Association for Information Systems
AIS Electronic Library (AISeL)

ECIS 2011 Proceedings

European Conference on Information Systems (ECIS)

Summer 10-6-2011

PERFORMANCE EVALUATION UNDER UNCERTAINTY: THE IMPACT OF INFORMATION SYSTEM INTEGRATION ON PROCEDURAL JUSTICE PERCEPTIONS

Stephan Kramer

Alexander Simons

PERFORMANCE EVALUATION UNDER UNCERTAINTY: THE IMPACT OF INFORMATION SYSTEM INTEGRATION ON PROCEDURAL JUSTICE PERCEPTIONS

Kramer, Stephan, RSM Erasmus University, Burgemeester Oudlaan 50, 3062 PA Rotterdam, The Netherlands, skramer@rsm.nl

Simons, Alexander, University of Liechtenstein, Fuerst-Franz-Josef-Strasse 21, 9490 Vaduz, Principality of Liechtenstein, alexander.simons@uni.li

Abstract

The design and functioning of organizational control systems that allow for the monitoring of employee performance is at the core of management accounting research. With the emergence of enterprise resource planning (ERP) systems and the recent developments towards information system integration, the traditional structures of organizational control mechanisms have significantly changed. Only sparse evidence exists, however, regarding the role that the integration of information technology plays in performance measurement and evaluation. As a response, this paper investigates the impact that information system integration has on managers' attitudes towards their performance evaluation processes. Based on organizational justice theory we hypothesize that integrated information systems positively impact managers' perceptions of procedural justice, as these systems can improve the comprehensiveness and objectivity of performance data as well as the traceability of managers' decisions. We further hypothesize that this effect is amplified with an increasing environmental uncertainty the managers perceive. Survey evidence from 132 managers of companies in Germany confirms the hypotheses and highlights the importance of integrated information systems in the performance evaluation process.

Keywords: Information system integration, Performance evaluation, Performance measurement, Procedural justice, Organizational justice.

1 Introduction

Management accounting techniques and accounting information systems are fundamentally bound up with the process of evaluating the performance of employees in organizations (Merchant and Van der Stede 2007). Research in this area predominantly draws on psychological theory to explain the impact of performance metrics and measurement processes on managerial behavior (Luft and Shields 2009). Managers' perceptions about the fairness of their performance evaluation processes (procedural justice) have consistently been shown to be a strong predictor for important behavioral consequences such as trust, commitment and performance (Colquitt et al. 2001). Research on organizational justice brought forward strong arguments that both the involvement of the subordinate and the adherence to evaluation rules on the side of the supervisor (e.g. consistency, bias suppression and information accuracy) contribute to the perception of a fair performance evaluation process (Colquitt et al. 2001).

The rise of information system integration in organizations provides them with new opportunities for evaluating the performance of their employees. Accordingly, over the last few years, the concept of integrated information systems has been gaining momentum again in the management accounting research community. Rom and Rohde (2007, p. 41) put it as follows: "research within management accounting and information systems is coming alive again with the advent of integrated information systems". Perhaps most frequently, the effects of ERP systems on management accountants' work are estimated and evaluated (e.g., Granlund and Malmi 2002). With the emergence of integrated software packages for the management of central business functions such as customer relations (Wainwright and Waring 2004, p. 330) and enterprise content (Nordheim and Päivärinta 2006), however, ERP systems today remain only one specific, yet very popular, type of integrated information systems. At the most basic level, integrated information systems typically share a common database, connect different functional areas and geographically distal parts of the organization, and support the creation and processing of various types of information and data (Granlund and Malmi 2002; Lee et al. 2007; Rom and Rohde 2007, Wainwrith and Waring 2004). Integrated information systems are usually not regarded as classical accounting information systems, because they are neither implemented nor controlled by management accountants (Chapman 2005). Perhaps it is for this reason why management accounting research to this day has devoted only little attention to the potentials and challenges of integrated information systems (Rom and Rodhe 2007). This is an unfortunate development, however, because integrated information systems are clearly and deeply intertwined with accounting processes in organizations. Chapman and Kihn (2009, p. 151), for example, write that ERP systems "seek to systematise and co-ordinate […] record keeping, the design and implementation of structures of categorisation and aggregation of transactions, ultimately allowing for the generation and manipulation of comprehensive virtual perspectives on the nature and flow of operations and resources."

In this paper, we draw on organizational justice theory (e.g., Cohen-Charash and Spector 2001) to assess the effects of information system integration on perceptions of procedural justice. First, we hypothesize that integrated information systems have a direct and positive effect on procedural justice, because they provide performance information that is more consistent, objective and accurate than those of traditional control systems. Moreover, we argue that information system integration improves the traceability of a subordinate manager's decision making, which provides a basis to more objectively justify his or her performance assessments. Finally, we demonstrate that this effect is amplified as the environmental uncertainty the manager perceives increases.

