

EXPLORING THE CONTRIBUTION OF INFORMATION TECHNOLOGY TO GOVERNANCE, RISK MANAGEMENT, AND COMPLIANCE (GRC) INITIATIVES

Manuel Wiesche, Technische Universität München, Chair for Information Systems,
Boltzmannstrasse 3, 85748 Garching, Germany, wiesche@in.tum.de

Michael Schermann, Technische Universität München, Chair for Information Systems,
Boltzmannstrasse 3, 85748 Garching, Germany, michael.schermann@in.tum.de

Helmut Krcmar, Technische Universität München, Chair for Information Systems,
Boltzmannstrasse 3, 85748 Garching, Germany, krcmar@in.tum.de

Abstract¹

Information technology (IT) has a tremendous impact on the discipline of accounting by introducing new ways of retrieving and processing information about performance deviations and control effectiveness. This paper explores the role of IT for managing organizational controls by analyzing value drivers for particular accounting information systems that commonly run under the label of Governance, Risk Management, and Compliance (GRC IS). We apply a grounded theory approach to structure the value drivers of GRC IS into a research framework. In order to understand the impact of IT, we relate the GRC IS value drivers to control theories. Practical implications include understanding GRC IS benefits beyond compliance and providing clear strategic reasoning for GRC IS depending on the individual company's situation. Research implications include the fact that integrating IT into the context of accounting leaves several unsolved yet promising issues in theory which future research might address. This paper is the first to use the lens of organizational control theories on Governance, Risk Management, and Compliance information systems and establishes a potentially fruitful research agenda for GRC IS as a highly relevant topic for information systems research.

Keywords: Accounting Information Systems, Information Technology, Organizational Control, Risk Management, Compliance, Governance, GRC

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1 Introduction

Information technology (IT) has a tremendous impact on the discipline of accounting. IT is seen as the catalyzing element of transforming the accounting discipline from pure information provision to a knowledge services profession (Sutton 2010). Especially the implementation of management controls has been changed fundamentally by IT. On the one hand, information systems such as Enterprise Resource Planning systems separate financial from non-financial data and therefore enable better financial accounting. On the other hand, they provide new potential for management control as “data become accurate, shareable, and available to many different parties but does hardly create the panoptic dream of visibility and action at a distance” (Dechow & Mouritsen 2005).

Nonetheless, management accounting literature lacks an integrated understanding of the impact of IT (Dechow et al. 2006, Woods 2009). Although studies report on the relevance and potential of IT (Chapman & Kihn 2009), there has hardly been any research on the impact of IT on accounting (Granlund 2009). A literature review by Efendi et al. (2006) within the top accounting journals provides evidence that confirms this statement. However, important claims in this regard are emerging from the practitioner literature. Practitioners argue that IT can help cope with accounting complexity (Fisher 2007). Organizations can use IT for cost minimization of accounting (Dittmar 2007), an integrated control overview (Chan 2002), control effectiveness (Ashbaugh-Skaife et al. 2008), and decision support (Beneish et al. 2008).

With the aim of understanding the impact of IT on accounting, this research focuses on empirical findings that support the understanding of information systems for Governance, Risk Management, and Compliance (GRC IS), which belong to the category of accounting systems, to collect and store data for processing into information used by decision makers (Hagerty & Kraus 2009). In this paper, we define GRC as the integrated governance, risk, and compliance perspective on management controls for accounting (Ashbaugh-Skaife et al. 2008). By controls, we understand interpersonal influence relations within organizations, enabling idiosyncratic behavior and compliance with the strategic plan and is therefore fundamental for any organization (Merchant & Otley 2006).

Since the purpose of this paper is to appraise the impact of IT on accounting by understanding value drivers of accounting information systems such as GRC IS, our research question is: *What are value drivers of GRC IS and how can they be structured?* We apply a grounded theory approach to identify and structure value drivers of GRC IS. With the intent to fully explain and predict the impact of IT, we develop a theoretical framework and relate our empirical findings to extant theories from management and organization science.

In the next section, we summarize practical and academic perspectives on accounting information systems. We then proceed by reporting on a grounded theory approach to reveal the value driver of GRC IS. In section 3, we give an overview over different perspectives on GRC IS in practice and what their value drivers are. In section 5, we discuss our findings, develop an integrated framework, and link it to existing theory. As a next step, we outline implications for research and practice. In section 6, conclusions are drawn.

