation model based on PLS



Data Analysis and Results

Our research model was tested using Partial Least Squares (PLS), a statistical method which allows simultaneous assessment of the structural (theoretical) model along with the measurement model. PLS offers a component-based strategy to the measurement of multiple dependent constructs and to the estimation of predictive structural coefficients in a model (Chin and Newsted 1999). The measurement model specifies the relations between observed items and latent variables. The structural model assesses the relations between latent constructs. PLS models are investigated in two stages. First, the strength of the measurement model was tested by examining the convergent and discriminant validity of constructs. The sequence ensures that the selected construct measures are valid and reliable before attempting to draw conclusions regarding the relationships among constructs. Convergent validity is evaluated in our model by examining the individual reliability of each indicator (manifest variable), the composite reliability ($\mathbf{r}_c$) of constructs, and the average variance extracted (AVE) by each construct (Fornell and Larcker 1981). Individual item reliability is considered as adequate when an item has factor loading that is greater than 0.707 on its respective construct. According to Fornell and Larcker (1981) the composite reliability should be above 0.8 and the average variance extracted (AVE) for all latent variables should be also greater than 0.5 to ensure a good fit between constructs and underlying items. Table 1 shows the individual item loadings for each construct. All items have a loading above 0.700 and therefore provide explanatory power for the research model. It also includes the composite reliability measure of Fornell and Larcker. As shown in Table 1, the composite reliability score for each variable is above 0.80, which indicate acceptable reliability. Convergent validity is assessed by AVE statistics. The AVE for each variable is 0.50 and above which demonstrates adequate convergent validity (Chin and Newsted 1999). Overall, the results from the PLS measurement model indicate that each variable exhibits satisfactory reliability and validity.

To test the hypotheses, the structural model needs to be estimated. The main objective of PLS is to maximize variance explained rather than fit, therefore prediction-orientated measures, such as R^2, are used to evaluate PLS models (Chin 1998). We also estimated the strength of our hypotheses (path coefficients) and evaluated the statistical significance of each path coefficient by applying bootstrapping (100 samples with replacement). Finally, we examined Q^2 values which determine the predictive relevance of structural model. Consistent with Chin (1998), R^2 should be above 65% to provide a substantial prediction effect. Chin also stated that Q^2 needs to be positive for all predicted variables (Chin 1998). Consistent with expectations, Table 2 shows significant positive correlation between various design elements concerning management control and its impact on the effective use in decision-making or on controller's capabilities to coordinate activities within the IT organization. The R^2 for each endogenous variable and related path coefficients are shown in Table 2. The results reported in Table 2 indicate how the effective use of management control information and the coordination capabilities of IT controllers influence the perceived corporate IT performance.

CONCLUSIONS AND FURTHER RESEARCH RECOMMENDATIONS

Uncertainties related to the real economic value of management control systems still exist. At a broad level, our results add to the extant literature on the effective design and use of management control systems; more specifically the results add to our understanding of the relationship between various management control information attributes and their direct impact on managerial performance and indirect impact on corporate IT performance. The study also provides valuable insights that IT controller's skills and their role as coordinators are mission critical for achieving higher performance results of the corporate IT function. Unfortunately, accounting or IS literature does not have agreed standards regarding how to evaluate whether certain management control

Table 1. Statistical results of measurement model

Construct	Indicator	Loading (λ)	Composite reliability (ρ_c)	Average variance extracted (AVE)
Relevance	REL1	0.8283	0.915	0.684
	REL2	0.8456		
	REL3	0.8242		
	REL4	0.8348		
	REL5	0.8025		
Accuracy	ACC1	0.8555	0.932	0.734
	ACC2	0.8464		
	ACC3	0.9180		
	ACC4	0.8098		
	ACC5	0.8510		
Fineness	FIN1	0.8836	0.917	0.688
	FIN2	0.8758		
	FIN3	0.7622		
	FIN4	0.7935		
	FIN5	0.8257		
Broadness	BRO1	0.9165	0.911	0.774
	BRO2	0.8642		
	BRO3	0.8578		
Timeliness	TIM1	0.8532	0.937	0.749
	TIM2	0.8969		
	TIM3	0.8592		
	TIM4	0.8626		
	TIM5	0.8554		
Skills of IT Controllers	SKI1	0.7183	0.844	0.645
	SKI2	0.9014		
	SKI3	0.7789		
Decision Capabilities	DEC1	0.8443	0.931	0.694
	DEC2	0.8749		
	DEC3	0.8128		
	DEC4	0.8552		
	DEC5	0.8088		
Coordination Capabilities	COC1	0.7732	0.852	0.591
	COC2	0.7069		
	COC3	0.8111		
	COC4	0.7792		
IT Performance	ITP1	0.8251	0.888	0.613
	ITP2	0.7857		
	ITP3	0.7793		
	ITP4	0.7843		
	ITP5	0.7370		

Table 2. Statistical results of structural model

Hypothesis	Path coefficient (β)	t-statistic (bootstrap)	Variance explained (R^2)	Prediction relevance (Q^2)	f^2-statistics (f^2)
Impact on IT performance	–	–	*65.2%*	*0.33*	–
H01: Decision capabilities	0.240*	2.1843	–	–	0.07
H02: Coordination capabilities	0.617***	5.9348	–	–	0.52
Impact on decision capabilities	–	–	*71.7%*	*0.36*	–
H03: Relevance	0.194*	2.1083	–	–	0.06
H04: Accuracy	-0.214 n.s.	1.4075	–	–	0.05
H05: Fineness	-0.122 n.s.	0.7683	–	–	0.02
H06: Broadness	0.235*	2.4107	–	–	0.16
H07: Timeliness	0.568**	3.1522	–	–	0.24
H08: Skills of IT Controller	0.407***	4.2340	–	–	0.36
Impact on coordination capabilities	–	–	*78.5%*	*0.25*	–
H09: Relevance	0.282**	2.7290	–	–	0.15
H10: Accuracy	0.352**	3.1792	–	–	0.18
H11: Fineness	0.078 n.s.	0.5062	–	–	0.01
H12: Broadness	0.054 n.s.	0.6237	–	–	0.01
H13: Timeliness	0.128 n.s.	0.9156	–	–	0.01
H14: Skills of IT Controller	-0.094 n.s.	1.0017	–	–	0.02
H15: Coordination capabilities	0.235*	1.7265	–	–	0.07

systems are better than existing systems. Few firms currently challenge their managers to quantify the expected benefits from updating their IT-related management control systems and processes. Justifying the expected benefits of such monitoring and coordinating systems require analysis and quantification of what improved transparency, increased business/IT-alignment and therefore better decision-making means. We believe that IS researchers can add much value in the development of methods that quantify the benefits of new control or governance mechanisms. Consulting firms sometimes conduct such analyses when estimating the cost savings or revenue enhancements associated with their proposals for new work with clients. However, we are unaware of any research that examines the reliability of the methods that consultants (or IT executives) use to make their projected governance benefits computations. “Show me the evidence” is a challenge IS researchers in these areas should acknowledge.

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