International Journal of Accounting Information Systems 20 (2016) 26–37

Contents lists available at ScienceDirect

International Journal of Accounting Information Systems

journal homepage: www.elsevier.com/locate/accinf

An exploratory study of the adoption, application and impacts of continuous auditing technologies in small businesses

Pall Rikhardsson [a,*], Richard Dull [b]

[a] Reykjavik University, School of Business, Menntavegur 1, 101 Reykjavík, Iceland
[b] West Virginia University, Department of Accounting, PO Box 6025, 300 B&E Building, 1601 University Av., Morgantown, WV 26506, USA

ARTICLE INFO

Article history:
Received 1 October 2014
Received in revised form 30 December 2015
Accepted 4 January 2016
Available online xxxx

Keywords:
Continuous auditing technology
Continuous auditing
Small businesses
Internal control
Internal auditing

ABSTRACT

Continuous auditing technology has been studied in various contexts, but mostly within large enterprises with their own integrated information systems and internal auditing functions. Although several vendors of continuous auditing technologies have reported implementations in small businesses, little is known about the use and impact of this technology in this type of organizations. This exploratory study considers the motivations for adopting a certain type of continuous auditing technology, as well as the applications and impacts of this technology in seven small businesses. The results indicate that the technology is usually implemented to increase resource efficiency, but is frequently perceived as a tool to fix data quality problems — rather than a strategically aligned technology. Implementation is not driven by an internal auditing department but by either an IT or finance department. Application of the technology is first and foremost transaction verification with process control applications emerging later. Main impacts include a change from corrective controls to preventive and detective controls; an increase in the perception of value created by the financial department; and an increase in management trust of data. The study also reveals potential negative impacts of this technology, such as alert immunization and loss of users' critical thinking.

1. Introduction

Utilizing information technology to ensure the quality of decision-relevant information, as well as ensuring compliance with laws, regulations, and policies, is high on the corporate agenda. In fact, many Chief Executive Officers believe that the correct utilization of information technology is critical to the role of the Chief Financial Officer — and that this role includes transforming the compliance burden into an opportunity (KPMG, 2014). Research shows that continuous auditing is one such technology implemented in an increasing number of organizations to tackle these challenges (Vasarhelyi et al., 2012).

Continuous auditing has been defined both as a process and as a technology (Bumgarner and Vasarhelyi, 2015). This paper focuses on the information technology that enables continuous auditing. Following Gonzalez et al. (2012b), this paper uses the term "continuous auditing technology" for this technology.

The current research is within the domain of Accounting Information Systems research (AIS). Apart from computer auditing, the AIS research agenda includes enterprise systems, knowledge based systems and the business value of IT (Sutton, 2010). In turn, AIS research is part of a broader research agenda in the social and technical sciences, focusing on the adoption, applications and impacts of information technology in organizations and societies (EU, 2012).

* Corresponding author.
E-mail addresses: pallrik@ru.is (P. Rikhardsson), Richard.Dull@mail.wvu.edu (R. Dull).

http://dx.doi.org/10.1016/j.accinf.2016.01.003
1467-0895/

All organizations have control systems. In the AIS and auditing literature these are usually presented either as internal control systems (COSO, 2013) or management control systems (Malmi and Brown, 2008; Chenhall, 2003). Internal control includes safeguarding assets and providing management with reliable information for decision-making so that the organization can reach its objectives (COSO, 2013). Management control is a broader concept and includes, for example, cultural controls, planning controls, cybernetic controls, rewards and compensation practices and administrative controls that are designed and implemented to change and direct management and employee behavior (Malmi and Brown, 2008). Simons (1995) points out that management controls only work if data and information systems are reliable and internal controls are essential to ensure the integrity of other systems. Internal controls are therefore critical for making management controls work (Simons, 1995). The link between information technology and control in general is an under-researched subject and "there are only few generally accepted conclusions about the relationships between IT and management control" (Granlund et al., 2013:275; see also Berry et al., 2009). Although research shows that application of continuous auditing technologies impacts control systems (Alles et al., 2002, 2008; Chan and Vasarhelyi, 2011; Gonzalez et al., 2012a, 2012b) not much is known about the characteristics of these impacts. A primary aim of the current research is to understand and provide evidence on the impact of continuous auditing technologies on internal controls in small businesses.

The vast majority of businesses globally are small businesses.[1] For example, in the top 20 world markets, small businesses make up 85% to 99.9% of the business population (ACCA, 2010). Small businesses also account for approximately 50% of private sector value-added and 77% of private sector employment globally (ACCA, 2010). Research shows that size matters when it comes to adoption of innovations in general (Damanpour, 1996) and information technology innovation in particular (Lee and Xia, 2006). Studies of adoption of information technology innovations in small organizations show that adoption rate and path is moderated by the type of information technology innovation, stage of the adoption and industry sector (Lee and Xia, 2006). Furthermore, management control system research shows that when companies increase in size their control systems increase in complexity. They also become more formalized, more likely to be policy and objective driven, and utilize a more varied mix of result, action, and personnel controls (Chenhall, 2003, 2006; Chenhall and Langfield-Smith, 2003; Davila and Foster, 2007; Malmi and Brown, 2008; Nobre and Zawadzki, 2013). This suggests that the characteristics of small business adoption and application of continuous auditing technologies – as well as the impacts of these technologies – are not necessarily similar to experiences in large enterprises.

Customer references from technology vendors selling continuous auditing technologies such as SAP, Oracle, IDEA, ACL and Expectus indicate that these technologies are purchased by and implemented in many small businesses. Indeed most of the customers of Expectus – the provider of the continuous auditing technology this study covers – are small businesses. Small businesses are generally not traded on any stock markets, have fewer compliance requirements and have less stringent financial reporting requirements than larger companies. Considering these general characteristics, why would small businesses implement continuous auditing technologies? This study considers this question and contributes empirical evidence on the adoption, application and impact of continuous auditing technologies in small businesses.

The current research adopts an exploratory approach, and includes semi-structured interviews with respondents in seven small businesses that have adopted and implemented continuous auditing technologies. The study addresses three specific research questions:

- What motivates small businesses adopt continuous auditing technologies?
- What are the applications of continuous auditing technologies in small businesses?
- What are the impacts of the application of continuous auditing technologies in small businesses?

Additional background for these questions is provided in Section 2.

The study's context is Iceland — a highly developed western economy where almost all of the companies are small businesses with less than 500 employees. This fact makes the Icelandic business environment a good population for studying small businesses. Having recovered from the effects of the financial crisis in 2008, today Iceland is a growth economy based on tourism, heavy industry and fisheries.

