JOURNAL OF MANAGEMENT ACCOUNTING RESEARCH
Vol. 24
2012
pp. 31–59

American Accounting Association
DOI: 10.2308/jmar-50240

The Role of Information Systems in Supporting Exploitative and Exploratory Management Control Activities

Michael Schermann
Manuel Wiesche
Helmut Krcmar
Technical University Munich

ABSTRACT: The goal of this research was to investigate the role of information systems (IS) in helping organizations to address the challenge of achieving a trade-off between exploitative and exploratory management control activities. The relationship between IS and management control activities is complex and stems from different theoretical backgrounds. We adopted a grounded theory approach to offer an integrative lens on this multi-faceted issue. Through the study of information systems for governance, risk management, and compliance (GRC IS) as a recent practice-driven initiative to establish the means for balancing exploitative and exploratory management control activities, we developed a grounded model of the relationship between IS and management control activities. Our model highlights the ways in which GRC IS serve as a catalyzer for establishing balanced management control systems that enable managers to simultaneously exploit and explore richer management control information.

Keywords: governance, risk management, compliance; GRC; information technology; management control; exploitation and exploration; grounded theory.

INTRODUCTION

A central issue in management research is finding and maintaining a balance between exploitative and exploratory activities (March 1991). Exploitative activities focus on efficiency and reducing deviations in performance and include standardization, refinement, and establishment of routines. Exploratory activities focus on innovation and include experimentation, risk taking, and search. While organizations that solely focus on exploitation may have difficulty developing new competitive advantages, organizations that solely focus on

The authors thank the anonymous reviewers at the *Journal of Management Accounting Research* Conference in Houston, Texas and Christopher S. Chapman for providing helpful comments on earlier drafts of this article. The authors acknowledge the invaluable support of Lydia Engler and Melina Elbert during data collection and data analysis. We acknowledge editorial revision of this manuscript provided by Carol Krcmar. We thank SAP AG for funding this project as part of the collaborative research center, Center for Very Large Business Applications (CVLBA). Support for this research was also provided by the Technische Universität München (TUM) Graduate School and the TUM Center for Doctoral Studies in Informatics and its Applications (CeDoSiA).

Published Online: July 2012

exploration may have difficulty transforming their innovative ideas into competitive advantages. Hence, the challenge to management is to achieve maintainable trade-offs to resolve the tension between exploitative and exploratory activities as they "are essential for organizations, but ... compete for scarce resources. As a result, organizations make explicit and implicit choices between the two" (March 1991, 71).

In management control research, this tension has been explored in relation to Simons' (1995) levers of control framework. Adopting quantitative and qualitative approaches, a number of studies have explicitly investigated how management controls entail balancing and trade-offs (e.g., Henri 2006; Mundy 2010; Widener 2007). An important aspect of management control activities is the nature of the information systems that support them, and so the goal of this research was to investigate the role of information systems (IS) in helping organizations address the challenge of achieving a trade-off between exploitative and exploratory management control activities (Simons 2010).

A complex relationship between IS and management control has been presented in the literature. Information systems help to reduce the effort required for acquiring, analyzing, integrating, and reporting information on organizational behavior and outcomes (Chapman and Kihn 2009; Dittmar 2007; Fisher 2007). In doing so, IS establish an integrated control overview (Chan 2002), enable organizations to measure control effectiveness (Ashbaugh-Skaife et al. 2008), and help to support decision-making (Beneish et al. 2008). Further, IS provide new capabilities for management control as "data become accurate, shareable, and available to different parties without creating the panoptic dream of visibility and action at a distance" (Dechow and Mouritsen 2005, 729).

Because the literature around this important topic is found in multiple disciplines with different theoretical backgrounds and concepts, we seek to offer an integrative perspective that draws together these diffuse insights. To help us develop such a perspective, we investigated the recent practitioner-driven phenomenon of information systems for governance, risk management, and compliance (GRC IS). Originally, GRC IS were developed as IT-enabled management control systems to respond to tightened regulatory requirements (e.g., the Sarbanes-Oxley Act). Thus, GRC IS support exploitative management control activities through the "automation of the management, measurement, remediation, and reporting of controls and risks against objectives in accordance with rules, regulations, standards, policies, and business decisions" (Caldwell et al. 2011, 3). More recently, however, organizations introduce GRC IS, without actual regulatory need, to support exploratory management control activities through establishing transparency and traceability in decision-making and new business analytics capabilities (Caldwell et al. 2011).

We adopted a grounded theory approach to investigate the role of IS in supporting exploitative and exploratory management control activities (Glaser and Strauss 2001; Suddaby 2006). In particular, we were interested in the rationale for introducing and using GRC IS by stakeholders such as executives, compliance officers, and administrative staff. The grounded theory approach seemed appropriate to integrate the diverse theories and concepts on the role of IS in supporting management control activities "as a stimulus [and] initial direction in developing relevant categories and properties and in choosing possible modes of" integrating extant literature (Glaser and Strauss 2001, 79). Thus, in terms of our research, grounded theory provides the methodological guidelines to study GRC IS as a practice-driven initiative. Using the principle of constant comparison (Glaser and Strauss 2001), we analyzed the responses from semi-structured interviews with 21 practitioners on the rationale and benefits of GRC IS. We did rounds of open coding using theoretical sampling for diversity. The resulting preliminary model was reviewed and discussed (Wiesche et al. 2011) which yielded further dimensions for coding. Based on the principles of theoretical sampling, we then conducted a second round of interviews, which led to theoretical saturation.

Our grounded model indicates that GRC IS serve as a catalyst for establishing balanced management control systems that enable managers to use controls to engage simultaneously in exploitative and exploratory activities. IT-enabled management control systems such as GRC IS facilitate an overview of the current state of an organization's management controls and offer opportunities for refinement and automatic execution of management controls. For exploitative purposes, GRC IS assist in assessing the effectiveness and efficiency of management controls. Simultaneously, GRC IS provide an information platform that offers richer and timelier data about performance deviations and emergent chances and risks. Managers can interact with GRC IS to develop and explore scenarios and experiment with exploratory and exploitative control information. Our model structures the catalyzing effects and relates these to different theoretical backgrounds of exploitative and exploratory management control activities. Thus we have integrated disparate views from the literature on the role of information systems in supporting management control activities.

The remainder of this paper is structured as follows. First, we describe the theoretical foundation for studying our research question. We then explain our inductive research strategy, outline our core analytic tenets, and present our approach to generate key conceptual categories. In the analysis section, we report on the development of our final understanding of GRC IS. In the results section, we explain the rationale and benefits of information systems for supporting exploitative and exploratory management control activities. In the implications section of the paper we describe our grounded model and discuss its implications for theory and practice. The final section of the paper presents our conclusion.

THEORETICAL BACKGROUND

For this study we adopted March's (1991) distinction between exploitative and exploratory management activities as a theoretical framework for achieving trade-offs in organizations. Exploitative activities focus on efficiency and reducing deviations in performance and include standardization, refinement, and establishment of routines. Exploratory activities focus on innovation and include experimentation, risk taking, and search. March's central argument is that organizations need to balance exploitative and exploratory activities to be successful. Exploitative and exploratory activities "compete for scarce resources. As a result, organizations make explicit and implicit choices between the two" (March 1991, 71). Hence, the challenge to organizations is to achieve and maintain trade-offs between exploitative and exploratory activities. The application of this argument has been useful in management research and organizational science (Kane and Alavi 2007; Gupta et al. 2006). By introducing March's argument to the management control literature, we follow Merchant and Otley's (2006) call for work contributing to an integrated theoretical body of management control.