2 Background

2.1 Academic Perspective on Accounting Information Systems

From academic point of view, researchers discuss the integration of accounting and IT in case studies (e.g. Butler & McGovern 2009), solutions for IT departments (Bonazzi et al. 2010) and regulations (Volonino et al. 2004). Although there is extant research on the business value of IT from accounting perspective, literature rarely discusses the value driver of IT on management control (Chapman &

Kihn 2009). To the best of the authors' knowledge, academic literature lacks the integration of theory concerning both IT and management accounting (Efendi et al. 2006, Sutton 2010), with the notable exception of Woods (2009). Woods builds theory from case studies by revealing the "critical role played by good information systems as tools to support the control process itself" (Woods 2009, 18), but further pointing out that "there is still a lot of research to be done on risk management systems and the interface between risk management, internal control and governance" (Woods 2009, 19).

Even though there is an extant body of knowledge on controls in accounting (Merchant & Otley 2006), there is hardly any theoretical research on IT value drivers on management control (Granlund 2009). Although literature criticizes failing internal control systems (ICS) (Jensen 1993) and demonstrates awareness of the impact of IT on accounting (Rom 2008, Sutton 2010), effects of IT on developing better controls have not been investigated yet. This is speculated to be due to the vicissitude of developments of IT and a lack of interest in both disciplines for the respective other (Dechow et al. 2006).

2.2 Current State of GRC IS in Practice

The Sarbanes-Oxley Act (SOX) in 2002 caused the development of new accounting information systems which can be found under the label of GRC IS, which today are certainly prominent in practice (Hagerty & Kraus 2009, Volonino et al. 2004). Although there have been efforts to formulate a standard definition (Racz et al. 2010), there is still no common understanding of GRC (Mitchell & Switzer 2009). Various concepts, models, and frameworks for GRC exist, whose structure depends on the author's perspective on this broad topic (Hagerty & Kraus 2009, Racz et al. 2010). Based on the different understandings of GRC, GRC IS differ in terms of results and impact. GRC IS provide a variety of control mechanisms ranging from segregation of duties and process monitoring to risk management (Teubner & Feller 2008, Wiesche et al. 2011).

Practitioners report different underpinning strategic reasoning and subsequently different value drivers for introducing particular features of GRC IS: Auditors and consultants focus on control deficiencies and the effects on the financial outcome (Ashbaugh-Skaife et al. 2008). Governance experts include the IT-business alignment and adequate and efficient coordination of tasks (Chan 2002). Compliance experts concentrate on effective controls, cost reduction, and the integrity of IT (Ramakrishnan 2008). Software vendors focus on segregation of duty and process control (Hagerty & Kraus 2009). IT practitioners focus on frameworks for the design of GRC IS (Beneish et al. 2008).

3 Research methodology

With the intent of scrutinizing the impact of IT on accounting, we conducted an exploratory study on GRC IS using the methodology of grounded theory as proposed by Glaser and Strauss (2001). According to this research methodology allows building theories of "process, sequence, and change pertaining to organizations, positions, and social interaction" (Glaser & Strauss 2001, 114). It is an inductive and theory building methodology, which ensures grounding the theory in empirical observations or data. This approach can be considered particularly appropriate, since there has been hardly any research on GRC IS as the integration of management controls and IT (Efendi et al. 2006).

Since this research builds upon practitioners' broad understanding of GRC IS value drivers, the focus of the selection of comparison groups for theory building was on maximizing diversity (Glaser & Strauss 2001). Maximizing diversity increases the possibility of finding different and varying data belonging to one sample. The differences support category building and summing up the data. This research shares GRC IS as a common unit of analysis, but uses different organizational settings as contexts. We conducted qualitative data analysis (Glaser & Strauss 2001) on 14 expert interviews.

3.1 Sampling and Data Collection

In order to achieve the highest diversity possible, we chose a broad view on GRC, including all perspectives that relate to IT-enabled controls within organizations (Table 1). The professions and disciplines relevant for this research included audit, consulting, governance, compliance, risk management, IT, and managers in terms of GRC IS (cf. section 2.2 for further details).