The remainder of this paper is structured as follows. Section 2 provides a brief overview of the theoretical framework and explains the core concepts used in this study. Section 3 presents the research approach, including data collection, variable measurement and statistical methods. Section 4 summarizes the results of the study. Section 5 discusses the implications and limitations of these results and concludes the paper.

2 Theoretical background and development of hypotheses

Information system integration. There is still much confusion around the notion of integrated information systems. „Information systems (IS) Integration is a commonly used term that can mean all things to all people" (Wainwright and Warin 2004, p. 329). Rom and Rohde (2007), for example, conceptualize integrated information systems on the basis of both their components and their characteristics. As to the former, they mention the examples of ERP systems, data warehouses and executive portals. As to the latter, they point to the integration aspect of such systems, which relates to data, hardware/software and information in particular. In their review of prior research in the field, Wainwright and Warin (2004) separate information systems integration into three domains, namely technical, organizational and strategic. In this paper, an integrated information system, such as an ERP system, is perceived as "an enterprise-wide package that tightly integrates all necessary business functions into a single system with a shared database" (Lee and Lee 2000, p. 281). In the context of ERP systems, Chapman and Kihn (2009, p. 153) argue that the central concept of information system integration is an integrated information architecture which improves the information processing efficiency of ERP. As such, information system integration can increase the traceability of decision making as data entered in one place is saved into a common data source, from which information can be retrieved at any location and time (Chapman and Kihn 2009). Moreover, such systems not only provide financial metrics, but are also capable to capture and deliver non-financial performance indicators (Dechow and Mouritsen 2005). Much of the data that flows into these systems, however, is quantitative, and as such, they provide objective measures that directly stem from business operations (Chapman 2005).

Procedural justice. The notion of fairness in organizations refers to different types of justice, for example, distributive justice (perceived fairness of outcomes), procedural justice (perceived fairness of the allocation process) and interactional justice (perceived fairness of the way decision makers behave toward the recipients) (Cohen-Charash and Spector 2001). Among these, "[p]rocedural justice is the best predictor of work performance and of counterproductive work behavior" (Cohen-Charash and Spector 2001, p. 308). The concept specifically refers to employees' perceived fairness of the procedures applied for determining the outcomes of performance evaluation, such as salary, bonus payments or promotions (Leventhal 1980). It has been argued that perceptions of fair or unfair treatment in the performance evaluation process directly influence important behavioral outcomes, including trust, commitment, job-satisfaction, and performance (Colquitt et al. 2001). Perceptions of fair treatment are fostered when evaluation processes adhere to a number of specific rules. Among others, procedures should utilize accurate information (accuracy rule), be consistent across persons and time (consistency rule), be unbiased and objective (bias suppression rule), offer mechanisms for correction (correctability rule), and adhere to ethical and moral standards (ethicality rule) (Cohen-Charash and Spector 2001; Leventhal 1980). In addition, the ability to voice one's own views and arguments during a procedure, and the ability to influence the outcome itself have been demonstrated to be important criteria of procedural justice perceptions (Colquitt 2001, Thibaut and Walker 1975).

The effect of information system integration on procedural justice. It can be seen from the foregoing that, ceteris paribus, the informational sources that a superior can draw on in the performance evaluation process due to information system integration are more comprehensive, objective and consistent than those of control systems which are not supported by IT or only make use of rather isolated applications. This can be further explained as follows. First, decision makers can rely upon a unified structure of performance information when comparing employees' performance, because integrated information systems make use of shared databases (Chapman and Kihn 2009). As these databases can store information for multiple years, potential changes in performance metrics over time also become transparent. While both features can foster the consistency of evaluations, performance information is also likely to be more accurate with regard to the true performance capability of the manager. Because of the integration aspect that is central to these systems (Rom and Rohde 2007), potential frictions due to unconnected legacy systems are avoided. Accordingly, integrated information systems are able to deliver unambiguous and objective data and, hence, they can also reduce subjective biases in the perfor-

mance evaluation process on the side of the superior. In addition, information system integration enhances the hierarchical visibility of decisions, as it allows for both the testing of assumptions and relationships and the drill down from highly integrated summaries to more detailed reports of organizational activity (Chen and Popovich 2003). This provides the opportunity to detect and correct errors for which the manager is not accountable. Given that integrated information systems can further increase the transparency and traceability of decision making, it is also likely that they can positively influence the extent to which allocation procedures are perceived to uphold ethical and moral standards. In summary, we expect integrated information systems to foster procedural justice in the performance evaluation process through the adherence to the consistency rule, the accuracy rule, the correctability rule, the bias suppression rule, and the ethicality rule (Table 1). Therefore, we hypothesize:

H1: The effect of information system integration on procedural justice is positive.

