

## The Role of Continuous Monitoring of Internal Controls over Financial Reporting: A Case Study of an Italian Medium-Sized Company

Giuseppe Ianniello, Marco Mainardi, Fabrizio Rossi  
and Miklos Vasarhelyi

**Abstract** This chapter aims to analyze the academic and professional utilization of continuous monitoring (CM) with subsequent tentative implementation in a medium-sized Italian company. The study focuses on the possible role of CM techniques in the system of internal controls over financial reporting. The primary research questions are as follows: (1) Are recent regulatory changes related to corporate governance creating opportunities to implement the CM approach? (2) What are the obstacles to applying the CM techniques in the Italian corporate governance model and the market for audits of accounts? and (3) What is unique about applying CM to small and medium-sized organization in the current IT environment? Using a case study method can provide initial answers to those questions and indicate possible firm-level benefits of CM (i.e., efficiency, better decision making, and cost savings) as well as benefits for stakeholders (i.e., more reliable financial reporting).

**Keywords** Continuous monitoring · Internal control systems · Accounting information system · Financial reporting · Continuous auditing · Corporate governance · SMEs

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## 1 Introduction

It is widely accepted that business organizations are affected by their environment. The term "environment" includes various aspects, including political, cultural, social, economic, financial, regulatory, and technological dimensions. From the corporate law perspective, it is significant that the regulatory context is essentially constantly evolving through European Union directives and recommendations and through reforms of domestic legislation that are intended to improve corporate governance and protect the interests of different stakeholders: shareholders, employees, and creditors. Some of the recent changes emphasize the role of the "internal control system" in the process of producing financial reporting (e.g., in the U.S., the Sarbanes-Oxley Act of 2002, Sect. 404). We focus on this factor in evaluating the framework for more effective corporate governance, including internal and external monitoring actors (boards of directors, boards of statutory auditors or supervisory boards—*collegio sindacale*, internal auditors, and external auditors). Among these actors is information technology (IT), including both its technological and informational aspects. In combining the legal requirements regarding internal control systems with the benefits offered by IT, a business organization can effectively react to the information age.

In fact, business organizations and internal communications are inevitably immersed in a process of change that derives from the opportunities offered by IT resources (e.g., enterprise resource planning—ERP—or the Internet). In general, large companies are interested in this change process, which also has consequences for the role played by financial and management accountants in the profession and in the relevant research [3]. The process of wealth creation is also affected by IT, which affects production, financing, distribution, and human resources. A wide array of examples of companies who manage key processes in real time are reported in Vasarhelyi et al. [2]. These authors also show that internal control systems for financial reporting, whether simple or sophisticated, are an example of this trend. Corporate control systems for production, marketing, and research and development have also been developed and automated. As the latter change has occurred<sup>1</sup> and most corporate control systems have become less directly observable, the need to monitor these systems has emerged. This monitoring,<sup>2</sup> a progressively important activity, is now called continuous control monitoring (CCM) [3].

The case study that we present in this chapter is a good experimental setting for at least two reasons. First, this company (Ceramica Catalano S.r.l.) has recently invested in developing an automated production process, with a strong emphasis on the quality of the end product. This cultural and technological emphasis allowed us to focus on additional aspects of the firm that were linked to operational and financial monitoring. We intend to explore the specific impact of continuous

<sup>1</sup> Configurable controls in large ERPs can involve tens of thousands of basic actions, many of which users can adjust.

<sup>2</sup> Such monitoring is intended to ensure that the control systems are active and effective.

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monitoring (CM) technology for internal control systems as a means of obtaining better-quality information, improving management accounting tools, and consistently taking advantage of IT innovations. However, such systems may be risky if these internal mechanisms are not fully integrated (or accepted) into the corporate culture. This lack of acceptance would reduce the advantages of the flexibility derived from IT innovation.

The second reason is the shift in interest from large corporations to small and medium-sized enterprises (SMEs). The latter are important in the European Union (EU) and in the economic context of Italy. More than 99 % of all European businesses are, in fact, SMEs. Such firms provide two out of three private sector jobs and contribute more than half of the total value added created by businesses in the EU. Moreover, SMEs are the true backbone of the European economy, as they are primarily responsible for wealth and economic growth and also play a key role in innovation and R&D.<sup>3</sup> The literature has revealed that SMEs address IT in specific ways depending on the organizational context [4]; moreover, the acquisition of IT in SMEs mainly occurs through program management outsourcing and depends heavily on external expertise [5].

The case study is founded on the view that the role of human resources inside an organization remains crucial in helping the firm to manage the transition to a dynamic information system and a CCM approach. Any IT innovation requires high-quality labor, regardless of the company size. The fundamental concept is that labor and IT tools work together to improve business performance. The CM of internal control systems for financial reporting is an extension of the changes to other business process (e.g., automated production), and those that have occurred in other spheres of human activity. As Brynjolfsson and McAfee [6] put it, "in medicine, law, finance, retailing, manufacturing, and even scientific discovery, the key to winning the race is not to compete against machines but to compete with machines. While computers win at routine processing, repetitive arithmetic, and error-free consistency and are quickly getting better at complex communication and pattern matching, they lack intuition and creativity and are lost when asked to work even a little outside a predefined domain".