Perspective	Expert ID	Language	Length	Background	Experience
Audit	Auditor 1	German	1 h 04 min	Business	8 years
Audit	Auditor 2	German	1 h 04 min	Accounting	4 years
Consulting	Consultant 1	English	1 h 25 min	Business	10 years
Consulting	Consultant 2	German	0 h 59 min	Audit	23 years
Governance	Governance expert 1	English	1 h 02 min	Audit	16 years
Governance	Governance expert 2	English	1 h 15 min	Compliance	10 years
Usage	Company expert 1	German	0 h 51 min	Computer Science	6 years
Usage	Company expert 2	German	1 h 13 min	Computer Science	12 years
Compliance	Compliance expert 1	English	1 h 07 min	Finance	16 years
Compliance	Compliance expert 2	German	1 h 49 min	Finance	22 years
Software	IT professional 1	German	1 h 22 min	Accounting	17 years
Software	IT professional 2	German	1 h 59 min	Computer Science	11 years
Risk	Risk manager 1	German	1 h 04 min	Information Systems	14 years
Risk	Risk manager 2	English	1 h 02 min	Risk Management	3 years

Table 1. Perspectives on GRC IS and Interviewees.

Since the different perspectives on GRC provide different focal points, we interviewed two experts from each perspective using convenience sampling. We met experts on GRC workshops in Germany and used professional discussion groups and blogs to identify potential respondents. All experts had between 3 and 23 years of experience in their profession; the average experience was more than 12 years. Although the experts all had different backgrounds, we grouped their perspectives according to their current job description. We conducted the interviews using guidelines with semi-structured questions, including questions about the experts' GRC understanding, the integration of the three G, R & C silos, GRC systems, and potentials of GRC systems as well as questions regarding the developed influencing factors on GRC. We tailored the interview guidelines to understand the potential of GRC IS and continuously substantiated the questions using the material from former interviewees.

3.2 Data Analysis Procedure

We tape-recorded, transcribed, and anonymized all interviews. We integrated the transcripts from the 14 interviews into a hermeneutic unit, comprising 67,761 words and 58 pages of text using the software ATLAS.ti. The coding procedure was conducted following Glaser and Strauss' (2001) guidelines. Firstly, the first author read and coded the interview transcripts line-by-line, using phrases from the transcripts that describe the phenomenon (open coding), and tagging similar phenomena with the same phrase. Following that, the second author likewise coded the transcripts independently. This resulted in a list of 129 codings and 563 phrases. We discussed and agreed on the differing codes. Furthermore, we conducted a second open coding step to consolidate the established categories. We put the derived concepts in coherence and then aggregated them into value driver categories.

4 Results

A first look at the interview data revealed high diversity regarding the elements of GRC IS. The interviewees stated various understandings ranging from IT products to management philosophy. A detailed look at the background and the GRC perspective helped classify the elements depending on

the underlying value drivers. We asked the interviewees to explain why s/he would implement GRC IS, what the underpinning goals and the impacts of the implementation were, how technology serves these goals, and who is involved in GRC IS concerning responsibility, accountability, consulting and being informed. As stated in section 3.2, we followed the fundamental analytical process by breaking down the described phenomena. We compared them to others to reveal similarities and differences and started to conceptually label and develop the categories. In the next steps, we built and tested the relationships between the categories, finding that each category was related to an IT value driver (table 2). We identified more statements relating to the developed categories and grouped them into an overall core category, the underlying motivation to introduce and operate GRC IS, which in the following is referred to as *value driver*. We derived the following four value drivers as unique to the GRC IS discussion since they require an integrated perspective of GRC and require the introduction of information systems. In the following, we will describe the discovered value drivers.

Selected phenomena (total 129)	Concept (total 9)	Category (total 4)
report control liability & effectiveness	Meet required regulations	Control performance
ensure that controls are in place and up-to-date		
automate processes to collect audit data		
find disconnected, fragmented information		
integrated, global segregation of duties	SOX compliance	
allows effective fraud detection		
recognize undesirable behaviour		
use IT to accelerate audits	Enhance control effectiveness	Control coherence
management can observe organizational units		
process high amounts of control data		
provide real-time information	Continuous monitoring of existing internal controls	
reduces manual oversights		
allows automated control testing	Comparability	
avoid fragmentation		
standardized workflows and reports for risks		
see whether certain countries or units are compliant		
build effective internal control system	Prevent future incidents ahead of time	Risk responsiveness
create organizational resilience		
recognize anomalies early	Avoid negative outcomes	
find early risks, blurry but indicator		
understand which loss indicators are right	See opportunities	
use positive incidents to drive innovation		
reduce reduction time for market trends		
use risk management to process abstract innovation	Prepare decision support	Management resilience
use functional unit's reports to make decisions		
provide more information for management		
increase reliability of internal controls		

Table 2. Selected phenomena, derived concepts, and corresponding categories

4.1 Control Performance

In all interviews, experts stated meeting regulations as value driver of GRC IS. SOX and other regulations require organizations to report on the reliability and effectiveness of internal controls. Especially in global, networked and complex organizations, it is impossible to meet the plethora of regulations without the support of IT. GRC IS support meeting these regulations through using manual and automated processes to collect and document relevant information. GRC IS help provide evidence to auditors that certain controls were implemented and are working properly. They contribute to the early recognition of certain risks and to the implementation of adequate mitigation strategies.