Prodecural justice rule (Leventhal 1980)	Explanation (Cohen-Charash and Spector 2001)	Integrated information systems effect
Consistency rule	The allocation process should be consistent across persons and time.	Transparent display of potential changes in performance metrics over time; unified structures of performance information
Bias suppression rule	Decision makers' personal self-interests should not impact the allocation process.	Provision of quantitative and objective data can reduce subjective biases in the performance evaluation process on the side of the decision makers
Accuracy rule	The information used during the allocation procedure should be accurate.	Avoidance of potential frictions due to unconnected legacy systems; information is likely to be more accurate
Correctability rule	There should be opportunities and mechanisms to correct unfair decisions.	Hierarchical visibility of decisions can be enhanced; errors for which the manager is not accountable can be detected and corrected
Ethicality rule	The allocation procedures should match the moral and ethical values of the perceivers.	Transparency and traceability of decision making can be enhanced; improved awareness of allocation procedures among the employees

Table 1. Effects of integrated information systems on procedural justice

The effect of perceived environmental uncertainty. Environmental uncertainty captures the predictability or unpredictability of the external environment an organization operates in (Govindarajan 1984). With a growing degree of environmental uncertainty, the organization is limited in its ability to preplan activities; moreover, the resulting outcomes are increasingly affected by external events (Galbraith 1977). The downside risk that this uncertainty causes is that feelings of evaluation apprehension can occur, because a manager can be held accountable for developments that are out of his or her control (Merchant and Van der Stede 2007). Managers are more likely to perceive a performance evaluation process as unfair that relies on performance indicators which may be confounded by higher levels of uncertainty (Landy 1989). As explained above, integrated information systems provide an objective basis for discussions and allow for retracing the external developments and managerial responses, which fosters the correctability of superiors' decisions. These systems may also serve as a mechanism to counteract negative consequences of external developments, because they provide a wide range of performance measures in real-time. In sum, we expect that the impact of information system integration on procedural justice will increase with rising perceptions of environmental uncertainty. Therefore, we hypothesize:

H2: The interaction effect between information system integration and perceived environmental uncertainty on procedural justice is positive.

The resulting conceptual model is outlined in Figure 1, which shows a direct model in the top half and an interaction model in the bottom half. In addition, company size and company tenure of the manager have been included as control variables in the model to control for potential spurious effects (e.g., Cohen-Charash and Spector 2001). Both can be found on the right hand side of the figure. Hypothesized relationships are depicted as solid lines and control graphs as dashed lines.

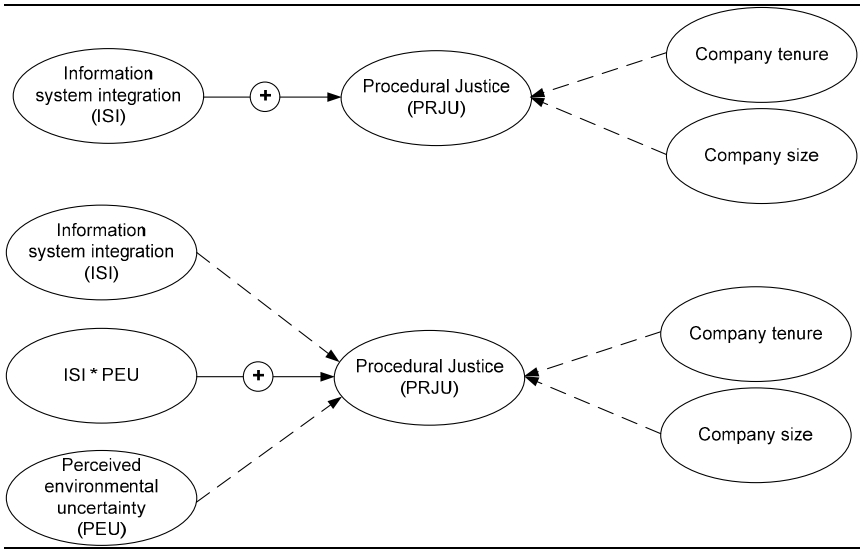

Figure 1. Conceptual model

3 Empirical study

Survey design. This paper is grounded in an empirical study conducted by the first author in 2009/2010, who sent a survey to 613 senior managers of companies in Germany to test the above hypotheses. The companies were selected from a commercial database that contains detailed information about 250,000 large companies in Germany. The design of the questionnaire and the contact procedure both followed the recommendations by Dillman et al. (2009). At the outset of the study, the managers were provided with a hand-signed cover letter by regular mail including some background information about the study and an assurance of confidentiality. As a token of appreciation and an incentive to participate, the respondents were promised a summary of the findings and assured of a donation of 10 € to a charity organisation of their choice in exchange for their response (Danneels 2008). Shortly afterwards, the managers were contacted via e-mail and provided with a link to the web-based survey. Three e-mail reminders were sent in intervals of two weeks on average. The survey yielded 140 responses, whereby eight responses had to be deleted due to incomplete or inaccurate completion of the survey[1], leading to an effective final response rate of 21.53 percent.[2] A non-response bias test was performed comparing the latent variable scores of the three main constructs from the first twenty observations with the last twenty observations of respondents. A *t*-test comparing the differences in the corresponding groups showed no significant differences at a threshold of $p < 0.05$, thus providing no evidence for non-response bias. Moreover, Harman's single factor test neither revealed a single factor nor did the first factor explain the majority of variance in the variables, indicating that common method bias is not a concern (Harman 1976). The Tables 2 and 3 provide descriptive statistics for the companies' and respondents' characteristics.