One of the objectives of this research is to explore the benefits of CCM for business processes. Just as the quality of a product depends on the process used to eliminate defects before the product is finished, the quality of financial information depends on the internal procedures used to generate the data. CM is one of the elements of an overall management control system package. In this context, the primary research questions are as follows: (1) Are recent regulatory changes related corporate governance creating the opportunity to implement the CM

<sup>3</sup> See [http://ec.europa.eu/small-business/index\\_en.htm](http://ec.europa.eu/small-business/index_en.htm) According to the European Commission Recommendation of May 6 2003, the category of micro, small and medium-sized enterprises is made up of enterprises that employ fewer than 250 persons and that have an annual turnover that does not exceed EUR 50 million and/or an annual balance sheet total that does not exceed EUR 43 million. Within this category, the Recommendation provides specific definitions of small and micro firms.

approach? (2) What are the obstacles to applying the CM techniques within the Italian corporate governance model and within audits of accounts? and (3) What is unique about the application of CM in SMEs in the current IT environment? Using a case study method can yield initial answers to those questions and indicate the possible benefits for organizations using CM (i.e., efficiency, better decision making, and cost savings) and their stakeholders (i.e., more reliable financial reporting).

The remainder of the chapter proceeds as follows. Section 2 addresses the different definitions of CM and the different approaches that have been used in the literature, with special attention to SMEs. Section 3 describes the Italian institutional framework, considering the role of accounting and the possible contribution of CM in this regard. In this section, we also present the governance model for a private limited liability company in the Italian context, providing a tentative answer to the general question of whether there is space for CM in the Italian regulatory system. Finally, we present the case study, which allows us to analyze the steps involved in introducing CM procedures and a CM program into the information system at the company that is the object of our research. In this section, we analyze internal control, CM and corporate governance, CM and just-in-time inventories, CM and dashboards, corporate performance reporting, balanced scorecards, online/real-time alerts that allow firms to take timely, efficient action during their operations, and the reliability of the resulting financial reporting. Our conclusions are presented in the last section.

## 2 Continuous Monitoring

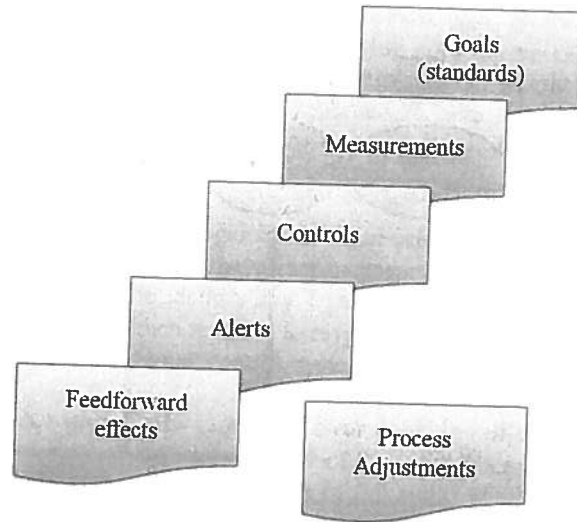
The monitoring of business has always been an intrinsic part of the organized business production process. The production of a good or service is always bolstered by organizational provisions for measuring, monitoring and re-evaluating the process [7]. The monitoring of organized activities was mainly visual and manual until the progressive introduction of computer technology into business operations. The continuous monitoring (CM) of business processes includes 4 main elements [8]:

1. Measuring the actual business process;
2. Establishing a basic standard to use to compare/evaluate the business process;
3. Comparing the absolute value of (1) minus (2) with a standard of acceptable variance; and
4. Establishing methods of alerting the firm about potential issues.

Business monitoring, which is mainly a management activity [9], differs from assurance in that it aims to ensure that business processes are performed as aimed.

Business assurance, which is mainly an auditor activity, aims to verify that business measurements are reliable and accurate. Figure 1 presents a hierarchical

Fig. 1 Meta-planes of action



set of planes of action that includes goals and achievements as well as control objects and activities.

The controls and the comparison between the standards or goals and the actual outcomes allow alerts to be generated when necessary, which in turn lead to the relevant process adjustments and corrections.

Figure 2 represents a more complete cycle of business activities progressively measured to facilitate the operation of the firm. This level of formalization of business activity requires a substantially expanded measurement framework in which complex non-deterministic measurements are progressively used to achieve the goals at each level.

The goals and results associated with each level in Fig. 2 allow for control and progressive performance. These basic elements of the empirical relational system are analyzed using the extant information technology—from manual to highly automated tools depending on the formalizability and economics of the processes. The economics of formalization is contingent on the size of the organization and, consequently, the frequency with which a function is repeated. A seldom performed function cannot be easily automated.

