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DISSERTATION THESIS

**CONTINUOUS AUDIT AND THE ROLE OF
DATA ANALYTICS. AN EVOLUTION OF THE
INTERNAL AUDIT FUNCTION (?)**

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1. Abstract

In today's business world "big" data is considered as one of the company's most valuable assets, creating significant competitive advantages. This data may also constitute an asset for potential use, analysis and exploitation by the Internal Audit, through the use of Data Analytics.

Data Analytics enable businesses and Audit to build the bigger picture of their activity and have a more holistic approach. Continuous Audit, empowered by the use of Data Analytics, comes to cover the need of an agile process in an environment characterized by constant change, transformation and increased data collection. Effective combination and implementation of Continuous Audit and Data Analytics should provide, in the end, an advantage for Internal Audit and the company.

The purpose of this thesis is to research, analyze and provide a critical approach on the aspects of Continuous Audit and Data Analytics, their application and effects on the Internal Audit function and business organizations. We aim to provide a comprehensive understanding of the subject, by presenting and analyzing the various issues and terms related with it – always subjective to our knowledge and evaluation.

2. Introduction

The three themes examined in this essay are the Big Data, Data Analytics and Continuous Audit, as per the order of presentation. In order to understand Continuous Audit and the role of Data Analytics, we should firstly understand what the elements of the (big) data are.

Thus, we begin our thesis with a brief study about the characteristics of Big Data. We show that its potential business value is in the insight it may offer. Data is collected in order to be analyzed, to find patterns and correlations that may not be initially apparent, but may be useful in making decisions. This process is the Data Analytics.

Data Analytics (DA) constitute the second theme of this essay. We proceed with the definition of the term, the types of analytics, and demonstrate how Data Analytics can be used and assist Internal Audit and the business. They provide the means to internal auditors to move from periodic assessments of risks and controls based on samples of transactions, to ongoing assessments using a larger proportion or the total of a population (The Institute of Internal Auditors, 2015). The application of DA enables and empowers Continuous auditing. Thus we deem that the evolution to Continuous Audit may be considered as a maturity process related to the use of Data Analytics.

The third and main theme of this essay refers to Continuous Audit (CA). We present a short theoretical background with the evolution of the process. We focus on the differences between Continuous Auditing and Continuous Monitoring, in addition to the ones between traditional and continuous. The concept of CA shifts the internal auditing model from the periodic audit of limited transactions' samples, to the ongoing review of much larger volumes of data. Automated methods to advance from the traditional audit to continuous forms are described, before we proceed to the presentation of company cases where the concept of Continuous Audit with the use of Data Analytics was implemented. The cases provide us with useful insight about the benefits and the challenges related to CA. We conclude with some considerations and obstacles that the organization should consider.

Sources used, included mainly field study, literature research, review and firsthand information. We followed a combination of exploratory and descriptive approach, based on qualitative research (case study approach), with the aim to get more information and provide a comprehensive overview of the topics. Cases were based on available presentations, reports and articles. Their analysis and approach expresses their evaluation by the writer.

The terms Continuous Audit and Continuous Auditing are used interchangeably.

3. Literature Review

We can divide the literature related to Continuous Audit (CA) and Data Analytics (for Big Data) in three categories.

Guidance provided by global institutes and professional associations. In this category we include the Institute of Internal Auditors (IIA), ISACA¹, the Chartered Institute of Internal Auditors UK & Ireland, the American Institute of Certified Public Accountants, Inc. and other similar organizations.

The literature consists of Global Technology Audit Guides (GTAG) or Assurance Guidance, Practice Advisories, essays and publications. The purpose is to provide guidance and information. In very brief, it show us that a new approach towards Internal Audit is needed, one that will address the ever changing business environment and the demanding challenges related to regulatory compliance and internal controls, technology, fraud, audit's value and independence and the competence of auditors. The technology is the key, in order to enable this approach, through the use of Data Analytics.