In management control research, a number of studies have explicitly investigated how management controls entail balancing and trade-offs (e.g., Henri 2006; Mundy 2010; Widener 2007). The economics of management control is instrumental in achieving trade-offs. Here, the effort of acquiring and analyzing information about organizational behavior is weighed against the risk sharing agreements of principal and agent (Eisenhardt 1985). With regard to providing a rationale for management control design, the literature indicates that a trade-off between behavior and output controls is essential (Ouchi 1979). Mundy (2010), furthermore, suggests that a trade-off between a controlling and enabling use of control systems is required. Speklé (2001) discusses control archetypes that managers need to choose from when implementing management control systems.

The literature shows that information systems alleviate trade-offs between conflicting perspectives on management control activities; but the literature also presents a complex

relationship between IS and management control (Chapman and Kihn 2009). Research results on the effect of IS on management control suggest that several factors change the use of management controls, underlying control modes, and the control systems' effectiveness (Granlund 2009). We see four major effects of IS on management control systems (see Table 1).

The first effect is a reduced cost of collecting control data that leads to a more transparent agency relationship (Eisenhardt 1985). By enabling automated control, such as access control systems and document management systems for compliance, IS provide an opportunity for preventive controls (Rikhardsson et al. 2005). With regard to SOX 404 compliance management, effective IT-enabled control helps to reduce audit costs (Canada et al. 2009). Thus, IS reduce the need for a "trade-off between the cost of measuring behavior and the cost of measuring outcomes and transferring risk to the agent" (Eisenhardt 1985, 135).

The second effect of IS on management control systems is an enhancement of measurability of outcomes and an increasing ability to acquire "knowledge of the transformation processes" (Ouchi 1979). IS, such as ERP systems, identity management systems and customer-relationship management systems provide the ability to gather and share more detailed information about the behavior of the organization and outcomes (Sia et al. 2002). IS for business process management and workflow management help to increase knowledge of the transformation process by standardizing procedures, routines, and task descriptions thereby increasing transparency on variations (Tang et al. 2000; Lucas and Olson 1994; Le Grand 1997). Mass data analysis, pattern matching, and machine learning enable organizations to examine transformation processes for criminal activities (Debreceny and Gray 2010; Jans et al. 2007, 2010). Thus, IS blur the previously distinctive dimensions of measurability of outcomes and knowledge of the transformation process for designing effective management controls (Ouchi 1979).

Third, IS enable an integrated and interactive use of management control systems by providing integrated access and analytics on previously separated data sources within the organization, e.g., accounting, operations, or marketing (Chapman 1997). Research results suggest that control effectiveness is a function of the level of IS integration (Woods 2009). Integrated IS enable managers to discard "scattered business silos" by formalizing control routines across business processes and organizational areas (Volonino et al. 2004). The effect of IS for management control, however, depends on the use of control systems. For instance, researchers have shown that vertical IS strengthen existing formalized control structures resulting in a more coercive management

TABLE 1

Effects of IS on Management Control

Control Issue	Source	Trade-Off	Effects of IS
Economics of Control	(Eisenhardt 1985)	Cost of measuring behavior versus transferring risk to agent and measuring output	IS reduce the costs of collecting control data, which leads to a more transparent agency relationship.
Rationales for Control Design	(Ouchi 1979)	Behavior versus output control	IS enhance measurability of outcomes and increase the knowledge of the transformation process.
Use of Control Systems	(Mundy 2010)	Controlling versus enabling use	IS reduce barriers to an integrated use of management control systems.
Result of Control Mechanism	(Speklé 2001)	Mechanic versus exploratory control	IS allow the convergence of insights from the organization to be used in decision-making.

control system (Den et al. 1992). Integrative IS equip organizational members with internal and global transparency and allow greater degrees of flexibility and self-empowerment (Adler and Borys 1996; Chapman and Kihn 2009). Thus, barriers to an interactive use of management control systems are reduced with integrated IS (Mundy 2010; Bisbe and Otley 2004).

Last, IS allow insights from the organization to converge, accumulate, and facilitate the transfer of these insights in a timely manner to decision makers. Dechow and Mouritsen (2005) argue that IS are configured with certain control strategies in mind and are therefore limited in their capability to gather new information (Dechow and Mouritsen 2005). Newer IS, such as GRC IS, enable managers to establish controls for situations in which processes and procedures are vague (Wiesche et al. 2012). Hence, IS allow managers to establish exploratory controls to identify weak signals (Ansoff 1975; Speklé 2001).

Table 1 structures the complex relationship between IS and management control as presented in the literature. We are aware that the four presented effects do not offer an exhaustive overview of the complex relationship between IS and management control activities. We rather use the four effects as starting points for investigating IS for governance, risk management, and compliance. These four effects guided the development of questions for our interviews.

RESEARCH METHOD

Research Strategy

Our study was designed to explore GRC IS as a means by which organizations resolve the challenge of achieving a trade-off between exploitative and exploratory controls. We interviewed 21 practitioners responsible for GRC IS initiatives and asked them to describe and discuss their rationale and motives for introducing and using GRC IS. Our access to operational GRC IS allowed us to compare and validate responses from the practitioners. In particular, we were interested in the role of GRC IS in resolving issues regarding the objective, scope, and design of management control activities (see Appendix A). We considered this inductive approach appropriate to answer our research questions (Henri 2006). As recommended by Suddaby (2006) we followed the methodological guidance of Isabella (1990) for conducting and presenting our research.

Sample

Our study sample was chosen to maximize diversity and increase the possibility of finding different and varying data belonging to one sample. Our first step was to interview administrative staff responsible for management control systems. In the course of our interviews, we added the perspectives of other practitioners including auditors, consultants, executive managers, compliance officers, software architects, and risk managers (Table 2).

Because each perspective on GRC IS provides a distinct focal point on the topic, over the course of our study we interviewed two practitioners from each perspective and added an additional interview for each perspective later on to check for theoretical saturation. We met these practitioners at GRC workshops in Germany and used professional discussion groups and blogs to identify potential respondents. The interviews varied in length between one and one and one-half hours. All practitioners had between three and twenty-five years of experience in their profession; the average experience was more than eleven years. Although the backgrounds of the practitioners were diverse, their perspectives were grouped according to their job description at the time of our study.

After interviewing and analyzing two practitioners for each perspective, we conducted a second cycle of interviews for each perspective with an additional practitioner to substantiate theoretical saturation (Lee et al. 2006). We specifically selected these additional practitioners because they

TABLE 2

Characteristics of Interviewed Practitioners

Perspective Category	Interviewee ID	Language[a]	Educational Background	Length of Work Experience
Administrative Staff	Administrative staff 1	German	IT	6 years
	Administrative staff 2	German	IT	12 years
	Administrative staff 3	German	Accounting	9 years
Auditors	Auditor 1	German	Business	8 years
	Auditor 2	German	Accounting	4 years
	Auditor 3	German	IT	10 years
Consultants	Consultant 1	English	Business	10 years
	Consultant 2	German	Audit	23 years
	Consultant 3	German	Management	25 years
Executive Managers	Executive manager 1	English	Audit	16 years
	Executive manager 2	English	Compliance	10 years
	Executive manager 3	German	Accounting	6 years
Compliance Officer	Compliance officer 1	English	Finance	16 years
	Compliance officer 2	German	Finance	22 years
	Compliance officer 3	German	Law	12 years
Software Architects	Software architect 1	German	Accounting	17 years
	Software architect 2	German	IT	11 years
	Software architect 3	German	IT	7 years
Risk Managers	Risk manager 1	German	IT	14 years
	Risk manager 2	English	Risk Management	3 years
	Risk manager 3	German	Banking	10 years

[a] German quotations were translated into English by the authors.

were responsible for GRC IS initiatives in organizations that had recently been involved in public compliance or fraud scandals.