Variable measurement. The variables were all measured as latent constructs with reflective indicators. As all scales were derived from the extant literature but worded in German, a translation-retranslation procedure was performed to establish inter-language validity (Daniel and Reitsperger 1991; Hartmann

[1] The eight responses were deleted due to the following reasons: (1) The respondents failed to answer the vast majority of questions; (2) their time taken to complete the survey was drastically shorter in comparison with that of the other respondents; (3) the respondents failed to recognize reverse-coded items in the questionnaire.

[2] A randomly drawn number of non-respondents were contacted by telephone and asked about their motives for not participating in the study. The mentioned reasons for non-response were time pressures, a general company policy of not participating in survey studies and a perceived lack of representativeness for the subject under study.

2005). *Information system integration* was measured using an extended four-item scale which was initially developed by Chapman and Kihn (2009). A sample item is "Information in reports produced by our information systems is entirely based on common sources of data (e.g., a common database)" (see Appendix for more information on the survey items). The construct uses a Likert scale which is anchored from 1 (strongly disagree) to 5 (strongly agree). *Perceived environmental uncertainty* was measured using a well-established six-item-construct that is based on Govindarajan (1984) and which, for example, asks on a five-point Likert scale (varying from highly predictable to highly unpredictable) how predictable or unpredictable competitors' actions, market demand or governmental regulations are. *Procedural justice* was measured by a seven-item scale developed by Colquitt (2001), which draws upon the works by Thibault and Walker (1975) and Leventhal (1980). The construct is Likert-scaled from 1 (to a low extent) to 5 (to a high extent). The questions refer to the procedures used to arrive at the employees' outcome (e.g., base salary, bonus payments and promotion opportunities). A sample item is "To what extent have those procedures been based on accurate information?". *Company tenure* was measured by the number of years of the manager in the company. *Company size* was measured by the logarithm of the company's number of employees.

	n	%		n	%
Company size Number of employees			Company turnover Turnover (in million €)		
1 – 200	16	12.12	0 – 100	68	51.52
201 – 500	54	40.91	101 – 200	13	9.85
501 – 1,000	28	21.21	201+	45	34.09
1,001 – 2,000	10	7.58	n.a.	6	4.55
2,001+	24	18.18			

Table 2. Companies' descriptive statistics

	n	Minimum	Maximum	Mean	Std. Dev.
Respondent profile					
Age	131	32	68	48.41	7.16
Industry tenure	131	1	48	16.41	8.67
Company tenure	132	1	48	14.46	8.91
Position tenure	131	1	29	8.14	5.67

Table 3. Respondents' and their respective superiors' descriptive statistics

Method: To test the hypothesized effects, the partial least squares (PLS) approach to structural equation modeling was applied (Tenenhaus et al. 2005; Chin 1998; Wold 1985). PLS estimates the structural model, which involves paths between latent constructs that are indirectly measured with multiple indicators, by using an iterative ordinary least squares regression-like procedure (Chin 1998). Because PLS does not make distributional assumptions and proceeds iteratively as well as block-wise, the method is particularly suited for smaller sample sizes, such as the one of this study (Chin 1998). *SmartPLS 2.0 M3* was used for the calculations (Ringle et al. 2005) and a data analysis was performed to establish both the validity and reliability of the measures and the appropriateness of the causal model (Hair et al. 2006). The evaluation of the PLS models followed the procedure brought forward by Hulland (1999), which comprises of a sequential analysis of (1) the measurement model and (2) the structural model. (1) The adequacy of the measurement model was assessed by analyzing the individual item reliability, the internal consistency, the convergent validity, and the discriminant validity of the reflective constructs (Bagozzi 1994; Hulland 1999). *Individual item reliability* can generally be assessed by the factor loading of an item on its respective construct. Recommendations for satisfying levels of item reliability range from 0.71 to 0.4 (Chin 1998; Hulland 1999). *Internal consistency* was measured by Dillon-Goldstein's ρ, which, in contrast to Cronbach's α, does not assume that all indicators are equally reliable and thus suits the PLS algorithm better (Chin 1998). The literature considers a threshold of 0.70 sufficient (Tenenhaus et al. 2005). Finally, *the convergent and discriminant validity* of the constructs were assessed on the basis of the average variance shared between a construct and its indicators, labeled as "average variance extracted" (AVE) (Fornell and Larcker 1981). For an adequate

convergent validity, the AVE of each latent construct in the measurement model should exceed 0.50 (Chin 1998). A satisfying level of *discriminant validity* is given when the AVE of each construct is greater than the squared correlations with any other construct, and the cross-loadings of all indicators are highest with the corresponding construct (Fornell and Larcker 1981).