Based on IIA's GTAGs, the Continuous Audit approach allows internal auditors to fully understand critical control points, rules, and exceptions. The literature provides the basic principles and the vision of CA and serves as a base for further guidance, as the theme is evolving and maturing. ISACA's relevant literature, used also in this essay, is providing knowledge and practices for Big Data and Data Analytics, including uses and benefits, technical analyses and presentations, as well as various best practices and applications.

The approach to a more continuous real-time concept, is reflecting the evolution of technology and has had a slow but progressive acceptance, both in practice and in professional guidance, as seen for example, in guidance provided by the IIA in 2005 (GTAG 3 Continuous Auditing: Implications for Assurance, Monitoring, and Risk Assessment) and ISACA in 2010 (IT Audit and Assurance Guidelines). The "close" to real-time concept is also present on the definitions of CA.

The second category relates to academic research and articles. They provide the theoretical background and evolution of the topic, closely related also with practice and actual cases.

Researches and scholars have reasoned for and established the appeal and possibility of "closer to the event" assurance processes (Groomer & Murthy, 1989 and Vasarhelyi & Halper, 1991, as

¹ Information Systems Audit and Control Association, an independent, nonprofit, global association engaging in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information system, now goes by its acronym only, to reflect the broad range of IT governance professionals it serves.

cited in Bumgarner & Vasarhelyi, 2015). The evolution and advances of information technology, the rise of Big Data, and the increasing use of analytics have rapidly changed the profile and context of auditing, arguing for an approach to a more continuous real-time concept.

Moreover the literature presents the evolution of the term. The idea of a Continuous Audit was initially developed as a data monitoring and exception system (Vasarhelyi, 1996, as cited in Bumgarner & Vasarhelyi, 2015). Professor Vasarhelyi is actually credited with the original Continuous Audit application. The initial concept was expanded as a result of the Sarbanes Oxley regulation and the need to issue opinions on the adequacy of internal controls. The expanded scope included continuous control monitoring and continuous data assurance (Alles et al, 2006, as cited in Bumgarner & Vasarhelyi, 2015). Continuous risk monitoring and assessment was the next suggested addition, to be fully integrated within the previous structure, in order to achieve a robust system of Continuous Auditing.

In parallel articles and research demonstrated that automation of many internal audit procedures can save costs and allow internal auditors to deal more, with tasks that require human judgment, with strategic issues and also perform more frequent audits (Vasarhelyi, 1985 and Alles et al, 2002, as cited in Bumgarner & Vasarhelyi, 2015).

Moreover the term of continuous assurance emerges also, which may incorporate the Continuous Audit. This is considered a broader term, defined as an umbrella of services that include the traditional audit and other similar services, enabled by new technologies and business needs. (Vasarhelyi & Alles, 2006, as cited in Bumgarner & Vasarhelyi, 2015). IIA's GTAG3 defines continuous assurance as "a combination of Continuous Auditing and testing of first and second lines of defense continuous monitoring" (Ames et al, 2015).

Literature also refers to issues and challenges related to the access to Big Data for observation, monitoring and mass retrieval by the auditors, and the requirements in knowledge and software tools, in order to do these (Kuenkaikaew S. et al, 2012 plus ISACA papers and journals).

The need of auditing to change is also examined with focus on the traditional audit vs. the continuous one. Differences, with emphasis on the population sampling, audit coverage and frequency of audits, are thoroughly examined and analyzed.

Recent research on CA has been focused on the development of improved models for comparison of predictive models with actuals ones (transactions), in order to identify variances in the processes (Brown et al, 2007 and Chiu et al, 2014, as cited in Bumgarner & Vasarhelyi, 2015).

The third category relates to articles, white papers (advisory documents), journals and publications from auditing and consulting firms, IT and related services providers, ERP developers and other specialists, experts and journalists. This literature demonstrate the need for Continuous Audit, in order to meet the expectations and requirements of the complex business environment and stakeholders demands, as well as the various benefits from the use of Data Analytics (Ernst & Young, Deloitte, KPMG and others). At the same time various tools, methods and solutions are presented, for informational and commercial reasons, from firms specializing in Data Analytics and ERP solutions, as Accenture, SAS and Oracle. Development and implementation of CA with the use of Data Analytics are examined with the focus on key requirements and steps to be followed.