Identification of Rationales for Using GRC IS

The strategy we used in our research allowed the practitioners to describe and discuss their rationale for using GRC IS to support management control activities. We asked the practitioners to explain why they would implement GRC IS, what were the underpinning rationales and implications for its implementation, how does technology support these objectives, and who in their organization was involved in determining the scope and objective of GRC IS initiatives.

We structured the interviews along four themes to understand GRC IS as an initiative driven by practitioners. First, we asked the practitioners to explain the triggers that started the discussion about GRC initiatives and the introduction of GRC IS at their organization. We considered this important since the practical discussion on GRC IS is usually motivated by increased regulatory pressure. For instance, the Sarbanes-Oxley Act of 2002 (SOX) is considered a major trigger for creating the market for GRC IS (Hagerty and Kraus 2009; Volonino et al. 2004).

We also asked the practitioners to describe their interpretation and understanding of GRC IS. Although there have been efforts to formulate a common definition (Racz et al. 2010), there is still no shared understanding of GRC IS. From a practitioners' perspective, GRC IS are very broadly defined as the "system of people, processes, and technology that enables an organization to understand and prioritize stakeholder expectations, set business objectives that are congruent with

values and risks, achieve objectives while optimizing risk profile and protecting value, operate within legal, contractual, internal, social, and ethical boundaries, provide relevant, reliable, and timely information to appropriate stakeholders, and enable the measurement of the performance and effectiveness of the system" (Mitchell and Switzer 2009). GRC IS provide a variety of control mechanisms ranging from segregation of duties and process monitoring to risk management (Teubner and Feller 2008). In light of this broad definition, we considered the specific concepts, models, and frameworks for GRC IS advanced by the interviewed practitioners. Based on the different understandings of GRC IS we assumed these concepts, models, and frameworks would differ in terms of results and impact (Racz et al. 2010; Hagerty and Kraus 2009).

Third, we asked the practitioners to explain the different strategic motivations for introducing GRC IS within their organization. We assumed that practitioners would bring forward various strategic motives and rationales for seeking approval for an investment in GRC IS and that there would be differences in these reasons depending on the position of the interviewee in the organization. Literature sources suggest that auditors and consultants would focus on control deficiencies and the effects on the financial outcome (Ashbaugh-Skaife et al. 2008). Executive managers would focus on the IS-business alignment and adequate and efficient coordination of tasks (Chan 2002) whereas compliance and risk managers would concentrate on effective controls, cost reduction, and the integrity of IS (Ramakrishnan 2008). Software architects would focus on segregation of duty and process control (Hagerty and Kraus 2009) and administrative staff responsible for management control systems would focus on evaluating and selecting appropriate frameworks for GRC IS (Beneish et al. 2008).

We next asked the practitioners to describe the impact of GRC IS on their organization and to describe their efforts in tailoring GRC IS to their particular situation. Research results suggest that integrated IS would reduce the effort of acquiring and analyzing information on organizational behavior and outcomes (Eisenhardt 1985). Software vendors provide GRC IS as a portfolio to accommodate different requirements, standards, and regulations (Hagerty and Kraus 2009). The most common platforms include *BWise*, focusing on quantitative and qualitative risk and compliance management, *SAP GRC*, providing an integrated platform for role management, process control, and risk management, and *Thompson Reuter's eGRC*, providing advanced audit services such as regulatory content services, change and policy management, and regulatory tracking services.

At the end of each interview, we asked the practitioners to provide any additional information relevant for our research. The interviews were tape-recorded and then transcribed. Data were collected anonymously. We incrementally developed the set of questions for each interview based on our experience from prior interviews. While each interview covered the four themes, the incremental development of questions allowed us to explore new topics during interviews. This procedure follows methodological guidelines established in prior research (Isabella 1990; Suddaby 2006; Lee et al. 2006).

Analysis

We used grounded theory to analyze our data (Glaser and Strauss 2001; Suddaby 2006; Lee et al. 2006) and used previous work on the impact of IS on management control activities to support our reflection of the data and guide data analysis (Chapman and Kihn 2009; Dechow and Mouritsen 2005). This allowed us to substantiate our preliminary theoretical understanding using the most recently collected data and, at the same time, apply theories in an effort to interpret the collected data. This procedure took place in a cyclical manner; each cycle of interpretation produced an adapted interview plan and a new set of questions. After interviewing and analyzing two

practitioners from each perspective, we condensed our results into preliminary coding categories and presented them at a conference (Wiesche et al. 2011).

As a result of discussing our preliminary coding categories with academics, we added seven interviews with practitioners responsible for GRC IS initiatives in organizations that had recently experienced public compliance or fraud scandals in Germany. We expected that these practitioners had experienced the economic and public ramifications of insufficient management control systems and would therefore provide a different perspective on the scope and importance of GRC IS. These additional data led to a reanalysis of data and a second round of data analysis (Glaser and Strauss 2001). While this round of analysis substantiated our preliminary theoretical understanding, we discovered and consequently resolved an important conflict in our interpretation and subsequently created an additional conceptual category. We considered this repetition of information and confirmation of our existing conceptual categories as a signal of theoretical saturation (Glaser and Strauss 2001; Suddaby 2006).

We integrated our transcripts into one hermeneutic unit comprising 84,461 words and 74 pages of text using the software *ATLAS.ti*. The coding procedure was conducted following Glaser and Strauss' (2001) guidelines. First, the second author read and coded the interview transcripts line-by-line using phrases from the transcripts that described the phenomenon (open coding), and tagged similar phenomena with the same phrase. The first author similarly coded the transcripts independently. This resulted in a list of 139 codes and 687 phrases. We discussed and agreed on the differing codes. We then conducted a second open-coding step to consolidate the established conceptual categories. During axial coding, the conceptual categories and their interdependencies were examined for patterns and themes that might explain the tension between exploitative and exploratory management control activities. Table 3 outlines the selected phenomena, derived concepts, and conceptual categories.

RESULTS

Rationales for Using GRC IS

The interviewed practitioners provided very heterogeneous rationales for introducing and using GRC IS. Initially, organizations can conduct management control activities without standard software or specific GRC solutions. Spreadsheets and paper-based reporting fulfill fundamental requirements at low implementation costs. After the implementation of these procedures, companies quickly demand more effective, automated systems that allow monitoring control effectiveness and a reduction in audit costs. This led us to the categorization of various arguments for using GRC IS into four distinct rationales (see Table 4).