(2) After the evaluation of the measurement model, the structural model was estimated and evaluated in a next step. The path coefficients represent the strength and direction of the relationships among the latent variables and can be interpreted as standardized beta coefficients of ordinary least square regressions (Henseler et al., 2009). In order to obtain the standard errors of the path coefficients and to calculate the confidence intervals and assessments of statistical significance, a bootstrapping procedure with 500 replacements was employed (Chin 1998). By dividing the original PLS estimate of a certain path coefficient by the bootstrapping standard error, an empirical *t*-value was obtained, which permitted an empirical *t*-test for the significance of the corresponding path coefficient (Chin 1998). The assessment of statistical significance was complemented by the coefficient of determination (R^2), an analytical concept that stems from multiple regression (Cohen 1988). The predictive validity of the parameter estimates was assessed via the Stone-Geisser criterion Q^2, which was calculated through a cross-validated redundancy index (Geisser 1974; Stone 1974). In general, predictive relevance can be concluded from the model if Q^2 exceeds 0. In line with prior literature (e.g. Henseler et al. 2009) we deemed the model fit appropriate if, besides reliability and validity of the constructs, a significant amount of each construct's variance was explained and a positive Q^2 was obtained (Tenenhaus et al. 2005). As all components of our model were purely reflective, we employed the product-indicator approach to estimate the interaction term (Chin et al. 2003; Henseler and Chin 2010). Thereby, we created a new latent construct, which included the cross-product of the indicators of the underlying exogenous main variables. The test for significance of the interaction term was analogous to the procedure outlined above. Besides the significance of the path coefficient of the interaction effect, we followed Carte and Russel (2003) in their recommendation to further assess the effect size f^2 as an indicator for the strength of the interaction effect.

4 Study results

The results of the measurement model evaluation are summarized in the Tables 4 to 7.

Construct/ indicators	Loading original sample	Loading sample mean	Std. error	T-statistic (bootstrap)	Composite reliability *(ρ)*	Average variance extracted (AVE)
ISI					**0.89**	**0.67**
ISI_1	0.77	0.75	0.10	7.61		
ISI_2	0.89	0.87	0.08	10.60		
ISI_3	0.88	0.87	0.06	15.03		
ISI_4	0.73	0.73	0.09	8.44		
PEU					**0.76**	**0.45**
PEU_2	0.41	0.38	0.18	2.23		
PEU_3	0.74	0.71	0.13	5.52		
PEU_4	0.81	0.76	0.14	5.94		
PEU_6	0.67	0.64	0.15	4.31		
PRJU					**0.86**	**0.53**
PRJU_2	0.44	0.49	0.15	2.90		
PRJU_3	0.86	0.86	0.04	21.47		
PRJU_4	0.89	0.86	0.04	20.80		
PRJU_5	0.84	0.82	0.05	15.83		
PRJU_6	0.57	0.61	0.11	5.11		
PRJU_7	0.64	0.65	0.10	6.73		

Size and tenure were excluded due to their measurement with only one item, the interaction term ISI * PEU was excluded due to the fact that it is not an independent construct.

Table 4. Evaluation of the measurement model

Table 4 shows that most items have a good indicator reliability with factor loadings greater than 0.71, yet five indicators fail to meet this criterion.[3] However, because their *t*-statistics are significant and the composite reliability of the constructs exceeds 0.70 in all cases, these deviations are tolerable. As such, the results suggest proper individual item reliability and composite reliability. Convergent validity as assessed by the AVE of the constructs is also satisfying (only perceived environmental uncertainty marginally misses the criterion of 0.50). The results for discriminant validity are presented in the Tables 5 and 6. Table 5 provides evidence that the diagonal square roots of the AVE values exceed all other scores. Table 6 shows the cross-loadings of the items, indicating that they load highest on their respective construct. In sum, the results provide evidence for sufficient discriminant validity.

	ISI	PEU	ISI * PEU[1]	PRJU	Comp. tenure	Comp. size
ISI	**0.82**					
PEU	-0.05	**0.67**				
ISI * PEU[1]	0.04	-0.08	**0.35**			
PRJU	0.29	-0.27	0.30	**0.73**		
Comp. tenure	-0.07	-0.11	-0.11	0.05	**1**	
Comp. size	0.05	-0.07	0.19	0.11	0.03	**1**

Diagonal elements (bold) are the square roots of the variance shared between the constructs and their indicators (i.e. the square root of the AVE). Off-diagonal elements are the correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.
[1] Although it is not an independent construct, the interaction term is reported here for informational purposes.

Table 5. Discriminant validity coefficients and latent variable correlations

	ISI	PEU	PRJU
ISI_1	**0.77**	-0.06	0.13
ISI_2	**0.89**	-0.07	0.21
ISI_3	**0.88**	0.00	0.31
ISI_4	**0.73**	-0.06	0.24
PEU_2	-0.09	**0.41**	-0.04
PEU_3	0.06	**0.74**	-0.18
PEU_4	-0.02	**0.81**	-0.21
PEU_6	-0.13	**0.67**	-0.22
PRJU_2	-0.01	-0.02	**0.44**
PRJU_3	0.20	-0.24	**0.86**
PRJU_4	0.23	-0.21	**0.89**
PRJU_5	0.33	-0.29	**0.84**
PRJU_6	0.15	-0.08	**0.57**
PRJU_7	0.13	-0.13	**0.64**

Size and tenure were excluded due to their measurement with only one item, the interaction term ISI * PEU was excluded due to the fact that it is not an independent construct.