The remainder of the paper is structured as follows: the next section contains a review of the relevant literature, followed by sections describing the research methodology; presenting the results; and describing and discussing the themes that emerged from the study. The final section provides the study's conclusion and suggestions for future research.

2. Continuous auditing technologies and small businesses

The operational definition of continuous auditing used in the current study is *the methodologies, processes and technologies that enable real time or close to real time assurance on a specific subject matter*. This is a broader definition than the one originally proposed by ISACA which limited the assurance to written assurances and the target group to independent auditors (CICA/AICPA, 1999).

Since introduced in the early 1990s, continuous auditing has developed into a practice focus in some audit firms, a set of methodologies and tools in many companies and information technology solutions provided by various technology vendors

[1] The definition of small businesses used is from the United States Small Business Administration that refers to small businesses having fewer than 500 employees https://www.sba.gov/content/small-business-size-standards (accessed March 25th 2015).

(AICPA, 2012; Alles et al., 2004, 2006; Chan and Vasarhelyi, 2011; Kuhn and Sutton, 2010; Rikhardsson et al., 2008; Vasarhelyi and Halper, 1991).

Continuous auditing – as a technology – is used by a variety of actors to continually gather data to support auditing and management objectives and activities (AICPA, 2015; Alles et al., 2006; Deloitte, 2010; KPMG, 2012; Vasarhelyi et al., 2004; Vasarhelyi and Halper, 1991). The technological solutions that enable continuous auditing have been referred to in the literature as "continuous auditing technology", "continuous monitoring technology", "continuous monitoring and control platforms", and "continuous assurance technology" (Gonzalez et al., 2012b; Alles et al., 2006; Groomer and Murthy, 2003; Masli et al., 2010). Adopting the terminology used in Gonzalez et al. (2012b) this paper uses the term continuous auditing technologies when referring to the spectrum of information technologies that can be used to enable continuous auditing. This ranges from continuous data monitoring to more advanced applications including continuous risk assessments and judgment evaluations (Gonzalez et al., 2012b). An important point to disclose is that the current study focuses on packaged software solutions and not customized solutions that need extensive programming or developing (Granlund, 2011). Packaged software solutions are usually selected and integrated with the help of the vendor or consultants and involve adapting the software package setup to customer requirements. A variety of such solutions are available on the market from vendors including ACL, Aptean, BWise, Caseware, Expectus, Fastpath, Infor, Oracle and SAP. A full overview of the variations between the solutions on the market is outside the scope of this paper. However, it is noted that these solutions vary in their functionality content, degree of integration into enterprise system solutions, vendor capabilities, user interface, flexibility, modularity and software technology (Kuhn and Sutton, 2010).

Considering the operational definition of continuous auditing technologies used herein, as well as the context of continuous auditing within small business, the next step is consider the theoretical and empirical background for the three research questions.

2.1. What motivates businesses to adopt continuous auditing technologies?

Alles et al. (2008) and Vasarhelyi et al. (2004) identify the drivers of adoption of continuous auditing as being on the demand side rather than the technology supply side. Vasarhelyi et al. (2004) assert that the motivations behind adopting continuous auditing technologies are both economic and compliance related (Vasarhelyi et al., 2012; Davidson et al., 2013). Alles et al. (2008), for example find that the motivation for adoption of continuous auditing in their case company is economic — i.e. the internal auditing department wished to reduce audit times, improve audit efficiency and increase the capacity of the internal auditing department. The capacity issue was related to the implementation of Section 404 of the U.S. Sarbanes-Oxley Act. To comply with this act the internal auditing department had to cope with more work while not being able to add employees. The application of continuous auditing technology was intended to increase the capacity of an internal auditing department (Alles et al., 2006, 2008).

Information technology governance includes ensuring the utilization of information technology by defining and implementing processes, structures, and relational mechanisms that enable creation of business value from IT investments (Wilkin and Chenhall, 2010). Research of information governance has shown the importance of management aligning information technology with strategic objectives; dealing with information technology risk; using resources to execute information technology strategies; ensure the value delivery of information technology; and selecting and using measures to evaluate operational performance changes and the value of information technology (Wilkin and Chenhall, 2010). From this perspective the adoption of information technology is the result of strategic management deliberations where implementation, risk issues; resource use and business case are addressed. Surveys have documented the alignment of continuous auditing technology adoption with management expectations. A survey by Gonzalez et al. (2012a) of the adoption of continuous auditing technology in larger enterprises, shows how performance expectancy (the degree the user believes that using a system will help achieve gains in job performance), effort expectancy (degree of ease associated with the use of the system), social influence (the users perception that people important to him or her believe that the system should be used) and facilitating conditions (organizational and technical infrastructure) affect the planned adoption of continuous auditing technologies. They found that potential effort expectancy and social influence is a significant predictor in the decision to adopt. Another study by the consulting firm KPMG, including more than 700 firms, shows that in addition to process improvement, increased process transparency and decentralization of error correction are high among the mentioned reasons for investing in continuous auditing technologies (KPMG, 2012).

These prior studies indicate that the motivations to adopt continuous auditing technology are based on the wish to better utilize capacity and save economic resources — often due to increased compliance requirements. Other motivations can come into play such as the wish for increased process transparency, control decentralization and social influences. The adoption of continuous auditing technology is frequently governed by the internal auditing department and aligned with the internal auditing strategy of the company.

2.2. What are the applications of continuous auditing technologies in businesses?

Granlund (2011) and Granlund et al. (2013) argue that AIS research often talks about information technology in general terms. Those studies point out that impacts on, for example calculative practices, can be heterogeneous, depending on the level of integration, modularity, and flexibility of the information system in question. They argue that researchers should not consider information technology as a "black box" or a "monolith" (Granlund et al., 2013). Following this thought it is clear that the functionality content differs between the various continuous auditing solutions on the market (Gartner, 2015; Kuhn and Sutton, 2010). It

should follow that the sophistication and complexity of the applications of continuous auditing technology would depend on what functionality is available in the specific solution.

Various researchers list applications of continuous auditing technologies (Alles et al., 2006, 2008; Best et al., 2004; Groomer and Murthy, 2003; Vasarhelyi et al., 2004). Alles et al. (2004) present a framework of continuous auditing technology applications that has been expanded and refined by Bumgarner and Vasarhelyi (2015). This framework has four levels ranging from relatively simple applications on Level 1 to more complex ones on Levels 3 and 4:

1. Continuous Data Audit: Focusing on verifying registrations as well as movement of data within and between systems and databases at the transaction level.
2. Continuous Control Monitoring: Using the technology to review specific system and process controls and control features, and to provide assurance that these are effective.
3. Continuous Risk Monitoring and Assessment: Using algorithms and probability models to assess judgments and risk evaluations as well as to monitor operational risks, environmental risks and rare, high impact risks.
4. Continuous Compliance Monitoring: Using information technology to create comprehensive taxonomies of regulatory compliance issues and progressively update regulatory changes as well as monitor organizational compliance with regulation.