A first objective of GRC IS initiatives is to collect data for control purposes. GRC IS facilitate centralization and continuous measurement in order to reduce the effort of collecting data while increasing the breadth and depth of collected data. We call this rationale "control measurability." The next objective focuses on the confirmation of reliable controls. GRC IS facilitate automation and digitalization of controls to ensure continuous monitoring and examination. We call this audit-driven rationale "control performance." A third objective of GRC IS is to enable managers to identify and mitigate risks. GRC IS help to establish transparency through technologies such as data mining and business intelligence, thus, enhancing a manager's absorptive capacity (Cohen and Levinthal 1990). We call this rationale "risk responsiveness." Finally, the objective of GRC IS from the perspective of executive management is to support decision-making. GRC IS provide pattern analysis, benchmarking, and scenario analysis to aid in the assessment of outcomes of alternative management decisions. We call this rationale "management resilience."

In the following sections, we present each rationale in detail. Our identified rationales are structured according to the perspectives of the interviewed practitioners in order to reveal the

TABLE 3

Selected Codes, Derived Concepts, and Conceptual Categories

Selected Codes (Total 139)	Concept (Total 11)	Category (Total 5)
• Ease of collecting control information • Reuse data from ERP system • Automatically generate control reports • Less interruption of day-to-day work	Automation of collecting control information	Control measurability
• Continuous control monitoring • Data collection in real-time	Continuous control	
• Report control liability and effectiveness • Ensure that controls are in place and up-to-date • Automate processes to collect audit data • Find disconnected, fragmented information	Meet required regulations	Control performance
• Integrated, global segregation of duties • Allows effective fraud detection • Recognize undesirable behavior	SOX compliance	
• Use IS to accelerate audits • Management can observe organizational units • Process large amounts of control data • Provide real-time information	Enhance control effectiveness	Control coherence
• Reduce manual oversights • Allow automated control testing	Continuous monitoring of existing internal controls	
• Avoid fragmentation • Standardized workflow and risk reports • Check compliance in countries or units	Comparability	
• Build effective internal control system • Create organizational resilience	Prevent future incidents ahead of time	Risk responsiveness
• Early recognition of anomalies • Find early risks, blurry but indicator • Understand which loss indicators are correct	Avoid negative outcomes	
• Use positive incidents to drive innovation • Reduce reduction time for market trends • Use risk management to process abstract innovation	See opportunities	
• Use functional units reports to make decisions • Provide more information for management • Increase reliability of internal controls	Prepare decision support	Management resilience

divergent benefits that stakeholders harness from GRC IS. We identify areas of shared interest and particular concerns, specific to groups of stakeholders by contrasting the perspectives to facilitate constant comparison (Suddaby 2006).

Control Measurability

According to our analysis, one of the most central arguments for implementing GRC IS was the capability of GRC IS to automate the collection and aggregation of information for management control purposes. Consider the example of the implementation of an access control system for

TABLE 4

Rationales for Introducing and Using Information Systems for Governance, Risk Management, and Compliance (GRC IS)

Rationale	Control Measurability	Control Performance	Risk Responsiveness	Management Resilience
Task	Collect data for control purposes	Confirm control reliability	Identify and mitigate risks	Decision-making
Technology	Centralization, continuous measurement	Control automation, digitalization	Data mining, business intelligence	Pattern analysis, benchmarking, scenario analysis
Role	Employee	Audit	Management	Executive management
Impact	Completeness of data collection at reduced effort	Continuous monitoring and examination	Enhances absorptive capacity	Provide support for actions

assuring segregation of duties. This type of system supports data collection by predicatively analyzing ERP roles and aligning user rights with the organizational structure. Hence, control data are easily collected because they are automatically documented within an information system and can be collected remotely without interrupting the operational tasks of the employee. The interviewed practitioners reported that dedicated IS would resolve trouble and avoid rush on regular and unheralded audits. When in place, the additional work of collecting the necessary data is taken over by GRC IS. Table 5 provides example quotes on control measurability from the interviewed practitioners.

Using GRC IS for data collection is a first step toward continuous control monitoring; by using continuous control monitoring, organizations ensure that their controls are in place and effective. Existing controls must be integrated within GRC IS to allow the automatic determination of control effectiveness. Such systems enable organizations to see in real-time whether their control system is properly working. Instead of focusing on automating detective controls, GRC IS establish a preventive control set and ensure continuous monitoring of its effectiveness.

Control Performance

All practitioners we interviewed identified meeting compliance regulations as another dominant rationale for implementing GRC IS. Governmental regulations, e.g., SOX or Basel II, require organizations to report on the reliability and effectiveness of internal controls. In global, networked, and complex organizations, all practitioners reported that it is impossible to meet the plethora of regulations without the support of IS. The use of GRC IS help to comply with regulations through offering semi-automated and automated processes to collect and document relevant compliance information. GRC IS provide evidence that required controls have been implemented and are working properly. Further, GRC IS contribute to the early recognition of risks and to the implementation of adequate mitigation strategies. Table 6 provides example quotes on control performance from our data.

Automated internal controls in the context of GRC range from the segregation of duty to policies and codes of conduct. In the context of Enterprise Resource Planning (ERP) systems, consider again the example of access control. Access control is characterized by high-level process knowledge and task complexity. It includes automation of end-to-end access and authorization management with strong integration within the controlled IS. Access control can be implemented

TABLE 5

Exemplary Quotes for Control Measurability by Organizational Roles

	Roles				
Concept	**Administrative Staff**	**Auditors**	**Consultants**	**Executive Managers**	**Software Architects**
Automation of collecting control information	"We now have all data in a central system and we are able to gain additional information on certain risks without interacting with a particular division or country."	"If we had a compliance problem in Russia, I needed to find out first why it occurred. I used several manually started programs and then we analyzed the results. We approached the regional executives and told them that in this context an additional financial control and one more oversight control were required. That means that every time someone made a printout, he had to have it reviewed and signed by his supervisor. It was then filed in the archive for control purposes. With GRC systems, everything is connected."	"Auditors examine our books once or twice a year. A tool does this continuously and is working twenty-four-seven."	"Being the boss, I need to know that all our internal controls are in place. They need to be monitored continuously, not just occasionally; GRC systems can do this."	"We collect tons of data and every step in the collection process is properly documented within SAP [ERP]. The amount of data is too great to analyze by hand. We need professional systems such as GRC to handle this huge amount of data. GRC can help me track processes: I need to know who created the purchase order, who approved it, how it was used in production, and who took care of the invoice."
Continuous control	"The verification of invoices is based on the implemented inspection of the purchase requisition within our systems. It works only when the accounting department can access the data; that means that this information is in the system and can be checked. If volume or price of the purchase requisition and the final invoice differ, the invoice cannot be released for payment. This process is 100 percent automated. However, we still need to intervene if any anomaly should occur."		"As soon as the system runs properly, monitoring can be done in real-time. I instantly see what has happened and no one has to try to figure out what happened two weeks ago."		

TABLE 6

Exemplary Quotes for Control Measurability by Organizational Roles

	Roles			
Concept	**Administrative Staff**	**Executive Managers**	**Compliance Officers**	**Risk Managers**
Meet required regulations	"People used to blame IS for not supporting segregation of duties. Having this system, we can guarantee compliant provisioning since everything is automated and in real-time. Users can gain further system access if approved by management."	"We put most of our control services within [the GRC system]. Control owners conduct self-assessments that are documented and then sent to relevant stakeholders. This is done within the system. I get a report and with my auditors' oversight controls, I know that everything works out fine."		"Consider the example that the user in the procurement system has one ID and another ID for using other systems. If those systems are not connected within our GRC tool, I cannot check in which system the user was active. Especially in regard to purchase orders within the FI/CO system, numerous documents from other systems merge and generate FI bookings, general ledgers, sub-ledgers, accounts, and payments to customers and suppliers. Of course, we could arrange that all users have the same ID in every system. It is almost impossible to update this arrangement and it requires too much coordination. If a user changes department or leaves the company, then I can delete this user with one button from all systems using the access control system."