Table 6. Cross-loadings

The structural model provides evidence for the formulated hypotheses H1 and H2 (see Table 7). The results of the direct model show that information system integration generally has a positive effect on perceived procedural justice (0.294, $p < 0.001$). The explained variance R^2 of procedural justice in this model is 0.11 and the Stone-Geisser criterion Q^2 is 0.04. As such, these results support hypothesis H1. For the extended interaction model, the path coefficient of the interaction term between information system integration and perceived environmental uncertainty on procedural justice is positive and significant (0.263, $p < 0.001$), with an effect size of 0.07. The explained variance R^2 of procedural justice is 0.22 and the Stone-Geisser criterion Q^2 is 0.10. As hypothesized, the effect of information system integration on procedural justice is amplified with an increasing perceived environmental uncertainty. As such, these results support hypothesis H2.

[3] Three factors (PEU_1, PEU_5 and PRJU_1) failed to exceed the minimum threshold of 0.4 and were excluded from the further analysis.

Hypotheses	Path coefficient	Q^2	R^2	f^2
Direct model				
H1: Integrated information systems → Procedural justice (+)	0.294***			
Control graphs				
CG: Company tenure → Procedural justice	0.035n.s.			
CG: Company size → Procedural justice	0.120n.s.			
Endogenous variable				
Procedural justice		**0.04**	**0.11**	
Interaction model				
H2: Integrated information systems * Perceived environmental uncertainty → Procedural justice (+)	0.263***			**0.07**
Control graphs				
CG: Integrated information systems → Procedural justice	0.262***			
CG: Perceived environmental uncertainty → Procedural justice	-0.230**			
CG: Company tenure → Procedural justice	0.038			
CG: Company size → Procedural justice	0.031			
Endogenous variable				
Procedural justice		**0.10**	**0.22**	
Significance (two-tailed test, bootstrapping with 500 replacements)				
CG control graph; n.s. not significant; * p < .05; ** p < .01; *** p < .001				

Table 7. Standardized PLS parameter estimates and test for predictive validity

5 Conclusions

The purpose of this paper was to explore the effect of information system integration on managers' perceptions of procedural justice in the performance evaluation process. Survey evidence collected from 132 managers of companies in Germany confirms that integrated information systems positively impact procedural justice perceptions. The results further show that this effect is amplified with an increasing degree of the environmental uncertainty that managers perceive.

Implications. Given these findings, we believe that the paper makes an important contribution to the management accounting as well as to the information systems literature. For management accounting research, the study provides insights into the behavioral consequences of integrating information systems into the performance evaluation process. By showing that information system integration has a strong positive effect on procedural justice perceptions of managers, the study highlights the importance of further research on the behavioral consequences of information technology in management accounting research. "An in-depth understanding of the relationship between IIS [integrated information systems] and the design of management accounting techniques and their use is lacking." (Rom and Rohde 2007, p. 63). For the information systems community, the study demonstrates the importance of organizational justice theory and its interplay with information technology: Fairness perceptions so far have not been investigated in sufficient depth by information systems researchers. Only recently does this topic gain momentum in the community, although typically in different contexts (e.g., Son and Kim 2008; Turel et al. 2008). The study demonstrates that information technology does have an impact on justice perceptions. As justice perceptions are important determinants of performance, this field of research has a lot to offer for the information systems community.

Limitations. There are also some limitations to the presented findings that must be acknowledged. Perhaps most noteworthy, our operationalization of perceived environmental uncertainty might raise concerns about a formative instead of a reflective measurement. Although our approach is in accordance with prior studies that likewise used perceived environmental uncertainty (e.g., Govindarajan 1984; Gul and Chia 1994; Hartmann 2005), we acknowledge that the decision rules introduced by MacKenzie et al. (2005) may suggest a formative operationalization. However, the items for perceived environmental uncertainty asked about perceptions regarding certain aspects in the development of the economic environment. It is thus not unlikely that a general underlying perception or "feeling" about the environmental uncertainty spilled over to the corresponding dimensions, thus representing or re-

flecting a general impression about uncertainty. The statistical analysis of our data is also consistent with a reflective approach: An initial factor analysis revealed that the initial six items load on a single factor. The same holds true for the four item solution after scale purification. Moreover, all thresholds for the quality criteria of reflective variables, i.e. individual item reliability, internal consistency, convergent validity, and discriminant validity, were deemed appropriate. While resolving this potential conflict is beyond the scope of this paper, it is the authors' belief that the careful design of the survey and the conscientious analysis of the data at least mitigate concerns about biases in the obtained results. In addition, the survey method used in this study is known for its inability to establish causal relationships and its susceptibility to common method bias (Podsakoff et al. 2003; Van der Stede et al. 2006). However, taking into account the subject of the study, this method is considered appropriate. Finally, the study limits its focus to procedural justice. Other forms of organizational justice (e.g., distributive justice) may likewise be related to information technology and systems.