“Companies need to document that they have implemented monitoring and controls and prove to auditors that they are effective. Such requests are prominent in all regulations such as SOX and GRC systems help achieving these requests.” (Auditor 1)

Automated internal controls in the context of GRC range from segregation of duty to policies and code of conduct. In the context of Enterprise Resource Planning (ERP) systems, the most prominent control is segregation of duty, called access control. Access control is a control mechanism, which is characterized by high process knowledge and tasks complexity. It includes automation of end-to-end access and authorization management with strong integration within the access control solutions. Such controls can be implemented early in the organizational value creation process and provide first insights on fraud or other undesirable behavior. Such controls can only be implemented with IT, enabling the processing of masses of data in real time and allow compliance with e.g. SOX:

“Without automation, GRC activities are disconnected and fragmented across the organization. The inefficient and manual processes leads to duplication of efforts, higher operational and manpower costs, loss of opportunities, revenue and competitive advantage. [...] The integration of backend ERP systems with GRC application[s] enables automated controls.” (Governance expert 2)

4.2 Control Coherence

An aspect, which persistently appeared in the study, was the ability to create transparency over internal controls, which are performed in the background of existing information systems. The different GRC perspectives reveal certain reasons for creating transparency. From an audit and compliance perspective, transparency accelerates audits and therefore reduces costs. Similarly, before the implementation of IT-enabled control, management had to rely on their employee’s engagement. Organizations were not able to know about all tasks performed on each hierarchical level. Therefore, they had to trust their employees and could only monitor the results at a reasonable level of costs. Automated controls are able to process high amounts of data and provide information in real time. This allows satisfying management’s need to get structured, real-time, and comparable information:

“It is important to ensure GRC convergence. The function of monitoring [...] is very important throughout the organization. I have seen it a few times now and I can say you that the average company has [...] different risk management functions. All risks seem different and similarities can easily be overlooked. So management doesn’t have a good view of the whole company. They can’t see the total risks.” (Governance expert 1)

Experts gave several examples ranging from the energy sector to risk management solutions for IT companies, providing automated testing of controls. A prominent example for controls, which provides transparency and contributes to comparability, is called process control. Process control serves as control for continuously monitoring existing internal controls. It further ensures a standardized workflow and reporting. Hence, process control spares cost-intensive manual oversight and provides a real time integrated perspective.

“To ensure e.g. access control performance, the systems have to be integrated with process controls. Such controls allow testing the effectiveness of internal controls.” (Governance expert 2)

4.3 Risk Responsiveness

The study results revealed clear evidence that automated internal controls within GRC IS increase the ability to build effective ICS, which prevent future incidents early in time. In organizations, there are often enough warnings, which, if correctly interpreted, could prevent certain negative outcomes from happening. The case of one interviewee’s organization, Alpha, may serve as a good example to understand why these warnings often perish. Having several hundred thousand employees in more than 70 other countries, Alpha operates more than 100 different IS for procurement alone. Regarding the SOX-required segregation of duties, management is not able to oversee all these systems. Even when aggregating less than 100 standard rules and introducing automated access control monitoring, internal audit detected several ten thousand violations when going live. This illustrates the extensive

effort, necessary to fulfill regulations, and reveals that implementing internal control today is not possible without support of IS. They ensure the processing of the high amounts of data. Alpha plans to further implement GRC functionality, providing Meta control for automated internal control monitoring which provides additional data for companywide risk management.

“With GRC concepts, companies can implement controls which [...] support the early processing of information and providing information on possible company risks which might be blurred, but if ignored might result in serious harm to the organization.” (Governance expert 1)

Today’s organizational settings become more complex and intricate, and it is often impossible to monitor and control all contributing factors. Although there has always been early information on possible negative outcomes, there was hardly any possibility to examine all indicators and derive preventing measures. IT-enabled control allows management to monitor continuously and rate weak signals in anomalies that possibly lead to both, negative and positive outcomes. Management has to find countermeasures for negative incidents, but can use positive incidents to drive innovation. Automation supports this argument, as it enables mass data processing and reduces reaction time.