(continued on next page)

TABLE 6 (continued)

Concept	Roles			
	Administrative Staff	Executive Managers	Compliance Officers	Risk Managers
SOX compliance	"Today, our [access control] system permanently logs every access issue in every country. If we need to update roles or permissions, the system automatically validates this with the current role and permission matrix. If conflicts are discovered, the system will not allow the change. We implemented something like a compliance cockpit. The system generates reports about the situation of certain permissions in specific countries on a regular basis and sends the reports to the responsible executive. We are now able to meet every audit request at any given point in time and we can now provide absolutely clear information."	"Fraud happens often because of bad provisioning. Users get too many rights, spread across several systems and nobody is able to monitor by hand what is going on. Given that situation, employees start abusing the system. They may pilfer goods and mark the missing goods as not delivered, use fictitious vendors, or change customer bank account information within our system. Having a global access control system limits these opportunities significantly."	"We need documented processes. When there is no documentation, we just monitor single steps. If we know the workflow within the processes, we can use mining techniques to interpret the collected data. That's not the full truth, but at least it provides indicators."	

along the organizational value creation process and records and prevents access violations. This provides initial insights on fraud or other undesirable behavior. However, access control can only be implemented using IS, which enables the processing of mass amounts of data in real-time. Access control helps to address and support compliance with regulations such as SOX.

Risk Responsiveness

Our study results revealed clear evidence that the automated internal controls within GRC IS increase the ability to build effective management control systems by collecting early warnings. If interpreted correctly, early warnings can prevent negative outcomes in organizations. A situation relayed by one of the interviewed practitioners provides a good example of what can happen in the absence of GRC IS data control. The organization, "Alpha," has several hundred thousand employees in more than 70 countries and operates more than 100 different enterprise information systems for procurement alone. Despite SOX-required segregation of duties, management at Alpha is unable to oversee all systems. In the process of formulating less than 100 rules for segregation of duty and introducing automated access control monitoring, an internal audit detected several thousand violations during going operative with GRC IS. This example illustrates the extensive effort that is necessary to effectively meet regulations and shows that implementing management controls is no longer feasible without IS to support the processing of mass amounts of data. Although all of the violations were intercepted by the automated access control, Alpha investigated the most risky violations (e.g., access to top security information), which led to adapted business processes and tighter security measures. Table 7 provides example quotes on risk responsiveness from our interviews.

Organizational settings have become more complex and intricate and it is often impossible to manually monitor and investigate all factors indicating potential organizational misconduct. IT-enabled control allows management to continuously monitor and identify weak signals in anomalies and to develop a response to such weak signals in a timely manner. Management can develop countermeasures for negative incidents and use positive incidents to drive innovation. Automation can support this situation by enabling the processing of large amounts of data and reducing reaction time to incidents.

Management Resilience

Practitioners seek to support management decisions with data gathered from GRC IS. Because functional units report their situation to management and management uses this information as a basis for decision-making, the relayed information must be reliable: using GRC IS, management can easily and quickly verify the information.

Data generated from GRC IS help management to choose and compare appropriate measures for risk mitigation or to inform decision-making on innovations to enhance organizational performance. Further, GRC IS foster an interactive use of control data as the basis for informed decision-making. Example quotes on management resilience from our interviews are provided in Table 8.

How Do GRC IS Resolve the Tension between Exploitative and Exploratory Management Control Activities?

IS Facilitate New Conditions for Management Controls: Synchronicity and Certainty of Actions

We found that GRC IS alter the conditions for designing management controls. GRC IS enable managers to exploit task conditions as output and behavior become more measurable (Ouchi 1979). With regard to the exploratory use of management control systems, GRC IS synchronize control

TABLE 7

Exemplary Quotes for Risk Responsiveness by Organizational Roles

	Roles		
Concept	**Executive Managers**	**Software Architects**	**Risk Managers**
Prevent future incidents ahead of time	"Systems such as GRC IS create a new kind of transparency demanded by stakeholders. These systems help me guarantee that the company will still exist in five years; they please our customers, satisfy our employees, and create a positive image for in the general public. To convey this impression, we need data. And because of the large size of our organization, we need systems to collect this data."		"In contrast to our internal control system, GRC information systems have a different value proposition. Instead of only occasionally taking random samples, our system comprises 170–200 controls, which are implemented in our ERP and continuously monitor our processes. Hence, we have a forecasting system which signals everything is working properly and according to schedule."
Avoid negative outcomes	"The events of the past years show that things are not as unrealistic as expected. In collaboration with the executive committee, we had to decide whether we use IT-enabled risk management to reduce compliance costs or to recognize unsatisfactory events early enough to develop countermeasures. Therefore, we invested in software for GRC and are currently developing controls and KPIs, which will be integrated within our daily business to recognize risks earlier."	"From my personal prospective, I have been most interested in the problem of assessing risk levels. Usually you have very little data on which to base your assessment. But it's not so easy to estimate how likely it is that an incident will occur and how bad the reaction will be if it occurs. You always have limited resources for doing the risk analysis. So you could of course spend weeks and months just coming up with a lot of strange incidents that may potentially happen but you need to limit your analysis so that you are actually able to deal with the situation in the time frame that you have. So this dilemma between identifying all risks that may be relevant and at the same time being able to perform the risk analysis within a realistic time frame is a big challenge."	

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TABLE 7 (continued)
Exemplary Quotes for Risk Responsiveness by Organizational Roles

	Roles		
Concept	**Executive Managers**	**Software Architects**	**Risk Managers**
See opportunities	"I can conduct real-time monitoring. That means that I can see something happen as soon as it occurs so I don't have to reconstruct the event afterwards. This is of course covers a lot more information—though still not complete—than a certain excerpt that I request afterwards. This is the difference— and it is automated. No one is sitting for two weeks analyzing stuff that happened months ago."		"If you implement GRC for automatically managing controls within your organization, you can collect risk information to ensure business continuity. We consolidate information on risks and chances and aggregate this information for management. I am currently working on our operational risk report. In the IT department of our group, CIOs are narrow-minded and build their own platforms. We use enterprise architecture data to understand the developments and provide risk information to management regarding the heterogeneity of our systems and the need for transparency and cost allocation. Management has now decided to build a central IT platform."

TABLE 8

Exemplary Quotes for Management Resilience by Organizational Roles

	Roles		
Concept	**Executive Managers**	**Compliance Officers**	**Risk Managers**
Prepare decision support	"I am responsible for making decisions. Therefore, I need lots of data to make these decisions. The data need to be comprehensive and reliable. I always ask for more data and receive long lists, which I have to search for the details I want. This sometimes takes hours. People need to collect details on the employee level and the system needs to aggregate it for me, but leaving open the option to play with the data."	"The most interesting problem is assessing risk levels. Usually you have a few data points on which you can base your assessment. However, you need information about how high or low the severity of a certain risk is and—you need to decide whether it is worth the cost to do something about it... It is very easy to come up with potential incidents that could harm you in some way. Nevertheless, it is difficult to estimate how likely it is that those incidents will occur and their level of severity. You want to be able to identify as many potential incidents as possible. So this dilemma—finding the right tradeoff between identifying all risks that may be relevant and at the same time being able to perform the risk analysis in the given time frame—is a huge challenge."	"What happens if big companies do not have controls implemented? They don't have a chance to get competitive advantages, do not know what their employees do, and don't know anything about their value creation. However, they remain liable for work conducted in their organization. In large companies, such monitoring can only be done with information systems. Take for example access rights. In our purchasing department, we have several hundred thousand violations within one process—occurring all over the world."

events and control reports and enable managers to respond adequately based on the extensiveness of available control information (Ansoff 1975; Eisenhardt 1985).