The current environment for continuous audits is one of progressive adoption, typically by large firms in critical functions. [11] However, adoption is still limited and casuistic. Furthermore, adoption is limited to very large organizations with budgets for R&D and deep management capabilities. Nevertheless, SMEs also (and perhaps even more urgently) require continuous assurance [2], including continuous data audit (CDA), continuous control monitoring (CCM) and continuous risk monitoring and assessment (CRMA). These firms typically lack the technical competences to take advantage of technology and resources and to develop such solutions. With this distinction in mind, we will now address some considerations that are specific to SMEs in relation to CA/CM.

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Section 2 addresses the issues that have been used in the study. It describes the Italian institutional context and the possible contribution of the governance model for a better text, providing a tentative framework for CM in the Italian context which allows us to analyze and integrate a CM program into the context of our research. In this section, the governance, CM and just-in-time performance reporting, balance sheets to take timely, efficient decisions of the resulting financial action.

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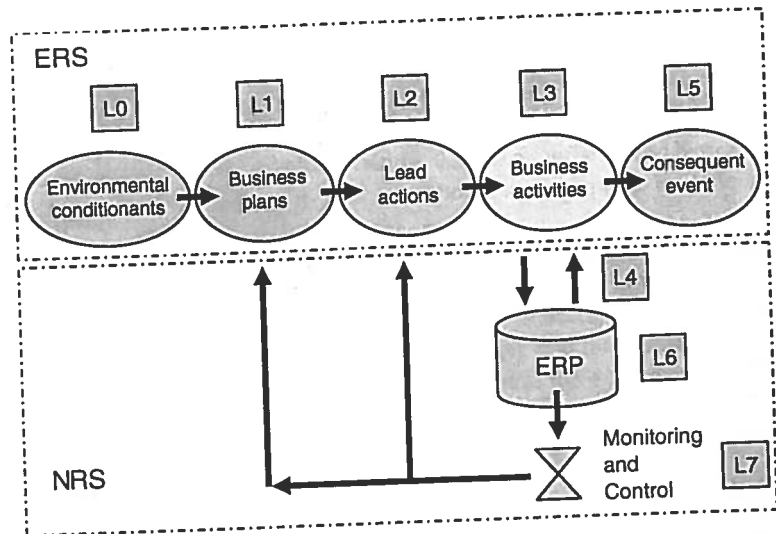
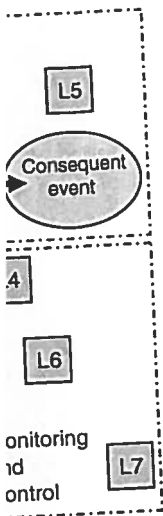


Fig. 2 Business activity measurements (Adapted from [10])

1. The governance of SMEs is likely to require the support of CA/CM even more urgently than that of large corporations;
2. Such firms face many obstacles, particularly capital intensity and technical competence. It can be postulated that CA/CM systems for SMEs should be provided by producers of packaged software that provides accounting, finance, and marketing functionalities but also fosters the monitoring capabilities that firms require in the 21st century;
3. Because these capabilities will be pre-packaged, competent usage rather than availability will provide the desired competitive advantage;
4. The inclusion of supporting "software agents" in CA/CM for SMEs can counterbalance the aforementioned deficiencies;
5. Governments should take an active role in supporting the development of CA/CM for SMEs.

### 3 The Italian Institutional Framework: Are There Opportunities for CM and CA?

The prospect of implementing the continuous auditing (CA) and continuous monitoring (CM) as part of the corporate governance of SMEs is problematic within the Italian institutional framework for several reasons. As stated in Sect. 2, CA is assumed to be a continuous verification process for which auditors are responsible, whereas CM is assumed to be a continuous process that is intended to monitor the internal control system used by a firm's management.



One issue, then, is what conditions make these control processes applicable in the context of small organization given that control monitoring does not necessarily require an auditing process but instead could be used regardless of whether there is an external verification process. It is also important to note that the concepts underlying control activities are the same across companies of different sizes, although the documentation can be presented in a simplified form for SMEs [12, 13].

The monitoring of control systems by management is often achieved through the close involvement of the management or the owner-manager in operations, which allows the individual in question to identify any significant weaknesses in the internal control system. An auditor is then required to reveal the main activities used by the company to monitor its internal control system in preparation for financial reporting [12].

The process of applying CA within SMEs requires a clear definition of these systems of corporate controls. Legislative Decree No. 39 of 2010 has unequivocally confirmed that the “control” is an audit process (i.e., a full audit) within all companies. If SMEs did not require “audits”, we could not logically discuss CA as a variation on the traditional audit for SMEs.

CA involves the automated, continuous collection of evidence to evaluate the entire system of business transactions rather than to conduct random ‘spot checks.’ It is obvious that the proper monitoring of internal control systems by management should result in less effort on the part of the auditor. Given these requirements, a precondition for continuous monitoring is the existence of an adequate information system and specifically the administrative and accounting procedures involved in producing financial reporting, which is highly automated.