“Risk management is a way to process abstract innovation. It is based on data which is won e.g. through access control and which is aggregated for representation to management.” (Consultant 2)

4.4 Management Resilience

Practitioners operating GRC solutions request decision support from the gathered GRC information. The functional units report on their situation and management use this information as basis for their decisions. Therefore, this information needs to be reliable. Before the development of solutions based on automated controls, management had to rely on informal control mechanisms like guidelines and codes of conduct, both not guaranteeing reliable results. With the development of GRC IS, management is able to verify the given information and to compare different reports.

“Management had to rely [on] reports and estimations with different quality and hierarchical level from various functions across the organization. At the end of the day, they had to decide [...] based on this information. The new approach [GRC IS] enables management to have transparency through reporting structures and tasks. I am convinced that it creates transparency and better knowledge of the employee’s tasks.” (IT professional 2)

Building upon data from GRC IS, enough information for management has been aggregated and selected to provide management resilience. Using the data provided by GRC IS, management can choose countermeasures for mitigation or seize the chance of positive variation to innovate and enhance organizational performance. Management can use the GRC IS to examine additional and more detailed information, if necessary for this specific decision.

“You ha[ve] a risk management officer and you ha[ve] risk intelligence, but judgment [is] not being applied. This is a big failure because risk was not given that attention that it has needed. When you are thinking about having effective governance, it includes the situation of risk. You cannot have effective governance and strategies if you do not understand risks. So management has to take risk into account.” (Governance expert 2)

5 Discussion

5.1 A Framework for GRC IS Value Drivers

The different examples and underlying perspectives on GRC IS reveal that practitioners differ in terms of their GRC IS value drivers. As an initial step, GRC initiatives (1) aim at fulfilling regulatory requirements through implementing risk management systems and effective controls. Initially, organizations can implement controls without standard software or specific GRC solutions. Spreadsheets and paper-based reporting fulfill fundamental requirements at low implementation costs. Having implemented such procedures, companies quickly demand (2) more effective, automated

systems that allow monitoring control effectiveness and reduce audit costs. Therefore, systems that provide Meta controls are implemented. Such Meta controls monitor control effectiveness and provide internal audit with an overall picture of existing controls and their coherence. To understand the organizational situation, the gathered control data has to be interpreted (3). Interpreting the data helps identifying risks and potentials for the organization. Finally, the control results, especially violations (4), ensure management resilience. Automated control systems allow control preprocessing, enabling managers to focus on variance and the interpretation of this anomaly. The variance from standard procedures does not always allude to risks and dangers but can be seen as a chance for innovation within the company. Consultant 1, an interviewee with more than 20 years of experience in the field of IT consulting, summarizes the differences in value driver as follows:

“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 create process transparency, leading to the ability to evaluate control effectiveness. [...] Finally, this data has to be summarized and thinned out. Only then, management is able to know how the company is doing and what decisions it has to make to correct possible errors.” (Consultant 1)

Using the prominent example of GRC IS, we identified several contributions of IT on accounting (Table 3). IT enables exploitation and exploration of controls in accounting. On the one hand, IT has impact on the efficiency and effectiveness of controls (see line 1 and 2 in Table 3), on the other hand, it allows new potentials in developing effective control systems and provide additional decision support for management resilience (see line 3 and 4 in Table 3). When designing internal controls, IT ensures control standardization and therefore audit efficiency through automation. Auditors are able to get an integrated picture of the complex control implementation. Similarly, IT ensures control coherence as automation and mass data processing enable monitoring the effectiveness of controls and therefore choosing the right control composition. Furthermore, IT enhances accounting toward knowledge service providers as it allows interpretation of weak signals and providing decision support. Aiming at implementing more effective ICS, IT creates transparency through ubiquity of information and therefore enhances management’s absorptive capacity. This strengthens management’s ability to interpret weak signals. Similarly, IT allows suggesting measures and actions for mitigation more efficiently. Instead of just preparing information on (non-) compliance, accounting can actually use intelligence and benchmarks to provide decision alternatives to management.