Regarding the exploitation of task conditions, management can implement control systems depending on the conditions of the task. Ouchi (1979) argues that designing control systems depends on the task condition "ability to measure output" and the task condition "knowledge of the transformation process." For example, implementing output control systems requires a clear understanding of the results of the value creation process and the ability to evaluate the outcome (ability to measure output). Behavior control, on the other hand, requires knowledge of the transformation process and understanding of the involved resources (Ouchi 1979).

Our results showed that information systems change the underlying task conditions for control purposes. As reflected in the rationale "control measurability," IT-enabled management control systems enhance management's knowledge of the transformation process through precisely defined, documented, and enforced process descriptions (Hammer and Champy 1993; Davenport 1993). Centralized processes, continuous result documentation, and workflow management enable

transparency of organizational operations. Using again the example of Alpha, after implementing global access control through their GRC IS, Alpha was able to control employee behavior and automatically prohibit system access as necessary.

As reflected in the rationale "control performance," our results showed that GRC IS allow early collection of control information at reasonable costs (Canada et al. 2009; Speklé 2001). Systems can collect control information automatically, allowing auditors to get a complete picture of organization behavior and outcomes (Rikhardsson et al. 2005). Using another example from our interviews illustrates management's ability to easily control outcomes with GRC IS. Internal regulations for procurement at "Beta" include a purchasing limit for purchasing agents. If the value of goods exceeds a certain amount, management must approve the purchase. However, purchase agents could split orders into smaller purchases where each purchase does not exceed the purchasing limit. Despite the risk of splitting purchases being well known, auditors seldom caught these splits. At Beta, the GRC IS comprised process controls that identified split purchases by monitoring all purchase orders to identify similar transaction entries without interfering with legitimate purchasing. In this instance, GRC IS enhance management's ability to measure output by providing details on every split purchase immediately before the purchase order was issued.

The rationale of "risk responsiveness" relates to the delay between an incident and the point of time when control data about this incident are available for management. GRC IS enhance the timeliness of control information by providing real-time processing and analysis of control information for use by management (Granlund 2009; Mundy 2010; Plattner and Zeier 2011). Consider again the example of Beta. The auditors in Beta's accounting department are responsible for ensuring that the implemented controls are in place and functioning. An internal audit was conducted every quarter. Auditors found instances of fraud committed several weeks past by employees of Beta. GRC IS in combination with new data base technology provides Beta's internal auditors with real-time data on incidents and enables Beta to analyze suspicious transactions speedily and terminate them before fraudulent activities could get through.

GRC IS also increase the range of management decisions by visualizing, restructuring, and aggregating complex control information to foster solution development for multifaceted problems. GRC IS allow benchmarking, scenario planning, and pattern analysis for better decision-making by the executive management (Sia et al. 2002; Debreceny and Gray 2010). Consider the case of "Gamma." Gamma originally implemented a GRC IS to better meet compliance regulations. Later, Gamma implemented data mining techniques to analyze data on business process deviations, which enabled management to identify non-compliant transactions. Gamma's management used these insights to improve the business processes.

Control Coherence as Antecedent for Simultaneously Exploitative and Exploratory Management Control Activities

Consistently across all interviews, practitioners reported on the benefits of integrated IS. As other researchers have shown for the domain of ERP systems, integrated IS approaches provide a common database that allows generating and manipulating "comprehensive virtual perspectives on the nature and flow of operations and resources" (Chapman and Kihn 2009, 151). GRC IS transfer this functionality of integrated record keeping to the domain of management control systems: previously separated control data can be integrated and analyzed to gain deeper insights on the state of the management control system.

The practitioners reported that continuous monitoring is one of the central benefits of GRC IS. GRC IS provide the functionality to reduce intervals between control reporting events from months to minutes. Instead of just examining samples, all control events are recorded and analyzed with GRC IS, which allows the detection of all control violations. The interviewed practitioners reported

that prior triggers for investigation (e.g., deviations larger than U.S.$10,000) no longer apply as even minor violations could be investigated with little additional effort. On the other hand, data gathered during the course of continuous monitoring do not immediately raise suspicions about potential performance deviations or risks. While these cues are timely, their implications for decision-making are not always clear. Thus, continuous monitoring enables organizations to accrue signals—albeit weak—about organizational behavior and outcomes (Ansoff 1975; Speklé 2001).

The combination of a common database and continuous monitoring requires managers to deal with initially vague control information that may become more specific over time (Ansoff 1975). Managers can now experiment with this dataset to develop grounds for decision-making (March 1991) and can develop temporary controls based on this experimentation to support or refute hypothesized implications and thus increase their knowledge of the transformation process. GRC IS support this process by providing the means to establish new controls and to automatically create the legally required control documentation for internal and external auditing.

GRC IS provide a balancing perspective, often referred to as process control by practitioners, on various exploitative and exploratory management control activities that are part of the organizational transformation processes. This balancing perspective enables each process owner to establish an individual "dashboard" that systematizes and organizes the users' information needs, related management controls, conducted analyses, and reports. According to the interviewed practitioners, working with these dashboards helps to establish a coherent set of controls that meets the information needs of the process owner. GRC IS establish a coherent set of effective controls on the process level and, thus, alleviate the trade-off between allocating resources to exploitative and exploratory management control activities.

By combining the common database and the balancing perspective of GRC IS, users can share definitions of particularly effective or highly critical controls. Thus, users not only monitor existing controls but also begin to develop new controls. Controls can also be used to establish benchmarks across departments or subsidiaries of an organization. Exemplary quotes from our interviews are provided in Table 9.

A Grounded Model of the Effect of IS on Management Control

Our research established four rationales of using IS to support management control activities. In the following, we discuss a grounded model to provide help in understanding the rationales for using IT-enabled management control systems as identified through our interviews. This model is based on existing literature on management control systems and categorizes the identified rationales for using IS to support exploitative and exploratory management control activities. Figure 1 presents an overview of this model.