The Italian regulations (art. 155 Legislative Decree No. 58/1998 and art. 2409-ter civil code) regarding the frequency (at least quarterly) of inspections during the accounting period are reasonably designed to inform the management and corporate governance bodies of unintentional errors, fraud, and deficiencies in a timely manner and as prescribed by international auditing standard no. 260. The aim is for the firm to be able to take the necessary remedial action before financial statements are involved, thus making the entire audit process proactive in a sense. This periodic verification is consistent with the CA process [14]. However, the implementation of CA and CM requires mostly automated environmental controls that are not always found in SMEs [15].

### 3.1 Oversight Systems in Italian Limited Liability Companies

Following the reform of corporate law, limited liability companies can opt for one of the following three administrative and oversight systems: the traditional (or Latin) model, the two-tier model, or the one-tier model. Within the three models, the oversight function is subdivided into two areas: administrative oversight and accounting oversight. In this chapter, we consider the traditional model

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because it is the most often used by Italian companies,<sup>4</sup> including our case study company. We consider unlisted companies to be subject to the regulations of the Civil Code (c.c.).

Italian law permits the so-called two-tier and one-tier models as an alternative to the traditional one only if company statute requires it. If the statute does not stipulate otherwise, art. 2380 c.c., paragraph 1 requires that *administrative and company oversight* be regulated according to the traditional model. Thus, the traditional model seems to be the one preferred by Italian legislators.

Although the administration (the administrative body in this model) also conducts oversight in a broad sense as well as managerial activity, the subjects that are institutionally delegated to supervise the firm are the board of statutory auditors (the internal company body or "*Collegio sindacale*") and the auditor (normally an external body).<sup>5</sup> In private limited liability companies, the board of statutory auditors is a monocratic internal body called the "*Sindaco unico*".

The former, pursuant to art. 2403 c.c., has the task of controlling *observance of the law and statute, respect of the standards of correct administration, and in particular the adequacy of the organizational, administrative and auditing structures adopted by the company and its actual functioning*. This is what is referred to as *administrative oversight or substantive legitimacy oversight*. The auditor, pursuant to art. 14 of Legislative Decree No. 39 of 2010, is responsible for the auditing, the ultimate aim of which is to evaluate the consistency of the financial statements with the most current auditing standards.

It is therefore clear that one feature of this model is the separation of the auditing function from the so-called administrative oversight function. In fact, the Italian legislation has sanctioned the separation of administrative oversight from accounting oversight (financial auditing). The auditor's report must now, in fact, include the auditing standards used and must describe the nature and extent of the audit, indicating that it has been performed according to auditing standards. It is now certain that the content of the audit is consistent with the international auditing standards (art. 11, Legislative Decree No. 39 of 2010). If the board of statutory auditors at an unlisted company (a *collegio sindacale* or *sindaco unico*) is in charge of auditing the accounts, the board will be required to perform a full audit.<sup>6</sup>

<sup>4</sup> See *Il Sole 24 Ore Norme e Tributi* of June 16, 2008 n. 165, which used as its source InfoCamere data as of June 9, 2008.

<sup>5</sup> Unless auditing is by law entrusted to the board of statutory auditors, it is conducted by an external body that, depending on the situation, can be an individual auditor or a registered auditing firm. The statutory board of auditors can also perform the audit in addition to providing administrative supervision according to art. 2409-2, paragraph 3 when the following conditions apply: there is an explicit statutory provision that assigns the responsibility for auditing to the board of statutory auditors, the company does not make use of the regulated equity market, the company is not required to publish a consolidated balance, and the statutory board of auditors is composed only of certified financial auditors.

<sup>6</sup> In the other corporate governance systems, the actors that are institutionally required to conduct the financial audit are always represented by the appointed external auditor.



#### 4 The Implementation of Continuous Monitoring Procedures in an Italian Medium-Sized Manufacturing Company

Continuous monitoring and continuous auditing are emerging in Italy as potential tools that managers and auditors can use to manage their responsibilities within corporate governance [10]. This interest is a function of (1) the development of a culture that is oriented toward improving internal controls and risk management [16, 17] and (2) a progressive regulatory push toward ensuring the effectiveness of control activities by supervisory boards (*collegio sindacale*) and statutory auditors.

In particular, in the last decade, a *culture of internal control* has become widespread in listed companies, which have been called upon to comply with certain rules to regain and ensure investor confidence, especially with regard to system management risk and internal controls over the financial reporting process. In fact, the corporate governance standards of Italian listed companies [18] in terms of internal control are consistent with international best practices [17, 19]. In unlisted companies, however, there is an awareness of the issues regarding internal control that have been generated by the introduction of laws regarding administrative liability for firms (Legislative Decree No. 231 of 2001). This particular law requires the development and adoption of a model of risk management for preventing crime, including financial infractions (e.g., fraudulent financial reporting). However, the constant improvement of internal controls has become standard even in unlisted companies, as administrators need to be familiar with and assess the components of internal control within their organizations.