	Objective	Contribution of IT	Impact	Organization- al level	Theory
1 Control performance	Efficiency of auditing	Control automation & digitalization	Ensure proper control implementation	Auditor	(Ouchi 1979)
2 Control coherence	Effective controls	Control integration	Monitor control effectiveness	Internal audit	(Turner & Makhija 2006)
3 Risk responsiveness	Interpret weak signals	Transparency, Business Intelligence	Enhances management’s absorptive capacity	Management	(Ansoff 1975)
4 Management resilience	Rationales for actions	Patterns, Benchmarks	Provide backing for actions	Senior management	(Sitkin & Pablo 1992)

Table 3. Characteristics of found value drivers of GRC IS.

5.2 Linking the Value Drivers to Existing Theory

The interviews revealed four value drivers of GRC IS, which we integrated into a framework (Table 3). Having this deeper empirical understanding of the underlying value drivers of GRC IS, in the following we try to generalize these empirical findings (Eisenhardt & Graebner 2007). Furthermore, we attempt to spot overlaps and connections of existing theory to our findings. Using existing theory to explain the found phenomena would contribute by supporting both, explanation of existing and

prediction of future phenomena (Eisenhardt & Graebner 2007). Since the disciplines of IS and accounting lack explaining theories (Dechow et al. 2006, Sutton 2010), we identified theories from management and organization science as closely related to both, economics of IS and accounting. The following linkage to theory reveals that existing theories lack the integration of the impact of IT and would highly benefit by integrating research from an IS perspective.

The first value driver, control performance, can be explained through organizational control theory (OCT). Organizational control describes the interpersonal influence relations within organizations, which can be seen as arrangements of individual human interactions (Ouchi 1979). Control enables idiosyncratic behavior and compliance with the strategic plan and is therefore fundamental for any organization (Lange 2008). Several control mechanisms exist to control relations within organizations (Lange 2008). All control mechanisms are based on two underlying control strategies (Ouchi 1979). The first, formal control strategy forces coercion and manipulates rewards and sanctions (Lange 2008). This control strategy requires explicit, formal rules, procedures, and policies to both monitor and reward organizational performance. The second, informal control strategy aims at minimizing the divergence of personal and company goals. Since GRC IS implements only formal control strategies, in the following, the two control mechanisms will be introduced, which implement formal control strategy: When implementing output control mechanisms, the principal monitors the agent's achievements at the end of the given tasks. The monitoring of the value creation process implements formal control through analyzing the output of the performed tasks. Executing output control requires a clear understanding of the results of the value creation process and the ability to evaluate the outcome. Behavior control implements control mechanisms that help the principal evaluate the agent's behavior. It enforces the formal control strategy through evaluating the tasks that the employee performs on appropriateness and alignment with the overall strategy. Behavior control requires knowledge of the transformation process and understanding of the involved resources (Ouchi 1979).

Reflecting the extant body of knowledge on OCT reveals several unsolved issues concerning GRC IS. Although the concept of GRC IS is broad and comprehensive, the only implemented control type is output control. Segregation of duties, identity management, whistle blowing, business activity monitoring, or global trade compliance all evaluate and control work and process results. Although we do not have any clear explanations, we assume that this phenomenon might have the following two reasons: One alternative would be that GRC IS are not developed enough to implement other control mechanisms. This seems unusual, since on the one hand, it is easier to implement behavior control and on the other hand, the experts revealed visions of GRC IS value drivers that do not exist in existing solutions but could be implemented in the future. Another reason, which seems more realistic, might be that behavior control becomes obsolete through the usage of IT.

Literature also discusses the second value driver, control coherence, in the context of OCT. Although research emphasizes the need for control combination (Turner & Makhija 2006), rather few discuss the effective selection and combination from a Meta perspective. As a first step toward control coherence, research highlights the differing effect of different combinations of control types on performance, but suggests the changing of the underlying situational condition for long term control success (Liu et al. 2010). Similarly Alles et al. (2008) point out the value of IT in auditing by control automation, but the authors also emphasize that practice still lacks adoption especially for continuous data assurance similar to the case of company expert 1. They provide a typology of audit automation efforts and conjecture that certain controls can be subject of automation but others not.

The concept of the third value driver, risk responsiveness, has been discussed in the context of interpreting early warnings (Ansoff 1975). Research in early warnings tries to identify weak signals as early as possible in the organizational context (Weick & Sutcliffe 2007). With the help of automation and mass data processing, IT could enable new forms of interpretation of early warnings, which further enhance accounting toward a knowledge services profession (Sutton 2010).