We found two underlying objectives for IT-enabled management control systems; one entails an exploitative approach to management control activities, the other entails exploratory management control activities. The objective of ensuring organizational performance focuses on exploiting the situational context and the conditions of the tasks under control. Ensuring organizational performance, therefore, requires control strategies that follow the rationales of control measurability and control performance. These rationales focus on exploitative management control activities that help to detect performance deviations exhaustively and in a timely manner. The objective of ensuring organizational integrity focuses on exploring the conditions of the implemented management controls to identify new threats to organizational integrity. Ensuring organizational integrity requires control strategies that follow the rationales of risk responsiveness and management resilience. These rationales focus on exploratory management control activities that help to identify prior unknown risks and to develop new management controls from initially vague control information. Our analysis suggests that IT-enabled management control systems

TABLE 9

Exemplary Quotes for Control Coherence within Each Rationale

	Roles			
Concept	**Control Measurability**	**Control Performance**	**Risk Responsiveness**	**Management Resilience**
Enhance control effectiveness	"With GRC software, the data can be collected and presented easier: just connect it to your ERP and other systems and as soon as a value exceeds a certain limit, the person in charge is notified."	"Every control was centralized; every piece of documentation crossed my desk. Today, we empower middle management within the department. They have access to the system and they have knowledge, which means they have the control. They collect all the data and send senior management a summarization of the data which they then can use for drilldown."	"Risk responsiveness ensures, for example, that receivables do not unnecessarily increase and the company stops delivering goods. Auditors should check the routines but it is no longer necessary to check each transaction."	"To ensure access control performance, the systems have to be integrated with process controls. Process controls allow the testing of the effectiveness of internal controls."
Continuous monitoring of existing internal controls	"Most of our controls are so-called transaction level controls and are a part of day-to-day operational work. We are trying to build our ERP systems and control landscape in order to have as much automatic validation and process control as possible."	"We were recently working on currency controls which are now implemented within our GRC system and which our auditors now test only once a year. The auditors focus on the difficult currency control issues and our system ensures automated full control over less complicated issues."	"Although initially triggered by providing evidence for implementing risk management and internal control systems, companies want GRC systems to go beyond these narrow solutions. . . .In a recent project, we created process transparency leading to the ability to evaluate control effectiveness. . . Finally, data have to be summarized and trimmed. Only then will management be able to know how the company is doing and what decisions it has to make to correct possible errors."	

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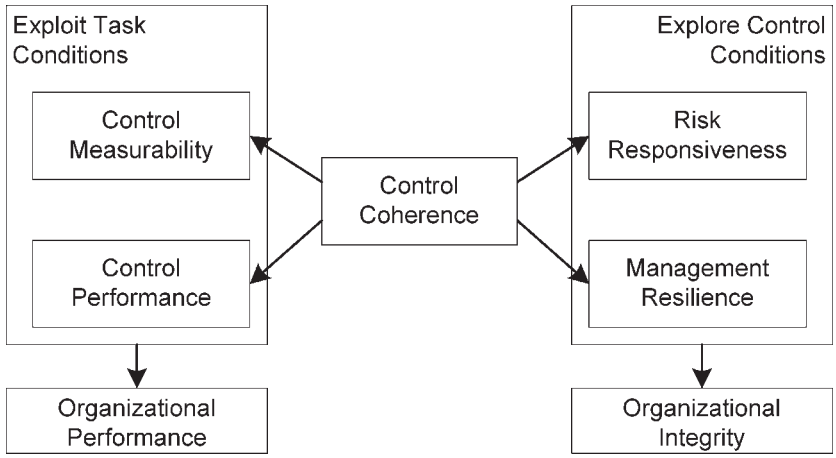
TABLE 9 (continued)

Exemplary Quotes for Control Coherence within Each Rationale

	Roles			
Concept	**Control Measurability**	**Control Performance**	**Risk Responsiveness**	**Management Resilience**
Comparability		"If we had a compliance problem in Russia or England..., I always had to find out first, why it occurred. I used several manually started programs and then analyzed the results. We approached the regional executives and told them that we needed an additional financial control and an additional oversight control for these problems. That means that every time someone made a printout, he had to get a signature from his boss that he reviewed the printout. The signed printout was stored in the archive for control purposes. With GRC systems, everything is connected."		"It is important to ensure GRC convergence. The function of monitoring . . . is very important throughout the organization. I can tell you that the average company has . . .different risk management functions. All risks seem different and similarities can easily be overlooked. Therefore, management doesn't necessarily have a good overview of the whole company—they don't often see the total risks."

FIGURE 1
The Balancing Role of Information Systems in Supporting Exploitative and Exploratory Management Control Activities



foster a balance of these two objectives by providing an integrated database, continuous monitoring, and dashboards.

Management control systems have different underlying control objectives. On the one hand, managers use management control systems to align the goals and risk preferences of their employees with the organization (Cardinal et al. 2010; Merchant and Otley 2006). In this respect, control systems serve the purpose of ensuring organizational performance (Ouchi and Maguire 1975). This objective is driven from an internal perspective since managers need this information to run the organization (Merchant and Otley 2006). On the other hand, our data revealed that management also implements control systems to provide transparency of their activities to stakeholders (Lange 2008; Jensen 1993); these control systems afford organizational integrity (Committee of Sponsoring Organizations of the Treadway Commission 2004). Management can use the collected control data to produce reports for external stakeholders, to assess if organizational aims have been met, and to assess if the organization has been compliant with standards, rules, and guidelines (Lange 2008; Fisher 2007; Volonino et al. 2004). IT-enabled management control systems support managers in developing new ideas and initiatives (Marginson 2002; Widener 2007). This externally driven perspective is heavily influenced by compliance requirements (Volonino et al. 2004). IT-enabled management control systems balance this internal perspective of organizational performance control and the external perspective of organizational integrity.

IT-enabled management control systems allow managers to simultaneously pursue exploitative and exploratory objectives. The opposing objectives of exploit task conditions to ensure organizational performance and to explore control conditions to ensure organizational integrity have different impacts on designing management control systems. IT-enabled management control systems enable organizations to establish control coherence and, as a result, management is able to design management control systems that serve both purposes. This requires balancing performance-oriented controls and demonstrating the achievement of compliance through documenting organizational integrity (Chapman and Kihn 2009; Dechow and Mouritsen 2005; Speklé 2001). We found that IS provide a common database for both exploitive and exploratory activities. Hence, IS enhance the designing of control strategies through a balance of management control activities.

In summary, IS reduce "the distance in time and space between activities . . . and realization of returns" for exploratory management control activities (March 1991, 85).

IMPLICATIONS

We investigated the role of IS for designing and managing control systems within organizations. IT-enabled management control systems provide monitoring to prevent errors, which we call "ensuring organizational performance," and to strengthen organizational resilience, which we call "ensuring organizational integrity." We identified the impact of IS on control design strategies comprising cost effectiveness, integrity, the measurement of control success, and mass data processing. When implemented, IT-enabled management control systems provide organizations with the capability to balance management controls for various purposes.

A first look at the data gleaned from the interviews revealed highly diverse interpretations of GRC IS among practitioners. The practitioners' understanding of GRC IS ranged from "it is an IT product" to "it is a management philosophy" and differed, as we expected, from one another according to the role of the practitioner in the organization. Practitioners used GRC IS as an initiative for implementing systems for ensuring segregation of duties (software architects), or as a system used to document and report organizational controls (administrative staff), or as a means to align business processes and organizational controls (auditors). Practitioners defined GRC IS as an integration of operational and strategic risk management (compliance officers). Finally, the executives we interviewed described GRC IS as a management philosophy for situational awareness based on IT-enabled control data collection (consultants, executive managers).

Our grounded model indicated the opportunities for control design strategies through balancing the exploitation and exploration of data on performance deviations and emergent chances or risks. We showed that IS catalyze three important objectives of management control activities. First, control automation allows managers to exploit an ever-increasing amount of data for control purposes. Second, IT-enabled management control systems enable managers to explore control data to find new risks and new opportunities. Third, IT-enabled management control systems foster a coherent view on the rationales of using information systems to add value to management control. We integrated these catalyzing effects into a grounded model that positions IS in the context of management control literature.