In their audit maturity model, Vasarhelyi et al. (2012) show how data access and audit automation evolves through these levels from manual processes and simple software to systematic data monitoring, alarms and integrated data access. The four levels reflect an increasing sophistication and complexity of use, as well as different levels of functionality requirements, ranging from relatively simple data flow monitoring functionality, to more complex analytically based verifications and tests.

2.3. What are the impacts of the application of continuous auditing technologies in businesses?

The "impacts of continuous auditing technologies" include impacts on internal controls (Granlund, 2011; COSO, 2013) and impacts on perceived business value delivery due to the adoption and application of the continuous auditing technology (Wilkin and Chenhall, 2010).

Granlund (2011) reviews and criticizes research on information technology and management accounting and control. He suggests that much AIS research has focused on the effects of information technology on management accounting techniques and how technologies actually work in practice. He also notes that AIS research seldom has a substantive management accounting and control issue as its starting point with the exception of research into computer audits. However, research in computer auditing most often defines control as internal controls due to its focus on auditing. The current research also considers the impact of continuous auditing technology on internal controls.

Continuous auditing technology enables extended assurances and control activities, customized alarms and reports, changes in audit approaches from reactive to detective, as well as changes to the organizational role of internal auditing (Alles et al., 2006). Other studies show that improved data integrity due to the application of continuous auditing technologies increases the confidence managers and employees place in data for decision making and reporting. This in turn should improve the speed and quality of decision-making (Vasarhelyi et al., 2012).

In addition to improving speed and quality of decisions, technology can provide business value to an organization. Information technology value delivery has been defined as "the relative worth or importance of an investment for an enterprise, as perceived by its key stakeholders, expressed as total life-cycle benefits (net of related costs), adjusted for risk and (in the case of financial value) the time value of money" (ValIT, 2008: 114). The general conclusion is that information technology can deliver positive business value if applied and managed correctly and given the effect of certain moderating variables (Wilkin and Chenhall, 2010; ValIT, 2008; Rivard et al., 2006). Business value includes here e.g. a sustainable competitive advantage, positive return on investments, higher productivity and lower costs. The value delivery of continuous auditing technology is ultimately based on the relationship between assurance cost and assurance quality (Power, 1997). If the continuous auditing technology reduces the cost of internal control, the cost of compliance, as well as increases the effectiveness of the audit process, then this creates positive business value (Alles et al., 2002; Chan and Vasarhelyi, 2011; French, 2011). Masli et al. (2010) for example, measures the impact of continuous auditing technology on the likelihood of material weaknesses and increases in audit delays. They find that the adoption of continuous auditing technology positively affects these variables and conclude that there are (perceived) benefits associated with adopting this type of technology.

Focusing on external audit fees as a specific cost, continuous auditing has been called "a progressive shift in audit practices towards the maximum possible degree of audit automation…in order to reduce audit cost…" (Vasarhelyi et al., 2010: p. 5). Evidence suggests that adoption of continuous auditing technology and higher IT capabilities lowers – or reduces the risk of higher – external audit fees (Masli et al., 2010; Chen et al., 2014).

The prior research collectively indicates that continuous auditing technology impacts controls including making internal controls more transparent, changing decision-making behavior due to increased management trust in decision relevant information and creating more positive attitudes towards control functions such as internal auditing departments. Value impacts suggest lower costs of control, avoided costs due to less risk of errors and lower external audit fees.

3. Research method and study context

The overall approach for the current research is the use of multiple case studies (Yin, 2013). Otley and Berry (1998) state that the central role of case studies is exploration that goes beyond mere description and can be used to generate theoretical statements from observations and descriptions. Based on Yin (2013) support for this choice of research method includes, that there is no control over the research environment in question; there is no control over the systems and persons being studied; and the study focuses on exploring a rarely studied subject.

This paper adopts what Scapens (1990, 2004) labels a descriptive case study that focuses on describing systems and procedures used in practice. The study includes multiple companies with one embedded unit of analysis — i.e. the continuous auditing technologies in place. The aim is to discern similarities and differences between companies to arrive at tentative conclusions and suggestions for further research regarding the adoption and impact of continuous auditing technologies in smaller businesses. This study does not define best practices in any way but provides information and empirical evidence regarding a contemporary accounting practice (Scapens, 2004). This design enables control over selecting types of cases to be included and what respondents to include (Yin, 2013).

The study is conducted based on companies in one country — Iceland. Characteristics of the Icelandic economy include a rising GDP, low unemployment, growth in the export industries, and a veritable boom in the tourist industry (Bloomberg, 2014; Forbes, 2013; Icelandic Ministry of Finance, 2014; OECD, 2013). Being dependent on imports and exports, mainly to Europe and North America, Icelandic companies share many characteristics with companies in those areas, including legal structures, governance and compliance requirements. However, as a result of the size and population of the country, effectively all Icelandic companies are small businesses with less than 500 employees. Although fewer than 20 Icelandic companies were registered on the Icelandic stock market in 2015, all companies over a certain size (and all of the companies in this study) are legally required to prepare and submit externally audited annual financial statements to a central government registry. The submission must include at a minimum, a profit and loss statement and a balance sheet. The annual financial statements have to be in an electronic form and the registry is open to public access. The annual financial statements have to follow the International Financial Reporting Standards (IFRS) or the Icelandic Annual Accounts Act. External auditors have to follow the International Standards on Auditing (ISA). In Iceland, there have not been any general legal developments similar to the U.S.'s Sarbanes-Oxley Act. The Icelandic Annual Accounts Act does not require any specific disclosures on internal control.[2] Neither have there been any legal developments in Iceland that have focused specifically on continuous auditing.

To select the study participants a two-step approach was employed. The first step identified small businesses that have purchased continuous auditing technologies from vendors supplying these solutions in Iceland. The second step selected small businesses to participate in the study, from those that were identified in the first step.