Management literature discusses risk based decision-making (RBDM) as the underlying theoretical lens for the fourth value driver, management resilience (March & Shapira 1987, Sitkin & Pablo 1992).

Management literature identifies various factors influencing RBDM, which are all based on the perception of risk and situation. The representation of risk, situation, and possible mitigation alternatives highly influences the overall decision (Sitkin & Pablo 1992). GRC IS enable new forms of management resilience by providing extant information about the organizational context of the decision with a specific focus on risks and opportunities.

5.3 Need for Further Research

Conducting exploratory research, our aim in this paper is not to exhaustively list all feasible impacts of IT on accounting in which IS academics have an edge, but rather, to illustrate the utility of IT in helping enhance the accounting discipline. We deem several aspects worth highlighting. First, it could be beneficial of future research to focus on the impact of IT on control coherence. Further explanation from a Meta perspective is needed on how organizations can effectively select and combine controls. Future research should address the selection and evaluation of implemented controls and consider the requests for identifying successful controls and preparing decision-making. As suggested by Alles et al. (2008), further research could provide decision support for selecting controls that are suitable for automation. Additional research on control coherence would provide an additional part of the necessary overall theory of organizations as demanded by Jensen (1993) by providing effective ICS.

Another promising direction for future research would be to examine how IT affects theory of controls. Existing IS initiatives including process management and ERP systems had influence on the underlying control situation. Since processes became more standardized and steeped in IT, further research should address the impact on the underlying information for control design in terms of transformation process and output measurability. This comes along with the dominance of output control as control type. Using the theoretical lens of OCT, we had expected that GRC IS incorporates both output and behavior control. Further research might find that IT influences control performance by turning behavior into output controls at an early point in time and therefore facilitates resilient ICS.

5.4 Implications and Limitations

Theses value drivers of GRC IS have practical implications not only for understanding GRC IS benefits beyond compliance, but they also provide practitioners with an overview of existing value drivers of GRC IS. Hence, this research gives clear strategic reasoning for GRC IS depending on the individual company's situation and suggests how organizations can benefit from it.

This paper is the first to use the theoretical lens of OCT on IT and accounting. It contributes by combining the two disciplines by showing the potential of accounting information systems. We identify IT as having exploiting and exploring impact on accounting through control automation, control coherence, early warnings, and management resilience. The developed theoretical framework reveals the potential of IT to provide value to accounting and therefore provides a research agenda for further IS research. The linkage to theory reveals that integrating IT into the context of accounting leaves several unsolved yet promising issues in theory which future research might address.

However, there are several limitations to take into account. First, it should be conceded that this grounded theory approach is based on only 14 interviews, which were chosen by convenience sampling. Although the exploratory nature and the aim of maximizing diversity allows certain broadness at the expense of depth, selecting only two experts from each GRC perspective could bias the findings through their personal opinion or specific experience and limits potentials for generalization on the total population. Since the scope of this research was to explore value drivers, further research needs to address a deeper empirical validation. In addition, although being the most obvious, OCT might not be the appropriate theoretical lens for researching GRC IS. Goal-setting theory might also be an alternative, as it is more output oriented (Locke & Latham 2002). Instead of using theories from management and organization science, we could also have used theories from computer science or IS which can be extended to accounting information systems as well. For

example, the theory of technology dominance (Arnold & Sutton 1998) might also help assessing the impact of IT on accounting especially in terms of management resilience. We also focused on exploiting existing accounting potentials. We examined control automation and coherence, but did not consider a self-contained perspective on exploration. Finally, the level of detail on the combination and interdependencies of the found value drivers is limited.

6 Conclusion

In this paper, we try to understand the impact of IT on accounting using the prominent example of GRC IS as accounting information system. We first applied a grounded theory approach to structure the value drivers of GRC IS. We identified control performance, control coherence, risk responsiveness and management resilience as fundamental value drivers. In order to increase the understanding of the impact of IT on accounting, we suggested a theoretical framework to relate the GRC value driver to extant theories, including organizational control theory, weak signals, and risk based decision-making. Due to the potential of influence exploitation of controls and exploration of new potentials of accounting as knowledge provider, IT can contribute to accounting by providing a foundation for implementing more effective control systems. Based on the discrepancies between study results and theory, we highlighted the profound but yet unexamined impact of IT on theory for further research.

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