The goal of this research was not to exhaustively list all feasible impacts of IS on management control, but rather, by conducting inductive research, to illustrate and categorize important rationales of using IS to support management through simultaneous exploitative and exploratory management control activities. There are several aspects of our research worth highlighting. First, it might be beneficial to focus on the impact of IS on control coherence in future research projects. Investigations as to how organizations can effectively select and orchestrate management controls would be worth pursing. Future research might also address the mechanisms of selecting and evaluating management controls. As suggested by Alles et al. (2008), further research could provide decision support for selecting management controls that are suitable for automation. Research on control coherence would certainly enhance what is currently known about the overall theory of organizations as advocated by Jensen (1993).

Our grounded model has practical implications as well. It provides structure to use GRC IS beyond purposes aimed at achieving compliance with regulatory guidelines. Further, the model provides practitioners with an overview of existing rationales for implementing GRC IS to tailor future GRC initiatives. Our research provides a starting point for strategic reasoning for initiating GRC IS in an organization.

We acknowledge that there are limitations to our study. The grounded theory approach was based on 21 interviews, which were chosen by theoretical sampling. Although the exploratory

nature of the study and our aim of maximizing diversity allow certain broadness at the expense of depth, selecting only three experts from each GRC perspective could bias findings and limit the generalization of the results to a larger population. Since the scope of this research was to explore rationale for initiating GRC IS, further research should address a broader empirical validation. In addition, organizational control theory might not be the appropriate theoretical lens for conducting research on GRC IS; goal-setting theory, which is output oriented, might be a viable alternative (Locke and Latham 2002). Instead of using theories from management and organization science, we could have used computer science or IS theories and related them to accounting information systems. For example, the theory of technology dominance (Arnold and Sutton 1998) might have provided insights into assessing the impact of IS on management control, especially in terms of management resilience. We also focused on exploiting existing control capabilities. Future research should address the issue of workarounds within IT-enabled management control systems and their effect on the discussed rationales (Ignatiadis and Nandhakumar 2009). Finally, most of the functionalities provided by GRC IS were newly introduced to the market by GRC IS providers at the time of the interviews. Hence, we could not account for long-term effects of GRC IS. Future research should investigate these long-term effects.

CONCLUSION

In this study we investigated the role of IS in helping organizations to address the challenge of achieving a trade-off between exploitative and exploratory management control activities. We adopted a grounded theory approach to seek an integrative perspective that draws together the different theoretical backgrounds on the complex relationship between IS and management control. We investigated IS for governance, risk management, and compliance (GRC IS) as recent practice-driven initiatives to establish the means to balance exploitative and exploratory management control activities. We conducted our study by comparing the responses from semi-structured interviews with 21 practitioners on the rationales and benefits of GRC IS. We conducted one round of open coding using theoretical sampling for diversity. A second round of interviews was conducted with practitioners who were responsible for GRC IS initiatives in organizations that had recently experienced public compliance or fraud scandals. We developed a grounded model that showed that GRC IS serve as a catalyzer for establishing balanced management control systems that enable managers to simultaneously exploit and explore richer data on performance deviations and emergent chances and risks. We identified the exploitative rationales of control measurability and control performance as well as the exploratory rationales of risk responsiveness and management resilience as fundamental rationales for the implementation of GRC IS. Our analysis revealed that GRC IS further alleviate the trade-off between exploitation and exploration by providing the means to establish control coherence. The grounded model integrates previously disparate literature on the role of IS in supporting management control activities.

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APPENDIX A

Interview Questions

First Interview

Current Position

- In which department do you work?
- What is your position in the company? (How long have you been employed in this position?)
- What are your duties and responsibilities?
- What is your expertise with GRC IS?

Understanding of GRC IS

- In your opinion, what are the basic elements of GRC IS?
  - What is GRC IS?
  - What is the most important element of GRC IS?
  - Which economic concepts does GRC IS include?
  - Which technical aspects does GRC IS include?
- How does GRC IS influence your work?
  - What is GRC IS used for?
  - Who in your organization benefits from using GRC IS?
  - How can the value of GRC IS be measured?
  - Does GRC have an impact on the company's business value?
- What information is necessary for GRC?
  - Where are these data gathered?
  - How are the data gathered?
  - Who decides what data are gathered?
- Do you know GRC IS reporting structures?
  - How are data from GRC IS communicated?
- What GRC platforms do you know?
  - From your perspective, how do you rate the quality of [name of software]?
  - What are the strengths of this tool?
  - Which elements need to be improved?
  - Which elements are missing?
  - Why did you choose [name of software]?

Last Interview

Current Position

- Please briefly describe the activities and functions of your department.
- What are your tasks and responsibilities?
- What experience do you have in your GRC domain?
- Please describe the most important processes in your GRC unit.
- To whom do you report?

Tasks Related to GRC IS

- Please describe how you collect/manage/visualize/monitor your data.
- Do you share/exchange any data with other GRC domains?
- Please describe how this is done. Can you give examples?
- Why do you share/exchange this data?
- With whom do you share/exchange the data?
- How often do you share/exchange data?
- Do you experience any problems with this process? If so, please describe them.
- What do you gain by sharing/exchanging this information?
- How could information systems support your tasks?
- What kind of management controls are implemented within GRC IS?
- What are the benefits of using GRC IS with automated controls?
- What are the reasons for implementing non-automated controls?
- Within your management control system, how much focus is placed on centralization and standardization?
- How do you use guidelines within your organization?
- How do you ensure that guidelines are properly followed?
- To what extent are controls integrated within the business processes and do not require any additional employee efforts?

(continued on next page)

APPENDIX A (continued)

First Interview	Last Interview

Integrated Perspective on GRC IS
• Why do you think governance, risk management, and compliance tasks are considered jointly?
  ○ Can you identify the value added by considering GRC jointly?
  ○ What would be missing if GRC were considered individually?
  ○ Which relationships would be ignored?
  ○ How does the integration of GRC create synergies?
  ○ Please name and explain dependencies between the corporate functions of governance, risk management, and compliance.
	Key Performance Indicators
	• Have you defined any key performance indicators/key figures?
	  ○ Are they clearly defined?
	  ○ Are they effective?
	  ○ Can they be realistically achieved?

Technological Developments
• How does GRC IS support management control tasks?
  ○ How does GRC IS support the integrated perspective on risks within the company?
  ○ How can GRC IS be connected to existing company processes?
  ○ Which tasks could not be performed without GRC IS?
• How are GRC-relevant data extracted from existing (ERP) systems?
  ○ Are there standards to support data exchange between GRC systems?
	Technological Developments
	• Which tasks do/could you manage with GRC software?
	• Why do/would you do it?
	• What is your goal?
	• What is/could be the impact of a software solution?
	• Have you experienced any difficulties with GRC software?
	• How are tasks supported by the use of information systems?
	• Which software solutions have you chosen and why?
	• What are the advantages and disadvantages of these solutions?
	• Do you have any specific requirements for GRC IS?
	• Does your solution fulfill all your requirements?

Challenges • In your opinion, why does management need GRC IS? • What were the main challenges when you started your GRC initiative?	**Challenges** • If you had the chance to design your own GRC solution, what would it look like? • Please explain how you ensure effectiveness of your information systems. • Which challenges do/would you meet in your attempt to achieve effectiveness, transparency, and automation?