The first step identified six continuous auditing technology vendors that market their solutions in Iceland. These are BWise, Approva, Oversight, Aptean, Caseware and Expectus. Further research showed that Expectus – the only vendor with offices in Iceland – had the largest customer base. Based on information from this vendor, a list was compiled of all of their customers that currently hold licenses for their continuous auditing technology solution ExMon. The ExMon solution contains functionality for transaction data monitoring and process control monitoring — i.e. Levels 1 and 2 of the application levels discussed in Section 2.2. Further using the terminology of Kuhn and Sutton (2010) for describing functionality of third party continuous auditing technology, this specific solution contained functionality for automatic notifications, workflow management, is compatible with a variety of enterprise systems, and can monitor financial transactions and business controls. More information about this solution and its specific functionality content can be found online.[3]

In step two, 19 companies were identified that can be classified as small businesses. The Chief Financial Officers of these 19 companies were contacted and of these, seven agreed to participate in the study. Table 1 provides an overview of these companies and respondents. None of the companies are publically traded — meaning the shares are owned by other companies, foundations, investment funds, families or private investors and not traded on any stock exchange. The governance structure of the companies includes a board of directors and an executive management team. Because the companies were promised full confidentiality and the Icelandic economy is small — only the title of the survey respondent, the number of employees, and the number of years the company has used the continuous auditing technology is disclosed in Table 1.

A face-to-face, semi-structured interview was conducted with each of the respondents at their place of work between February and April 2014. At least two of members of the research team were present at all the interviews with one member conducting the interview and the other taking notes.

The questions were exploratory and open-ended with keywords for asking probing questions and follow-up questions (Brinkman and Kvale, 2014). They were loosely organized around the three research questions — i.e. the motivations for adopting the continuous auditing technologies, the application of this technology in the company and the impact it had on control practice and value delivery. The interview guide is shown in Appendix A. The questions however, were used as prompts and the respondents were allowed to discuss other topics as well — as long as the issues in the interview guide were addressed. Each interview lasted from 45 to 70 min.

[2] The full English text of the Act is available here: http://eng.atvinnuvegaraduneyti.is/laws-and-regulations/nr/nr/7410
[3] www.exmon.com

Table 1
Responding company overview.

Company	Respondent	Size (Employees)	Years using continuous auditing technology solution
1.	Chief Financial Officer	70	2
2.	Accounting director	100	3
3.	Chief Financial Officer	217	2
4.	Chief Financial Officer	232	4
5.	Internal auditor	282	3
6.	Chief Financial Officer	300	4
7.	Chief Financial Officer	318	3

Given the reluctance of some of the managers, the interviews were not audio-recorded. Instead, immediately after each interview, the researchers met and transcribed additional notes, memorable quotes and observations to supplement the notes taken during the interview. The subsequent coding consisted of entering this information into a table where the questions defined the rows and the company names were the column headings. This process gave the researchers an overview of the different responses to each question, enabling summarization of the answers as well as the ability to note similarities and differences.

4. Results

Only one of the small businesses interviewed had a specific internal auditor function while the other companies place the responsibility for internal audit activities in the finance department. As could be expected in small organizations, the formalization of internal controls is low in the case companies. Only one of the companies had a specific internal control strategy or internal control process descriptions and only one had documented risk assessments and response plans. Only two have documented their internal controls, established objectives and conducted formal risk assessment.

4.1. What motivates small businesses to adopt continuous auditing technologies?

The most often mentioned reason to adopt a continuous auditing technology was the need to improve the quality of decision relevant data reported to managers, as well as to reduce the effort involved in maintaining this quality. All of the companies have implemented business intelligence systems with OLAP (Online Analytical Processing) data cubes that receive data from other systems. They each apply reporting front ends (business intelligence software or spreadsheets) to get the required information to the managers. The managers interviewed mentioned that prior to the implementation, significant resources were spent to ensure that data was correct in both the transaction system and the cubes:

> "*It's critical that managers trust the data they use for making decisions. By using* (*name of continuous auditing technology solution*) *the controller can be alerted if there are problems with the data in the cubes and can take action before its gets further* (*Company 5*)".

The technology was seen as an opportunity to save resources by reducing the manual effort involved in data assurance. Furthermore, the technology provided a path to move away from ad hoc detective and corrective controls, to continuous exception-based controls. As one respondent stated:

> "*We want to use the limited time of the employees* (*of the finance department*) *for something that creates value rather than error checking* (*Company 5*)".

An interesting response from two of the companies was that the finance function had not known that the continuous auditing technology had been acquired until after the fact. This was because the IT function had purchased the solution as a tool for improving data quality, without realizing the potential benefit to others in the organization.

> "*The company initially bought the system as a data flow monitor originally for the IT department. Then we saw that it could be used to monitor processes. It has developed a lot. Now we monitor more than 20 process controls* (*Company 7*)".

Another company reported:

> "*We started with data flow monitoring but moved into master data management monitoring* (*Company 3*)".

The adoption of continuous auditing technology in these cases was not to support an overall internal auditing strategy. It started with one application and evolved into other application areas as proficiency with the system increased and other departments became aware of the technology's potential benefits.

4.2. What are the applications of continuous auditing technologies in small businesses?

The applications of the continuous auditing technology solution by each case company fell into two primary categories. The first includes application of the technology to monitor data quality. Improving data quality includes ensuring the correctness of transaction registrations and securing the integrity of data flows between systems and modules.

> "*We use* (*name of continuous auditing technology solution*) *to monitor the flow of data between* (*the enterprise system*) *and the* (*electronic product catalogue*) *into the data warehouse to ensure that the same data is in both places and that all updates and edits in one place are reflected in others* (*Company 4*)".

Another company described how the solution was used to monitor and verify the transfer of data between the employee time registration system and the payroll system. Company 2 provided examples of ensuring correct registrations of data in the accounting system. It had set up alarms in the continuous auditing technology solution that went off under predefined circumstances. For example, if transaction data was registered in non-transaction accounts, cost data was registered in revenue accounts (or vice versa), or the same data was entered twice (such as two payments for the same invoice).

The second application category is the monitoring of process controls. This was described by four of the companies as something that evolved out of the dataflow monitoring for which the solution was originally acquired. One of the companies, in the transportation sector, used the continuous auditing technology in the accounts receivable process. The technology monitored the use of customer credit cards and changes in service rates to ensure the correctness of customer payments by comparing the amounts paid by credit cards to the standard rates charged for its services. It also used the technology in the vehicle maintenance process to monitor vehicle maintenance costs — a significant part of the total cost of the company. In that instance, the continuous auditing technology solution is used to compare invoices from spare part suppliers to previous invoices and purchasing agreements to monitor price changes and ensure that the company gets the discounts it has negotiated with the suppliers.

Another of the companies – in the pharmaceutical sector – used the continuous auditing technology in the production process to monitor its approximately 6000 product variations to ensure a match between the product specifications, product documentations, and product packaging markings for each product. That company also used the technology in its order process to keep track of the synchronization of orders between vendor, production and customer.

> "*The customer can call and ask for changes in, for example, quantity or specifications. We have to ask the production function if this is possible and then coordinate with the vendor of ingredients and packaging.* (*The continuous auditing technology solution*) *centralizes the monitoring of updates from one module to another in the enterprise system and can alert us if one part of the chain lags behind or has not been contacted* (*Company 2*)".