Regarding the *effectiveness of control activities*, it is important to note that for unlisted companies, recent regulatory changes have imposed a new framework of internal controls that influence the corporate responsibility of supervisory boards (*collegio sindacale*) and statutory auditors. In particular, as part of its administrative supervisory function, the supervisory board (*collegio sindacale*) is required to monitor and release periodic reports on the reliability of the organization given the size and the complexity of its business. The parameters on which the organizational structure of the company is evaluated are accountability, separation of duties, checks and balances, the security and functionality of the information system, and monitoring mechanisms for internal control activities used to oversee the company's accounting system.

The new statutory audit regulations make it mandatory to carry out audits based on the principles of review; the evaluation of the internal control system during each phase of the audit process (planning, performing verification, opinion) is required. Continuous monitoring and continuous auditing could therefore be helpful for Italian unlisted companies; in these firms, strengthening the understanding and evaluation of internal control systems is an ongoing challenge for both boards of directors and auditors.

To analyze the potential of continuous monitoring and continuous auditing in unlisted Italian SMEs, we have used the case study method [20, 21, 22]. The case

studies analyzed in this chapter originate from a research project entitled "Process innovation and continuous monitoring" that was launched in early 2012 by the Department of Economics and Management at the University of Tuscia—Viterbo and the company Ceramica Catalano S.r.l.

For several years, the Department of Economics and Management has tried to develop models of control of production processes that make it possible to monitor costs simultaneously and thus determine the relationship between the yield and the profitability of production processes and products, particularly in the ceramic industry [23].

Ceramica Catalano S.r.l. is an Italian bathroom furniture industry that was founded in 1967. The company sells its products in more than one hundred countries around the world and stands out compared to its competitors in terms of the quality and design of its products [24]. The project is intended to analyze how ceramic production processes interact with a highly automated information system and accounting system and to evaluate the potential to develop a flow of information that would be typical of continuous monitoring.

In addressing what is unique to the use of CM in SMEs in the current IT environment, we have asked the following detailed questions:

1. What are the conditions that make it possible to begin a continuous monitoring process in an Italian manufacturing SME?
2. What are the steps in the technical implementation of continuous monitoring, and what management areas are involved?
3. What opportunities for continuous auditing may also be related to the financial reporting process? [25].
4. Who could benefit from the use of the information provided by continuous auditing?

We have conducted our research by analyzing the company's internal control system, gathering evidence, analyzing databases, conducting observations, asking questions and conducting case reporting. Our findings and analysis are summarized in the subsequent sections.

#### *4.1 Conditions for the Adoption of CM in Italian SMEs*

Regarding the conditions that allow the introduction of continuous monitoring, in addition to those described in Sect. 2, we should also comment on specific issues that affect Italian manufacturing SMEs. The governance of these companies is characterized by poor separation between the owners and the administration or management [26], a strong link with local industrial district, a control environment in which the opposition between managers and controllers is limited, and weak formalized systems of internal control and risk management exist.

Continuous auditing techniques can be adopted by firms characterized by the following:

- A corporate culture that extends beyond “family” relationships between owners, managers and employees and an internal control environment characterized by ethical values and rules that ensure professional governance and performance evaluations, transparent operations and a robust financial reporting system;
- A corporate information system that is able to collect, store, process and distribute data using an advanced computer system that can conduct continuous monitoring. Such a system will allow the management to continuously analyze their compliance levels and the performance of their business processes with reference to their expected levels of efficiency and effectiveness.

For these reasons, it was appropriate for us to select Ceramica Catalano S.r.l. as our case study firm. With regard to the firm’s corporate governance and control environment, the following information is relevant:

The firm is a limited liability company whose administration is entrusted to a board of directors that consists of three members and delegates authority to a single executive director, the CEO. The CEO is a minority shareholder of the company. The control function is entrusted to a supervisory board (*collegio sindacale*) that is also in charge of the statutory audit process. There is no an audit department. The company is owned by 25 shareholders, all of whom are employees or ex-employees of the company; no one directly or indirectly holds the majority of the shares. The company’s production site is in Italy, in the ceramic district of Civita Castellana in the province of Viterbo, and the firm employs a highly automated production process. The company has developed a quality manual and uses processes that are ISO 9001:2008 certified. The firm also constantly attempts to ensure the environmental sustainability of its production processes and its products.

In recent years, in developing its corporate information system, the company has invested significantly in production technology by developing industrial synergies with major production facilities in the ceramic field. These investments have resulted in the highly organized, automated processes that the firm uses today, which are supported by software programs that can generate both qualitative and quantitative information for each individual phase of the production process.

The company has not yet adopted an ERP solution [28]; it relies on a management reporting system that is based on database processing according to the information needs of the individual management areas (production, sales, administration, and payroll). At the end of 2011, the company had approximately 270 employees and had annual sales of approximately €40 million, selling its products in more than 80 countries. This productivity has made Ceramiche Catalano S.r.l. the largest exporter of bathroom fittings made in Italy.

#### 4.2 Steps for Developing a Continuous Monitoring Approach

In this sub-section, we analyze the phases of development for CM. The starting point for our research is the analysis of production processes (I), from raw materials to finished products, including the design phase. The analysis process,

when carried out in a timely manner, can determine the performance of each process relative to the resources utilized. The analysis makes it possible to link the results obtained during the individual steps in the production process to the different types of costs (direct and indirect) of the product. Generally, in traditional accounting systems, indirect costs are charged to cost centers in aggregate and are assigned to specific activities within the production process.