Future research. The presented results may inform future research within the academic disciplines of management accounting and information systems in several ways. As the results are only a first step towards the integration of findings from both communities, further research is needed that analyzes the complex interdependencies between both streams. For example, it is not well understood how information system integration impacts the different stages of the performance measurement cycle, such as the definition of performance measures, target setting, incentive provision, or performance measurement. Future studies can make more finely grained distinctions between these stages to estimate and evaluate the behavioral consequences that may result from the adoption of information technology. Also, the academic literature on information systems integration to a large extent focuses on ERP systems, thus neglecting other forms and components of integrated information systems (Rom and Rohde 2007). As such, fellow researchers are challenged to expand the scope of this research beyond the confines of ERP. In addition, it has been argued that an increasing degree of integration does not necessarily result in better system designs (Rom and Rohde 2007). Different levels of integration have not been considered in this research and may thus be part of future research in the field.

References

Bagozzi, R.P. (1994). Structural equation models in marketing research: Basic principles. In Principles of marketing research (Bagozzi, R.P. Ed.), pp. 317-385, Blackwell, Cambridge.

Carte, T.A. and Russell, C.J. (2003). In pursuit of moderation: Nine common errors and their solutions. MIS Quarterly, 27 (3), 479-501.

Chapman, C.S. (2005). Not because they are new: Developing the contribution of enterprise resource planning systems to management control research. Accounting, Organizations and Society, 30 (7-8), 685-689.

Chapman, C.S. and Kihn, L.-A. (2009). Information system integration, enabling control and performance. Accounting, Organizations and Society, 34 (2), 151-169.

Chen, I.J. and Popovich, K. (2003). Understanding customer relationship management (CRM): People, process and technology. Business Process Management Journal, 9 (5), 672-688.

Chin, W.W. (1998). The partial least squares approach for structural equation modeling. In Modern methods for business research (Marcoulides, G.A. Ed.), pp. 295-336, Lawrence Erlbaum Associates, London.

Chin, W.W., Marcolin, B.L. and Newsted, P.R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a monte carlo simulation study and an electronic-mail emotion/adoption study. Information Systems Research, 14 (2), 189-217.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. 2nd edition. Erlbaum, Hillsdale, NJ.

Cohen-Charash, Y. and Spector, P.E. (2001). The role of justice in organizations: A meta-analysis. Organizational Behavior and Human Decision Processes, 86 (2), 278-321.

Colquitt, J.A. (2001). On the dimensionality of organizational justice: A construct validation of a measure. Journal of Applied Psychology, 86 (3), 386-400.

Colquitt, J.A., Conlon, D.E., Wesson, M.J., Porter, C.O.L.H. and Ng, K.Y. (2001). Justice at the millennium: A meta-analytic review of 25 years of organizational justice research. Journal of Applied Psychology, 86 (3), 425-445.

Daniel, S.J. and Reitsperger, W.D. (1991). Linking quality strategy with management control systems: Empirical evidence from Japanese industry. Accounting, Organizations and Society, 16 (7), 601-618.

Danneels, E. (2008). Organizational antecedents of second-order competences. Strategic Management Journal, 29 (5), 519-543.

Dechow, N. and Mouritsen, J. (2005). Enterprise resource planning systems, management control and the quest for integration. Accounting, Organizations and Society, 30 (7-8), 691-733.

Dillman, D.A., J.D. Smyth and L.M. Christian (2009). Internet, mail, and mixed-mode surveys: The tailored design method. John Wiley & Sons, Hoboken, NJ.

Fornell, C. and Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18 (1), 39-50.

Galbraith, J.R. (1977). Organization Design. Addison-Wesley, Reading, MA.

Geisser, S. (1974). A predictive approach to the random effect model. Biometrika, 61 (1), 101-107.

Govindarajan, V. (1984). Appropriateness of accounting data in performance evaluation: An empirical examination of environmental uncertainty as an intervening variable. Accounting, Organizations and Society, 9 (2), 125-135.

Granlund, M. and Malmi, T. (2002). Moderate impact of ERPS on management accounting: A lag or permanent outcome? Management Accounting Research, 13, 299-321.

Gul, F.A. and Chia, Y.M. (1994). The effects of management accounting systems, perceived environmental uncertainty and decentralization on managerial performance: A test of three-way interaction. Accounting, Organizations and Society, 19 (4-5), 413-426.

Hair, J.R.J., W.C. Black, B.J. Babin, R.E. Anderson and R.L. Tatham (2006). Multivariate data analysis. Prentice Hall, Upper Saddle River, NJ.

Harman, H.H. (1976). Modern factor analysis. University of Chicago Press, Chicago, IL.

Hartmann, F. (2005). The effects of tolerance for ambiguity and uncertainty on the appropriateness of accounting performance measures. Abacus, 41 (3), 241-264.