A case company in the communication sector used the continuous auditing technology in the invoicing process to monitor the data that is sent to customers. This was done to "*…minimize the risk of angering customers by sending invoices twice*, *sending irrelevant marketing offers or materials containing errors such as wrong invoices*, *wrong addresses or wrong names* (*Company 6*)".

This company also used the continuous auditing technology to monitor certain mobile phone subscriptions of customers and initiate sending reminders (from a separate marketing automation system) when subscriptions had to be renewed.

4.3. What are the impacts of the application of continuous auditing technologies in small businesses?

Most of the managers agree that savings in time and resources due to automation and reduction in errors are the most significant direct benefits, although none of the companies had measured this directly. One benefit often mentioned was better use of labor capacity when control activities become automated, allowing finance and other employees to focus on more value-adding tasks, rather than error checking and follow-ups.

There is an increased focus on real-time and preventive control practices after the adoption of the continuous auditing technology. One respondent that used the technology to monitor discounts reported an immediate impact on control practice:

> "*When the sales managers see that the sales staff is giving rebates that are not normal then they can grab the phone and take action immediately instead of discovering this on the monthly sales report* (*Company 4*)".

Another impact was a perceived increase in decision quality. Managers believe errors have been corrected before they get the reports, and that they do not have to be concerned about wrong data. This was more of a "gut feeling" — none of the respondents had systematically measured data quality improvement.

Some of the respondents noted that reductions in errors lead to reductions in costs and lower risk of lost revenue. Examples include better purchasing routines, reduced material and service costs, and increased rate of debt collections. Finally, increased customer satisfaction was mentioned — or, more correctly, reduced risk of affecting customer satisfaction through wrong invoices, irrelevant service offers, and service offer spamming.

Several of the respondents mentioned a change in the perception of other managers of the financial department. The department was no longer seen as "*police officers* (*Company 5*)," but more as "*process consultants* (*Company 1*)". The finance department

was seen as having an active role in designing (or helping managers design) routines that enabled managers to correct errors themselves in real time. According to these managers, helping other departments making their processes more effective or efficient creates business value that is well appreciated by the process owners.

> "*Automation simplifies all control work and enables us to collect statistics and analyze data. Become proactive instead of reactive. You have to understand that preventing errors is definitely cheaper that correcting errors. Especially with the customers* (*Company 7*)".

Although many of the respondents mention that the external auditors had shown some interest in the company applications of continuous auditing technology, none of the respondents had seen any real changes in the auditing approach of the external auditor:

> "*They have seen that there is less need for data collection and they can place more trust in the data in the systems as well as the business processes due to the use of the* (*name of continuous auditing solution*). *But they have not really started exploiting this* (*Company 2*)".

When asked about any negative impacts of continuous auditing technologies one respondent mentioned the risk of "*alert immunization* (*Company 3*)" and "*reduction in critical thinking* (*Company 7*)". Alert immunization, resulting from initially setting up broad parameters for alerts, increased the risk of "false positives". After a while, users become desensitized to the alerts and ignore the notifications — running the risk of missing an alert for a valid risk.

> "*We saw that the system pumped out e-mail alerts for everything under the sun, which made people irritated and finally they stopped taking notice of the alerts* (*Company 3*)".

The risk of reduced critical thinking by employees refers to the possibility that managers and employees place too much trust in the continuous auditing technology and lose the ability to think critically about control related events and risks.

> "*It is dangerous to assume that if there is something wrong the* (*name of continuous auditing technology solution*) *will find it. Or that if I make a mistake the system will correct it* (*Company 7*)".

5. Discussion

Overall, the interviews confirm the characteristics of control in small businesses, including a flat organizational hierarchy with a Chief Financial Officer that has many roles (Canace and Juras, 2014; ACCA, 2012) — as well as the absence of internal audit departments, evolving control practices and low formalization (Chenhall, 2003; Davila and Foster, 2007). The use of continuous auditing technologies is not anchored in an internal audit department, but rather with a Chief Financial Officer and the finance function or a Chief Information Officer and the information technology function. This implies that continuous auditing in a small business might follow a different development path than in a larger company where an internal auditing function would often spearhead continuous auditing. Movement along the audit maturity continuum might be slower and higher levels of maturity not reachable without a specific internal audit function (Vasarhelyi et al., 2012).

In the small case companies the main motivation to adopt continuous auditing technology was not related to external reporting or auditing but to management reporting. Studies of development of internal auditing maturity see internal auditing practices developing with subsequent investment in continuous auditing technologies to support more sophisticated control practices (Vasarhelyi et al., 2004). In the companies examined in this study, this was not the case. The continuous auditing technology was acquired as an IT tool to fix a data quality problem, which then "kick started" a broader development of internal control practices. This implies that the relationship between developing audit maturity and information technology is more of a "chicken or the egg" causality rather than the linear development path depicted in the audit maturity model. Sometimes control practices evolve and need to be supported by more advanced information technology. But sometimes information technology is acquired first to solve a problem and enables more developed control practice later.

In the case companies, the software solution was first and foremost acquired for performance improvements. Gonzalez et al. (2012a) however, found that the motivation to adopt in the companies they surveyed was less likely to be linked to performance improvement expectations and more to ease of implementation and social influences. This difference could be explained by the fact that the information technology in the case companies was acquired for a specific purpose rather than a part of internal auditing development efforts. The expected performance improvements (reduced manual effort in correcting errors) were thus directly linked to the application of the software.

There was little evidence of an IT governance process being in place for continuous auditing technology. There was no explicit alignment with strategy, there was no risk assessment or value delivery assessment carried out and the benefits of application had not been measured systematically. This supports Vasarhelyi et al.'s (2012) suggestion that early adopters of continuous auditing technologies – at least in small businesses – might be more opportunistic and instrumental in their decisions and motives for adoption.

The two main applications of continuous auditing technology in the small businesses studied were transaction monitoring and business process control. The transaction monitoring was common across all companies whereas fewer had applied the technology to process controls. This matches Levels 1 and 2 in the application framework described in Section 2.2. However, the solution implemented in the case companies did not contain the functionality necessary for application on Levels 3 and 4. The functionalities and algorithms necessary for supporting the risk assessment processes and the qualitative compliance control monitoring, are considerably more advanced than those currently contained in the solution implemented in the case companies. Thus, the functionality content of the continuous auditing technology solution in use is a variable that influences maturity of internal auditing (Vasarhelyi et al., 2012).