4. The Big Data

Over the last years, Big Data has emerged as one of the top issues and strategic priorities for organizations. The concept of collecting and storing large amounts of information for eventual analysis is not something new (McDermott, 2018). Nor is the use of these data and analytics, in order to create business value and make decisions. However the concept gained more impetus from the beginning of 21st century and is evolving since then.

Business activities and operations generate transactions and events. These include purchases and sales, payments, inventory receipts and issues, accounting entries, system logs and records. Various portable devices create an ever increasing volume of data. Big Data incorporates both the typical world of transactions and the “new” one of interactions and observations (Bakhshi & Setty, 2013), which were not used or known before. “This new world brings with it a wide range of multi-structured data sources that are forcing a new way of looking at things” (Bakhshi & Setty, 2013, p.1).

4.1. What is Big Data?

Big Data refers to information (potential), numbers, records, data created and collected from every aspect and source related to business operations.

Regarding the terminology, data is considered as information in raw or unorganized form, for example numbers or symbols, which relate to conditions, situations, objects or ideas. Information on the other hand is data specific and with purpose, meaningful and relevant, accurate and timely,

which decrease uncertainty, thus is valuable because it can affect decisions and behaviors (Online Businessdictionary.com, as cited in Rowlett, 2014).

According to ISACA Big Data is defined as “high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making” (Pearce, 2017). Actually this originates from the definition of Big Data by Gartner’s² analyst Doug Laney back in 2001 (as cited in Sicular, 2013).

Big Data has the potential to be mined for information and used in projects and analytics applications. In essence, it relates to data sets which are too large and too fast-changing, to be analyzed with the use of traditional database techniques or software tools, at a reasonable time (ISACA White Paper, 2013).

It is commonly described or defined using the three Vs model (McDermott, 2018, & www.oracle.com & www.sas.com, 2019). These are:

- The variety, which refers to the available types or formats of the data. These can be structured, like the numeric data in traditional databases and unstructured (the term semi-structured is also used in addition to these) like audio, video, text and other types. The difference is that unstructured data should be further processed in order to provide meaningful information and applied in analytics.
- The volume refers to the amount of data produced and stored by an organization. Companies create and collect data from many sources, from business transactions to sensor records and clicks on their website. However, Big Data is a subjective term; there is no predefined volume limit, to qualify data as “big” (McDermott, 2018).
- Velocity is the speed, the rate by which the data is produced, received and processed, in order to be evaluated and be prepared for further exploitation and use. Nowadays it is produced and received with unprecedented speed and must be processed on a timely manner. We should keep in mind that data is created constantly.

The potential business value of Big Data is in the insight, which was not available before (Sicular, 2013). It makes possible to gain more complete answers because it provides more information (www.oracle.com, 2019). These answers can assist a company to achieve cost and time

² Gartner is a global leading research and advisory company, with expertise in technology research.

reductions, new product development, optimization and improvement of processes, faster problem solving, prompt decision making and better strategic planning (www.sas.com, 2019).

As per ISACA, Big Data is both a marketing and a technical term referring to a valuable enterprise asset that is information (ISACA White Paper, 2013). This information – if properly extracted and analyzed – assist the company in understanding issues and making decisions. According to COBIT 5³, information is considered effective if it meets the needs of the information consumer, which in this case is the enterprise. The better the quality of the data, the better the decisions based on the data—ultimately creating value for the enterprise (ISACA White Paper, 2013).

Indeed, research conducted at the Sloan School of Management (M.I.T. USA), shows that companies which use “data-directed decision making” enjoy a five to six percent boost in productivity (Swalwell, 2012, as cited in ISACA White Paper, 2013).

Data is collected to be analyzed to find patterns and correlations that may not be initially apparent, but may be useful in making decisions. This process is called (big) Data Analytics (ISACA White Paper, 2013).

5. Understanding and using Data Analytics

In order to understand Data Analytics (DA), we begin with the definitions of the term, using references to their use and purpose.