After the above analysis, one can continuously identify the trends in the process (II) with reference to production and costs. In this context, it is necessary to identify the key controls, both in terms of the yield of the production process (the quality of the product in the processing phase) and the efficiency of the activities (the cost during the processing phase). This analysis will make it possible to develop a CM system that can improve planning and control.

The monitoring system should be based on a reporting system (III) that is capable of measuring the previously identified indicators. These include

- The cost of the product and the batch according to the ABC method [28];
- The number of non-conforming products (defective products, repaired products, II choices) in each stage of processing;
- The cost of non-compliance in each stage of processing;
- Deviations from the standard costs and budget; and
- Financial analysis scenarios.

It is then necessary to identify the users and to determine the format and frequency of the reported information. The purpose of reporting within information systems is to provide analytical documentation on meaningful activities. Such disclosures should be as updated and correct as possible and therefore should not generate inconsistent interpretations.

After the above activities have been completed, the aim is to re-design the IT system (IV). In this way, for "every point in time," the company can identify the cost of each product and its contribution to the operating results in all phases of the process, taking into account deviations, the causes of variations, and the impact on the marginal product.

The start of CM is linked to an architectural approach within the information system. The firm must consider the following questions:

- What database (DB) should be used? In our case study, the company uses a transactional database that can, in turn, be used to develop an analytical DB or ERP system, possibly supplemented by external data sources and processes (associations, institutional databases, market analysis, or others);
- What tools provide the information? CM requires a firm to use the reports prepared by the transactional database as well as new forms of communication through reports, dashboards for workstations and mobile devices, or multidimensional cubes processed by analytical databases or data warehouses;
- What security and assurance systems should be used for the data? Data security is a significant challenge: more information generates more value for those who use it, but confidential data also generate risks and have legal implications. To

ensure the reliability of the data, CM must be supplemented by data validation mechanisms that can provide an adequate level of assurance. In addition to periodic checks that indicate the reliability and security of the software, warning indicators can be provided for continuous data assurance.

Once the system is in place, CM will allow the company to constantly monitor the system of production and will provide dynamic information on compliance with production standards and budgets. The benefits of implementing the continuous monitoring approach for Ceramica Catalano S.r.l. could include the following:

- Leveraging technology and automation to identify and quantify the risks associated with the process;
- Creating dashboards for monitoring risk and performance;
- Taking immediate action in high-risk areas to achieve planned levels of performance;
- Improving internal controls by using continuous dynamic information rather than static analysis;
- Performing targeted testing to assess the effects of risk processes;
- Communicating the results of the monitoring process within the organization to raise awareness among employees and suppliers about the characteristics of specific manufactured goods.

Strengthening the above knowledge will also allow significant improvement in existing products and processes. This procedure is therefore intended to help firms design, establish and apply a model of internal control for their industrial processes that allow effective monitoring and efficient performance. This management tool can be considered an innovation in the management of production systems in the ceramic industry.

Consistent with this statement is a recent document released by the *Consiglio nazionale dei dottori commercialisti ed esperti contabili* (the Italian CPA institute) on "The application of international auditing standards to SMEs" [12] that addresses evaluation and monitoring tools adopted by audited companies. In particular, regarding the planning of statutory audits and the assessment of control risk, the document indicates that "the monitoring of controls is a process over time to evaluate the effectiveness of internal control system. This activity consists in the timely evaluation of the effectiveness of controls and in taking the necessary corrective actions. The management is monitoring of controls through ongoing activities [...] The auditor obtains an understanding of the main activities used by the company to monitor the internal control over financial reporting and writing in particular those concerning the control activities relevant to the review, and includes how the company takes corrective action with respect identified weaknesses in their controls."

Document [12] indicates that, regarding compliance procedures, *the auditor may obtain audit evidence to determine whether changes were made to the automated control that affect the continuous and effective operations*. Clearly, continuous auditing is not directly referenced here, but it is recognized that CM

could be a significant element of the internal controls used by SMEs. Another useful document is a questionnaire that auditors used to address internal control systems, no. 10 [12], which determines whether there is a series of internal controls in place to oversee the reliability of financial statements.

Table 1 indicates that in the case study analyzed, some controls can be effectively made automatic. However, this is not the case for others because of concerns regarding continuous monitoring; for now, only the accounting related to the production areas (passive cycles, fixed assets and inventory) can be addressed in this manner. In the last column, we indicate the frequency of the checks.

Obviously, the use of automatic controls and their reliability is linked to the risks associated with IT systems. For this reason, systematic assessments of the reliability of the IT environment are required. Relevant considerations include whether off-the-shelf software is used, how data and systems are accessed (authentication and credentials), the appropriateness of the authority levels assigned to various users and of their roles and responsibilities, and the physical security of the servers. Understanding these issues is essential to understanding and evaluating the reliability of an IT system.