The four levels of the application framework have grown out of research of application of technology in practice (see e.g. Alles et al., 2006, 2008). As such the framework is limited by what is being done in practice rather than on the capabilities of the software solutions on the market. Granlund (2011) and Granlund et al. (2013) call for more focus on the characteristics of the information technology being studied. These calls are being answered in studies such as links between organizational competencies and enterprise system capabilities (Prasad and Green, 2015) and how business analytics solutions support organizational capabilities. The research on how business analytics supports organizations includes topics such as data management, analytics and performance management (Chae and Olson, 2013). There is a need to similarly focus on the characteristics and functionalities of modern continuous auditing technologies.

The sophistication and complexity of internal controls have been seen to increase with the implementation of enterprise systems (Chan and Vasarhelyi, 2011; Kuhn and Sutton, 2010; Vasarhelyi et al., 2012). Kuhn and Sutton (2010) provide an overview of the characteristics of audit modules embedded in enterprise systems and add-on solutions similar to the one used by the case companies. However, the small business managers interviewed see internal control development and enterprise systems as two separate issues. All of the case companies use enterprise systems from either Microsoft or SAP. They do not associate internal auditing and control development with these systems; although these systems offer integrated functionalities such as log files, alerting, and process monitoring (Kuhn and Sutton, 2010; Rikhardsson et al., 2008). Continuous auditing technology is defined solely in terms of the specific add-on solution that has been adopted for this purpose. A question arises regarding the reason behind this continuous auditing perspective — is this phenomenon because of lack of knowledge on behalf of the managers or because add-on solutions simply suit smaller enterprises better than embedded audit modules in enterprise systems?

The implementation of continuous auditing technologies in the case companies had two main impacts on control. One impact was the shift in management perception of controls. Before the application of the continuous auditing technology it was described as reactive and corrective but is today characterized as being preventive. This is similar to the developments predicted by the audit maturity model (Vasarhelyi et al., 2012). The other related change is the change in perceptions of controls supporting real time decision-making. Instead of waiting for information to become accessible through periodic reports, for example, the monthly reporting cycle, managers get alerts regarding developments in real time. Thus problems like excessive rebates to customers or forgotten rebates on supplier invoices can be dealt with as they emerge. These are similar to the effects reported in larger enterprises after implementation of continuous auditing technology (Vasarhelyi et al., 2012).

The case companies have not carried out any systematic calculations of value delivery from the continuous auditing technology. However, their responses and examples of perceived value delivery in Section 4 can be classified into four different categories of perceived value of the continuous auditing technology:

1. Cost related impacts

- Avoid not getting rebates on purchases — preventing higher cost of goods sold.
- Avoid errors in supplier prices — preventing higher costs of goods sold.

2. Revenue related impacts

- Avoid giving excess rebates to customers — preventing lost revenue.
- Avoid undercharging customers (less than standard rates for services) — preventing lost revenue.
- Increased collection rates for accounts receivable — preventing lost revenue.
- Reduce risk of losing customers due to errors — helping maintain current revenue.

3. Productivity related impacts

- Increase capacity in administrative functions — enabling increased productivity for the same labor costs.
- Reduce manual tasks — enabling employees (e.g. financial department) to focus on additional value adding tasks.

4. Improved decision-making

- Enable managers to react to information in real time — focusing on issues that impact costs or revenues.
- Enable managers to trust data and focus efforts on using the data — enabling faster and more accurate decisions.

It has been suggested that external auditors could benefit from adopting continuous auditing technologies and integrating them in the auditing processes (AICPA, 2012; Chan and Vasarhelyi, 2011; Kuhn and Sutton, 2010; De Aquino et al., 2008; Debreceny et al., 2005; Alles et al., 2004). This technology has the potential to reduce the number of hours needed by the external

auditor to evaluate risk, acquire sufficient knowledge about processes, and establish reasonable assurance that internal controls work as intended. Ultimately, this should be reflected in the fee that the company has to pay for the work of the external auditor. A reduction external auditor hours or fees did not occur for the small businesses interviewed for the current study. The external auditors of the companies were reportedly interested in using the continuous auditing technologies in connection with their auditing activities but had not acted on this interest — nor did the respondents see any change in auditor fees after adopting continuous technology.

6. Conclusions

The main conclusion, based on the seven case company experiences, is that there are differences in adoption, application and impacts of continuous auditing technology in small versus large businesses. Five of the differences are identified and described below.

The first difference is that for small businesses, the adoption of continuous auditing technology does not follow a well-defined management-governed, strategically-aligned process that occurs in larger organizations. In small businesses, the technology is almost always – or at least initially – used as a tool to fix one specific problem.

Secondly, in small businesses, the solution is not usually bought by, nor anchored in, an internal auditing function nor is it seen as the means to support more advanced auditing practices. The main driver of development is improving the data in management information systems. An interesting research topic would be to focus on business intelligence and analytics applications as a driver of more mature continuous auditing practices. Business intelligence involves enabling more users to access data of varying quality, focus on "one version of the truth", and enhance real time decision-making. Such drivers might be important for developing control practices in small businesses.

Small businesses using the introduction of an IT innovation, such as a continuous auditing technology, as a vehicle of change represents the third difference. Although bought for one purpose the application of the technology spreads to other areas after some time. An interesting future research issue would be to look at different diffusion patterns in business where application of continuous auditing technology is governed by, for example, an internal auditing department and compare this to businesses where the diffusion is unstructured, instrumental and opportunity based. Do different diffusion patterns produce the same, or different, applications and impacts on organizations?

The fourth difference is that in small businesses the functionality content of the solution adopted, limits the possibility of developing more mature audit practices for small businesses. The initial choice of a continuous auditing technology is therefore important as it will define and limit what development is possible. Following the thoughts of Kuhn and Sutton (2010), a more thorough review of the solutions in use (both embedded and third party), comparisons of functionality and characteristics could help researchers to evaluate maturity development in the companies adopting and applying these solutions.

The fifth difference needs additional research. While there is a perceived (self-reported) increase of business value when applying continuous auditing technologies in small businesses, more research is required to actually compare these perceptions to reality of organizations, as well as to quantify actual results. Although it is very interesting that the respondents perceived that the investment in the technology had paid off through cost reduction and reduced control effort, this perception had not been systematically measured. Specifically, there is a need to investigate further what types of business value are delivered by continuous auditing technologies, the timing of these impacts and their sustainability over time.

While the study considers the specifics of continuous auditing technology in small businesses within the context of existing research that has focused on large organizations, additional research should help refine the differences in the different sized organizations.

In addition to additional research that is needed, there are also some obvious limitations to the current study that need to be considered. One primary limitation is that there were only seven organizations from one country included in the study. These organizations were selected because they had implemented a specific continuous auditing solution from one vendor. While this may somewhat limit the generalization of the results, by comparing the responses of the managers interviewed to prior empirical research, this study has offered some interesting insight and conclusions regarding the three research questions, as well as how the results compare to prior empirical research in the field.