According to ISACA “Data Analytics involves processes and activities designed to obtain and evaluate data to extract useful information. The results of DA may be used to identify areas of key risk, fraud, errors or misuse; improve business efficiencies; verify process effectiveness; and influence business decisions” (ISACA White Paper, 2011, p. 5).

“Data Analytics is the collecting, organizing and examining large volumes of data with the aim of discovering useful insights, suggesting conclusions, and supporting decision-making” (Mennie, 2019, p. 5).

³ COBIT (Control Objectives for Information and Related Technology) 5 is a business framework for the governance and management of enterprise IT.

“Data Analytics is an analytical process by which insights are extracted from operational, financial, and other forms of electronic data internal or external to the organization.” The purpose is again to provide understanding and answers (KPMG, 2012, p. 2).

Data Analytics is defined as, “the science of examining raw data with the purpose of drawing conclusions about that information.” (Alexiou, 2016, p. 1)

As it is clear from all the above definitions Data Analytics, involve processes and activities designed to collect, examine and evaluate data in order to extract useful information and insight. As shown in the previous section, organizations nowadays are generating Big Data – huge volumes of data ranging from financial transactions to key metrics. Internal auditors, particularly in medium and larger organizations, are making use of Data Analytics to both guide their audit plan and test controls (Chartered Institute of Internal Auditors, UK & Ireland, 2017).

5.1. Types of Data Analytics

We can identify four types or stages of Data Analytics, as per ISACA’s approach (ISACA White Paper, 2011, p. 5-7).

➤ *Ad-Hoc Data Analytics*

The Ad-Hoc Data Analytics is the first stage, which assists in the identification of patterns or potential risk within a business system. It is a way to initiate understanding of business processes, while becoming familiar with the data of a specific project. Typical techniques include exploratory data mining and data quality testing. Acquisition, import and verification of data may take considerable time and effort.

Results – and benefits – include the increased knowledge of systems and processes, cost savings and system improvements.

➤ *Repeatable Data Analytics*

Repeatable Data Analytics comprise the next stage in the evolution (or “maturity”) of DA. They consist of predefined and scripted analytics, designed to perform the same test on similar data, on a scheduled basis. The program scripts can be ran repeatedly thus increasing the frequency of Data Analytics. Data acquisition process is partially or fully automated.

Benefits include efficiency, consistency and more effective corrective actions.

➤ Centralized Analytics

It is a centralized approach for the development, storage and operation of Data Analytics. A central repository (a central storage area) is established for repeatable DA programs and files. Analytics applications are set up and scheduled to run against the centralized data.

Main advantages of this approach are increased consistency and efficiency, more reliable results, since the process is repeatable, increased data security and backup ability.

➤ Continuous Monitoring (CM)

It is a continuous run of analytics which enable – or offer the capability for - the immediate identification of a potential exception transaction. Analytics are fully automated and executed on scheduled intervals, on a regular basis. It is considered the highest maturity level of the process.

Benefits can be summarized to improved efficiency, reduction of errors and timely identification of mistakes and possible problems.

There are four (4) modules or types of continuous monitoring:

- Embedded modules are preconfigured sets of rules, set up to identify violations of the segregation of duties or monitor high risk transactions in real time. They are considered a preventive solution, useful for the monitoring of the control environment.
- Independent modules are preconfigured rules, established to run against data extracted after a transaction has been processed, therefore a detective solution. The process reduces costs associated with the manual sample selection and test of the controls' effectiveness.
- Security Incident Event Monitoring analytics are monitoring the incidents related to network activities, logging events, system access (rights) and firewall operation.
- Continuous Auditing (CA) is defined as the process of performing audit-related activities in a continuous manner (Coderre, 2005). CA includes continuous risk and control assessments in which automated analytics are an integral part. We should note that:
 - The definition of CA is presented and analyzed in detail in the next chapter.

- The terms Continuous Monitoring and Continuous Auditing are often mixed, as will be presented later. CM is often developed and owned by operations' management.
- Based on the above point, it is considered that effective use of CM by management may reduce the effort required by auditors for control testing.