Finally, it is important to consider the corporate actors that can benefit from the CM approach. The board of directors and CEO, who will have access to an immediately usable tool for firm governance, are among these actors. Other affected actors include departmental managers, who will have the real-time information that they need to act in critical business areas and an information system accepted by the entire organization, as well as the firm's supervisory board

**Table 1** Applicable automatic controls according to the CDNC questionnaire on the internal control systems for statutory audits in SMEs

Control activities	Automatic key controls	Frequency report
<i>Procure to pay</i>		
All purchases are authorized	Applicable	Daily
We accept only the goods and services ordered	Applicable	Daily
The receipt of goods and services is adequately monitored	Applicable	Weekly
Returns and claims against suppliers are monitored	Applicable	Weekly
Invoices are properly reviewed and approved	Applicable	Weekly
All purchase transactions made are recorded	Applicable	Monthly
Purchases are recorded as they are received	Applicable	Monthly
Payments to providers are properly authorized and recorded in a complete and accurate manner	Applicable	Daily
<i>Fixed assets</i>		
The existence of fixed assets and their physical and operational status are periodically checked	Applicable	½ annually
<i>Inventory</i>		
Work in progress is monitored	Applicable	Quarterly
Inventory that is obsolete, slow moving or overstocked is identified	Applicable	Quarterly
The unit costs of the inventory are properly determined	Applicable	Quarterly
Inventories are valued correctly	Applicable	½ annually

sed by SMEs. Another address internal control series of internal contents.

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liability is linked to the natic assessments of the t considerations include l systems are accessed of the authority levels bilities, and the physical sential to understanding

; that can benefit from the ) will have access to an ong these actors. Other will have the real-time areas and an information e firm's supervisory board

: questionnaire on the internal

	Automatic key controls	Frequency report
	Applicable	Daily
	Applicable	Daily
	Applicable	Weekly
	Applicable	Weekly
	Applicable	Weekly
	Applicable	Monthly
	Applicable	Monthly
a	Applicable	Daily
1	Applicable	½ annually
	Applicable	Quarterly
ified	Applicable	Quarterly
	Applicable	Quarterly
	Applicable	½ annually

(collegio sindacale), which evaluates of the functioning of the internal control system and the evolution of the firm's performance management. Because this board is in charge of the statutory audit process in our case study firm, it may enjoy a higher level of confidence in the accounting information used in the budget management process, undoubtedly influenced by the controls used in CM.

## 5 Conclusion

In addressing the impact of recent regulatory changes on corporate governance and the creation of opportunities to implement the CM approach, we have focused on two main issues: a) the new statutory audit law (Legislative Decree No. 39 of 2010) and b) the increase in the responsibility of managers for the actual functioning of the internal control system (Legislative Decree No. 231 of 2001). Overall, the Catalano s.r.l. case study shows the relevance of CM. Managers understand the need for CM and its potential benefits as well as the main key risk indicators related to operations management.

The case study shows that the most significant challenge to the application of CM within the Italian corporate governance model is the level of informatization of business processes. The investments in innovations in production processes that the company made in recent years have allowed CM techniques to be used that otherwise could not have been. Moreover, CM is perceived by the management as a tool for corporate governance that can also improve competitiveness.

Regarding what is peculiar about the use of CM in SMEs in the current IT environment, the case study shows that only certain conditions allow the implementation of CM processes. The firm must have an adequate "corporate culture" and "information system," as described in Sect. 4.1. In Catalano s.r.l., CM will be actively used to assess production, control product quality, and evaluate the economic performance of the related process. (These are key performance indicators.)

The case study confirms that CM could be used in the financial reporting process. In particular, CM should improve the reliability of the financial data related to the production process.

Because this research is in the initial phase, this subject will require further analysis. At the end of the CM project focused on Catalano s.r.l., off-the-shelf software could be developed that would be useful to other companies in the ceramic production industry.

This research (1) contributes to an initial discussion of the potential implementation of CM in SMEs given the Italian legal framework and the links with the traditional management control systems; (2) discusses the operations management tools for SMEs and their possible benefits for firms, as well as how a culture of CM and performance measurement can be generated within the ceramics industry in the province of Viterbo; and (3) provides evidence of the possible benefits of CM and thus encourages government policies that would incentivize the use of new IT tools by SMEs in management and control processes.