Even considering the limitations, the findings of the study provide insight beyond the previous literature, which has primarily focused on continuous auditing and the impact on large organizations. This insight is important considering the number of small businesses worldwide, and their importance to local, national, and global economies.

Acknowledgments

The authors would like to thank Eva Mjoll Thorfinnsdottir and Gunnfridur Bjornsdottir for their assistance in collecting the empirical data for this paper, and Megan Miller for assistance with proofreading and editing the manuscript.

Appendix A. The interview guide

Issue	Questions
Introductory questions	1. What is your main role regarding internal controls? 2. Could you tell me about how internal control is defined and organized? 3. How would you define continuous auditing and continuous auditing technology?
Motivation for adopting continuous auditing technologies	1. How is information technology used in internal control in general? 2. Why did you implement "name of the continuous auditing technology solution"? a. Resources b. Risk management c. Legal requirements d. Increased focus on compliance e. Other
Applications of continuous auditing technologies	1. What do you use "name of continuous auditing technology solution" for? 2. Are there other application areas than related to those you have mentioned? 3. How do you process and report the information that is generated by the "name of continuous auditing technology solution"? 4. Who is the main user of the solution?
Impact of continuous auditing technologies	1. What impact has the adoption of the continuous auditing technology had on the organization? a. Processes b. Economic c. Compliance d. Other 2. Have there been any impacts on the work of the financial department? 3. Has there been any impact on the relations and approach of external parties such as e.g. external auditors?
Future development	1. How will internal control develop in your company in the coming years?

References

ACCA, 2010. Small Business — Global Agenda. (London. Retrieved August 8th 2014 from http://www.accaglobal.com/content/dam/acca/global/PDF-technical/small-business/pol-afb-sbaga.pdf.

ACCA, 2012. The Changing Role of the CFO. The Association of Chartered Certified Accountants (Retrieved August 8th 2014, from http://www.accaglobal.com/us/en/research-insights/finance-transformation/changing-CFO.html.

AICPA, 2012. The Current State of Continuous Auditing and Continuous Monitoring. American Institute of Certified Public Accountants, Toronto.

AICPA, 2015. Audit Analytics and Continuous Audit: Looking Toward the Future. AICPA, New York.

Alles, M., Kogan, A., Vasarhelyi, M.A., 2002. Feasibility and economics of continuous assurance. Auditing 21 (1), 126–138.

Alles, M., Kogan, A., Vasarhelyi, M.A., 2004. Restoring auditor credibility: tertiary monitoring and logging of continuous assurance systems. Int. J. Account. Inf. Syst. 5 (2), 183–202.

Alles, M., Brennan, G., Kogan, A., Vasarhelyi, M.A., 2006. Continuous monitoring of business process controls: a pilot implementation of a continuous auditing system at Siemens. Int. J. Account. Inf. Syst. 7 (2), 137–161.

Alles, M., Kogan, A., Vasarhelyi, M.A., 2008. Putting continuous auditing theory into practice: lessons from two pilot implementations. J. Inf. Syst. 22 (2), 195–214.

Berry, A.J., Coad, E.P., Harris, A.F., Otley, D.T., Stringer, C., 2009. Emerging themes in management control: a review of recent literature. Br. Account. Rev. 41 (1), 2–20.

Best, P.J., Mohay, G., Anderson, A., 2004d. Machine-independent audit trail analysis—a tool for continuous audit assurance. Intell. Syst. Account. Financ. Manag. 12 (2), 85–102.

Bloomberg, 2014. Let banks fail is Iceland Mantra as 2% joblessness in sight — Bloomberg. Retrieved August 8th 2014, from http://www.bloomberg.com/news/2014-01-27/let-banks-fail-becomes-iceland-mantra-as-2-joblessness-in-sight.html.

Brinkman, S., Kvale, S., 2014. Interview: Learning the Craft of Qualitative Research Interviewing. Sage Publications, London.

Bumgarner, N., Vasarhelyi, M.A., 2015. Continuous auditing — a new view. Audit Analytics and Continuous Audit: Looking Toward the Future. AICPA, New York, pp. 3–51.

Canace, T.G., Juras, P., 2014. CFO: from analyst to catalyst. Strateg. Financ. 96 (2), 27–33.

Chae, B., Olson, D.L., 2013. Business analytics for supply chain: a dynamic-capabilities framework. Int. J. Inf. Technol. Decis. Mak. 12 (1), 9–26.

Chan, D.Y., Vasarhelyi, M.A., 2011. Innovation and practice of continuous auditing. Int. J. Account. Inf. Syst. 12 (2), 152–160.

Chen, Y., Smith, A.L., Cao, J., Xia, W., 2014. Information technology capability, internal control effectiveness, and audit fees and delays. J. Inf. Syst. 28 (2), 149–180.

Chenhall, R., 2003. Management control systems design within its organisational context: findings from contingency-based research and directions for the future. Acc. Organ. Soc. 28, 127–168.

Chenhall, R., 2006. Theorizing contingencies in management control systems research. In: Chapman, C., Anthony, G., Hopwood, A., Shields, M. (Eds.), Handbooks of Management Accounting Research vol. 1. Elsevier, London, pp. 163–205.

Chenhall, R., Langfield-Smith, K., 2003. Performance measurement and reward systems, trust, and strategic change. J. Manag. Account. Res. 15, 117–143.

CICA/AICPA, 1999. Continuous Auditing: Research Report. Canadian Institute of Chartered Accountants, Toronto.

COSO, 2013. Internal Control — Integrated Framework.

Damanpour, F., 1996. Organizational complexity and innovation: developing and testing multiple contingency models. Manag. Sci. 42 (5), 693–716.

Davidson, B.I., Desai, N.K., Gerard, G.J., 2013. The effect of continuous auditing on the relationship between internal audit sourcing and the external auditor's reliance on the internal audit function. J. Inf. Syst. 27 (1), 41–59.

Davila, A., Foster, G., 2007. Management control systems in early-stage startup companies. Account. Rev. 82, 907–937.

De Aquino, C.E.M., Da Silva, W.L., Vasarhelyi, M.A., 2008. Moving toward continuous auditing. Intern. Audit. 65 (4), 27–29.