Henseler, J. and Chin, W.W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. Structural Equation Modeling: A Multidisciplinary Journal, 17 (1), 82-109.

Henseler, J., Ringle, C.M. and Sinkovics, R.R. (2009). The use of partial least squares path modeling in international marketing. Advances in International Marketing, 20, 277-319.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. Strategic Management Journal, 20 (2), 195-204.

Landy, F.J. (1989). Psychology of Work Behavior. Brooks/Cole, Pacific Grove, CA.

Lee, Z. and Lee, J. (2000). An ERP implementation case study from a knowledge transfer perspective. Journal of Information Technology, 15 (4), 281-288.

Lee, S.M., Lee, Z. and Lee, J. (2007). Knowledge transfer in work practice: Adoption and use of integrated information systems. Industrial Management & Data Systems, 107 (4), 501-518.

Leventhal, G.S. (1980). What should be done with equity theory? New approaches to the study of fairness in social relationships. In Social exchange: Advances in theory and research (Gergen, K., M. Greenberg and R. Willis Eds.), pp. 27-55, Plenum Press, New York, NY.

Luft, J. and Shields, J.F. (2009). Psychology models of management accounting. Foundations and Trends in Accounting, 4 (3-4), 199-345.

MacKenzie, S.B., Podsakoff, N.P. and Jarvis, C.B. (2005). The Problem of Measurement Model Misspecification in Behavioral and Organizational Research and Some Recommended Solutions. Journal of Applied Psychology, 90(4), 710-730.

Merchant, K.A. and W.A. Van der Stede (2007). Management control systems: Performance measurement, evaluation and incentives. Prentice Hall, Harlow.

Nordheim, S. and Päivärinta, T. (2006). Implementing Enterprise Content Management: From Evolution through Strategy to Contradictions Out-of-the-box. European Journal of Information Systems, 15 (6), 648-662.
Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88 (5), 879-903.
Ringle, C.M., Wende, S. and Will, A. (2005). SmartPLS 2.0 M3. www.smartpls.de.
Rom, A. and Rohde, C. (2007). Management accounting and integrated information systems: A literature review. International Journal of Accounting Information Systems, 8, 40-68.
Son, J.-Y. and Kim, S.S. (2008). Internet users' information privacy-protective responses: A taxonomy and a nomological model. MIS Quarterly, 32 (3), 503-529.
Stone, M. (1974). Cross validity choice and assessment of statistical predictions. Journal of the Royal Statistical Society, 36, 111-133.
Tenenhaus, M., Vinzi, V.E., Chatelin, Y.-M. and Lauro, C. (2005). PLS path modeling. Computational Statistics & Data Analysis, 48 (1), 159-205.
Thibaut, J. and L. Walker (1975). Procedural justice: A psychological analysis. Erlbaum, Hillsdale, NJ.
Turel, O., Yuan, Y. and Connelly, C.E. (2008). In justice we trust: Predicting user acceptance of e-customer services. Journal of Management Information Systems, 24 (4), 123-151.
Van der Stede, W.A., M.S. Young and C. Xiaoling Chen (2006). Doing management accounting survey research. In Handbook of management accounting research: Volume 1 (Chapman, C.S., A. Hopwood and M.D. Shields Eds.), pp. 445-478, Elsevier Science, Oxford.
Wainwright, D. and Waring, T. (2004). Three domains for implementing integrated information systems: Redressing the balance between technology, strategic and organisational analysis. International Journal of Information Management, 24, 329-346.
Wold, H. (1985). Partial least squares. In Encyclopedia of statistical sciences (Kotz, S. and N.L. Johnson Eds.), John Wiley & Sons, New York, NY.

Survey items

Information system integration (ISI) / Scale from 1 (Strongly disagree) to 5 (Strongly agree)
1. Information in reports produced by our information systems is entirely based on common sources of data (e.g. a common database).
2. We have a fully integrated information system.
3. Our information system is connected to all functional areas and regions of our organization.
4. Our information system contains both financial and non-financial information.
Perceived environmental uncertainty (PEU) / Scale from 1 (Highly predicable) to 5 (Highly unpredictable)
Please assess the predictability of the following developments in the economic environment of your company (e.g., in the next 2 to 3 years):
1. Competitors' actions (*)
2. Market demand
3. Manufacturing technology
4. Product attributes / design
5. Raw material availability (*)
6. Governmental regulation
Procedural justice (PRJU) / Scale from 1 (to a low extent) to 5 (to a high extent)
The following questions refer to the process and procedures that were used to arrive at your outcomes (e.g., your base salary, bonus payment or promotion opportunities). To what extent…
1. Have you been able to express your views and feelings during those procedures? (*)
2. Have you had influence over the outcome arrived at by those procedures?
3. Have those procedures been applied consistently?
4. Have those procedures been free of bias?
5. Have those procedures been based on accurate information?
6. Have you been able to appeal the outcome arrived at by those procedures?
7. Have those procedures upheld ethical and moral standards?
(*): Items were deleted after scale purification.