## References

1. Scapens, R.W., Jazayeri, M.: EPR systems and management accounting change: Opportunities or impact? A Research note. *Eur. Acc. Rev.* **12**(1), 201–233 (2003)
2. Vasarhelyi, M.A., Alles, M., Williams, K.: *Continuous assurance for the now economy*. The Institute of chartered Accountants in Australia, Sidney (2010)
3. Alles, M.G., Kogan, A., Vasarhelyi, M.A.: Continuous monitoring of business process controls: A pilot implementation of a continuous audit system at Siemens. *Int. J. Acc. Inf. Syst.* pp. 137–161 (2006)
4. Ein-Dor, P., Segev, E.: Organizational context and the success of management information systems. *Manage. Sci.* **24**(10), 1067–1077 (1978)
5. Davos, J., Van Landeghem, H., Deschoolmeester, D.: Rethinking IT Governance for SMEs. *Ind. Manage. Data Syst.* **112**(2), 206–223 (2012)
6. Brynjolfsson, E.M., McAfee, A.: Thriving in the automated economy. *Futurist* **46**, 2 (2012)
7. Gal, G., Mock, T.J., Romero, S., Vasarhelyi, M.A.: A measurement theory perspective on business measurement. Working paper, pp. 1–29 (2012)
8. Vasarhelyi, M.A.: *Man-Machine Planning Systems*. PhD Dissertation, Graduate School of Management, UCLA (1973)
9. KPMG: What is driving continuous auditing & continuous monitoring today? White Paper, KPMG International, pp. 1–16 (2010)
10. Deloitte & Touche: *Continuous Monitoring and Continuous Auditing: From Idea to Implementation*. Deloitte & Touche LLC, pp. 1–15 (2010)
11. Vasarhelyi, M.A., Romero, S., Kuenkaikaew, S., Littley, J.R.: Adopting continuous audit/continuous monitoring (CA/CM) in internal audit. *ISACA J.* **3** (2012)
12. Consiglio Nazionale dei Dottori Commercialisti ed Esperti Contabili: *L'Applicazione dei Principi di Revisione Internazionali alle Imprese di Dimensioni Minori*. CNDCEC, Roma (2012)
13. International Federation of Accountants: *Guide to Using International Standards on Auditing in the Audits of Small and Medium-Sized Entities*. IFAC, New York (2010)
14. Warren, D., Smith, M.: Continuous auditing: An effective tool for internal auditors. *Intern. Auditing* **21**(2), 27–35 (2006)
15. Moultrie, J., Clarkson, P.J., Probert, D.: Development of design audit tool for SMEs. *J. Prod. Innov. Manage.* **4**, 335–368 (2007)
16. Committee of Sponsoring Organizations of the Treadway Commission: *Internal Control—Integrated Framework*. AICPA, Durham (1992)
17. Committee of Sponsoring Organizations of the Treadway Commission: *COSO Enterprise Risk Management—Integrated Framework*. AICPA, Durham (2004)
18. Corporate Governance Committee: *Corporate Governance Code*. Borsa Italiana, Milano (2011)
19. Cangemi, M.P.: Internal audit's Role in Continuous Monitoring. *EDP Audit, Control, and security Newsletter* **41**, 4 (2010)
20. Eisenhardt, K.M.: Building theorise from case study research. *Acad. Manage. Rev.* **14**(4), 532–550 (1989)
21. Yin, R.K.: The case study crisis: Some answers. *Adm. Sci. Quart.* **26**, 58–65 (1981)
22. Yin, R.K.: *Case Study Research: Design and Methods*. Sage Publication, CA (2008)
23. Garofalo, G.: *Capitalismo Distrettuale, Localismi d'Impresa, Globalizzazione*. Florence University Press, Firenze (2007)
24. Dardi, D., Martino C.: *Il Bathroom Design in Catalano's Business Culture*. 24Ore Cultura, Italia (2011)
25. PriceWaterhouseCoopers: *Il Controllo Interno per l'Attendibilità del Financial Reporting*. II Sole 24 Ore, Milano (2008)



agement accounting change:  
12(1), 201–233 (2003)

urance for the now economy. The  
10)

monitoring of business process  
stem at Siemens. *Int. J. Acc. Inf.*

ccess of management information

inking IT Governance for SMEs.

ed economy. *Futurist* 46, 2 (2012)  
easurement theory perspective on

Dissertation, Graduate School of

s monitoring today? White Paper,

tinuous Auditing: From Idea to  
)

J.R.: Adopting continuous audit/  
J. 3 (2012)

erti Contabili: L'Applicazione dei  
ensioni Minori. CNDCEC, Roma

nternational Standards on Auditing  
, New York (2010)

e tool for internal auditors. *Intern*

design audit tool for SMEs. *J. Prod.*

y Commission: Internal Control—

ay Commission: COSO Enterprise  
ram (2004)

nce Code. Borsa Italiana, Milano

onitoring. *EDP Audit, Control, and*

earch. *Acad. Manage. Rev.* 14(4),

ci. *Quart.* 26, 58–65 (1981)

age Publication, CA (2008)

mpresa, Globalizzazione. Florence

s Business Culture. *24Ore Cultura,*

ndibilità del Financial Reporting. II

26. Warren, R.: Corporate governance for competitive advantage in SMEs. In: Jones, O., Tilley, F. (eds.) *Competitive Advantage in SMEs: Organising for Innovation and Change*, pp. 54–70. Wiley, Chichester (2007)
27. Kuhn, R., Sutton, S.G.: Continuous Auditing in ERP System Environments: The Current State and Future Directions. SSRN, November (2009). <http://ssrn.com>
28. Wegmann, G.: Developments Around the Activity-Based Costing Method: A State-of-the Art Literature Review. SSRN, September, (2007). <http://ssrn.com>