Debreceny, R.S., Gray, G.L., Jun-Jin Ng, J., Siow-Ping Lee, K., Yau, W., 2005. Embedded audit modules in enterprise resource planning systems: implementation and functionality. J. Inf. Syst. 19, 7–27.
Deloitte, 2010. Continuous monitoring and continuous auditing. Retrieved September 28th 2014, from http://www.deloitte.com/view/en_US/us/Services/audit-enterprise-risk-services/dbf8f10c3f889210VgnVCM200000bb42f00aRCRD.htm.
EU, 2012. ICT Research and Innovation in a Globalised World (ISTAG — Working Group on International Cooperation). European Union Retrieved from http://cordis.europa.eu/fp7/ict/istag/documents/ict-research-and-innovation-final-72pp.pdf.
Forbes, 2013. Iceland's stabilized economy is a surprising success story — Forbes. Retrieved November 8, 2015, from http://www.forbes.com/sites/traceygreenstein/2013/02/20/icelands-stabilized-economy-is-a-surprising-success-story.
French, D., 2011. Continuous audit technology enabled continuous assurance — white paper.pdf. Presented at the ISACA North American CACS Conference, Las Vegas Retrieved October 28th 2015 from http://www.isaca.org/Groups/Professional-English/continuous-monitoring-auditing/GroupDocuments/Continuous%20Audit%20%20Technology%20Enabled%20Continuous%20Assurance%20-%20White%20Paper.pdf.
Gartner, 2015. Magic quadrants and critical capabilities. Retrieved May 6th 2015 from http://www.gartner.com/technology/research/methodologies/magicQuadrants.jsp.
Gonzalez, G.C., Sharma, P.N., Galletta, D., 2012a. Factors influencing the planned adoption of continuous monitoring technology. J. Inf. Syst. 26 (2), 53–69.
Gonzalez, G.C., Sharma, P.N., Galletta, D.F., 2012b. The antecedents of the use of continuous auditing in the internal auditing context. Int. J. Account. Inf. Syst. 13 (3), 248–262.
Granlund, M., 2011. Extending AIS research to management accounting and control issues: a research note. Int. J. Account. Inf. Syst. 12 (1), 3–19.
Granlund, M., Mouritsen, J., Vaassen, E., 2013. On the relations between modern information technology, decision making and management control. Int. J. Account. Inf. Syst. 14 (4), 275–277.
Groomer, S.M., Murthy, U.S., 2003. Monitoring high volume on-line transaction processing systems using a continuous sampling approach. Int. J. Audit. 7, 3–19.
Icelandic Ministry of Finance, 2014. Economic outlook in the Nordic Countries 2014. Retrieved August 8th 2014, from http://eng.fjarmalaraduneyti.is/media/frettir/Economic-Outlook-in-the-Nordic-Countries-2014.pdf.
KPMG, 2012. Continuous auditing and continuous monitoring: the current status and the road ahead. Retrieved September 28 2014 from http://www.kpmg.com/cee/en/issuesandinsights/articlespublications/pages/continuous-auditing-and-continuous-monitoring.aspx.
KPMG, 2014. The view from the top. Retrieved May 20th 2015 from http://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/the-view-from-the-top.pdf.
Kuhn, J.R., Sutton, S.G., 2010. Continuous auditing in ERP system environments: the current state and future directions. J. Inf. Syst. 24 (1), 91–112.
Lee, G., Xia, W., 2006. Organizational size and IT innovation adoption: a meta-analysis. Inf. Manag. 43 (8), 975–985.
Malmi, T., Brown, D.A., 2008. Management control systems as a package—opportunities, challenges and research directions. Manag. Account. Res. 19 (4), 287–300.
Masli, A., Peters, G.F., Richardson, V.J., Sanchez, J.M., 2010. Examining the potential benefits of internal control monitoring technology. Account. Rev. 85 (3), 1001–1034.
Nobre, T., Zawadzki, C., 2013. A study of management control introducing process in SME using the strategic analysis framework of Crozier and Friedberg. Comptab. Control. Audit. 19 (1), 91–116.
OECD, 2013. OECD economic surveys: Iceland 2013. Retrieved February 10th 2015 from http://www.fjarmalaraduneyti.is/media/frettir/2013-Iceland.pdf.
Otley, D.T., Berry, A.J., 1998. Case study research in management accounting and control. Acc. Educ. 7, 105–127.
Power, M., 1997. The Audit Society: Rituals of Verification. Oxford Press, Oxford.
Prasad, A., Green, P., 2015. Organizational competencies and dynamic accounting information system capability: impact on AIS processes and firm performance. J. Inf. Syst. 29 (3), 123–149.
Rikhardsson, P., Best, P., Christensen, C., 2008. Sarbanes Oxley compliance, internal control and ERP systems. the case of MySAP ERP. In: Ferran, C., Salim, R. (Eds.), Enterprise Resource Planning for Global Economies. IGI Global, London, pp. 208–226.
Rivard, S., Raymond, L., Verreault, D., 2006. Resource-based view and competitive strategy: an integrated model of the contribution of information technology to firm performance. J. Strateg. Inf. Syst. 15 (1), 29–50.
Scapens, R., 1990. Researching management accounting practice: the role of case study methods. Br. Account. Rev. 20 (3), 260–279.
Scapens, R.W., 2004. Doing case study research. In: Humphrey, C., Lee, B. (Eds.), The Real Life Guide to Accounting Research. Elsevier, Oxford, pp. 257–279.
Simons, R., 1995. Levers of Control. Harvard Business School Press, Boston MA.
Sutton, S.G., 2010. A research discipline with no boundaries: reflections on 20 years of defining AIS research. Int. J. Account. Inf. Syst. 11 (4), 289–296.
ValIT, 2008. Enterprise Value: Governance of IT Investments: The Framework 2.0. IT Governance Institute (Available from http://www.isaca.org/Knowledge-Center/Val-IT-IT-Value-Delivery-/Pages/Val-IT1.aspx).
Vasarhelyi, M.A., Halper, F.B., 1991. The continuous audit of online systems. Auditing 10 (1), 110–125.
Vasarhelyi, M.A., Alles, M.G., Kogan, A., 2004. Principles of analytic monitoring for Continuous Assurance. J. Emerg. Technol. Account. 1, 1–21.
Vasarhelyi, M.A., Alles, M.G., Williams, K., 2010. Continuous Assurance for the Now Economy. Chartered Accountants in Australia, Sydney (Retrieved September 28th 2014 from http://raw.rutgers.edu/docs/previousprojects/Continuous_Assurance_for_the_Now_Economy_-_2nd_draft%20mav.pdf).
Vasarhelyi, M.A., Alles, M.G., Kuenkaikaew, S., Littley, J., 2012. The acceptance and adoption of continuous auditing by internal auditors: A micro analysis. Int. J. Account. Inf. Syst. 13 (3), 267–281.
Wilkin, C.L., Chenhall, R., 2010. A review of IT governance: a taxonomy to inform accounting information systems. J. Inf. Syst. 24 (2), 107–146.
Yin, R., 2013. Case Study Research: Design and Methods. fifth ed. Sage Publications, London.