5.2. How Data Analytics can help

Data Analytics and their use in Internal Audit methodology empower auditors with the ability and potential to provide more insight. The existence of Big Data combined with analytics makes it now feasible to mine data and assess the results with different perceptions, thus allowing the establishment of new patterns, relationships and correlations. Moreover it allows auditors to identify trends and exceptions (Chartered Institute of Internal Auditors, UK & Ireland, 2017). With DA auditors can build statistical models that explain the data in relation to other factors and identify significant fluctuations from the model.

Analytics can be exploratory, where new features (in the data) are discovered, and confirmatory, where existing hypotheses are proven true or false (Alexiou, 2016).

In order to identify these trends and exceptions, internal auditors can use a wide range of tools, such as (Chartered Institute of Internal Auditors, UK & Ireland, 2017):

- Desktop tools, as the Excel, which may be the most commonly used tool for Data Analytics, available to most organizations and easy to use.
- Specialized tools which provide a wide range of tasks, as the SPSS; a software platform from IBM offering advanced statistical analysis (www.ibm.com).
- Audit specific tools as the ACL, which enable advanced analytics but require investment and training.
- Enterprise tools, as the SAP. These tools can be used by audit functions, but again they require training, combined with data science skills and knowledge.

Analysis techniques have been used and before by auditors, to examine random or specific data sets, in order to identify errors or misstatements (among others). Internal Auditors usually test samples of transactions based on judgmental criteria, and not every transaction.

The use of Data Analytics enables auditors to test the 100% of a population (relevant need defined by audit objectives). Fraud analysis and Continuous Auditing are two examples, where the total population is often tested.

The application of Data Analytics enables Continuous Auditing. It provides the means to internal auditors to move from periodic assessments of risks and controls based on samples of transactions, to ongoing assessments using a larger proportion or the total of a population. This reference is what the Global Technology Audit Guide (GTAG 3) relates to Continuous Auditing (The Institute of Internal Auditors, 2015).

5.3. Use of Data Analytics in IA

The main use of Data Analytics is in the fieldwork stage of audit, in order to identify irregularities and test controls, but also to risk assessment and audit planning (Chartered Institute of Internal Auditors, UK & Ireland, 2017). The following table is reproduced from the same source (p.7).

Table 5.1

Internal audit function	Data analytics use examples
Compliance	Assess regulatory requirements. Perform supplier audits by utilizing line-item billing data to identify anomalies and trends to investigate. Identify poor data quality and integrity around various data systems that are key drivers to non-compliance risks.
Fraud, risk assessment, detection and investigation	Highlight data anomalies that pose the greatest financial and/or reputational risk to the organization. Identify ghost employees, potential false suppliers, and related parties or employee-supplier relationships. Identify areas at high risk of fraud and assess controls. Investigate the symptoms of an asset misappropriation scheme to answer the “who, what, when, where” questions.
Operational performance	Isolate key metrics around spend analysis e.g. payment timing, forgone early-payment discounts and payment efficiency. Perform duplicate payment analysis and recovery. Perform revenue-assurance analysis. Perform slow-moving inventory analysis.
Internal controls	Identify key performance and key risk indicators across industries and business lines. Anticipatory e.g. business continuity plan. Detective and corrective e.g. control account reconciliations. Directive e.g. code of conduct. Preventative e.g. passwords, access controls. Perform segregation of duties and user access analysis. Assess control performance. Exception reporting e.g. identify potential outliers that would indicate control failures or weaknesses.

Original Source: Based on IIA Research Foundation

5.4. Benefits of using Data Analytics

The key benefits of using Data Analytics include (Chartered Institute of Internal Auditors, UK & Ireland, 2017) & (Andriyevsky et al, Ernst & Young LLP, 2018) & (ISACA White Paper, 2011):

- Increased efficiency by using analytics vs. performing the analysis manually.
- Increased effectiveness, by testing the whole population instead of random or judgmental sampling, as well as enabling Continuous Auditing so that Internal Audit and the business can promptly identify timely emerging trends and risks.
- Focus on potential issues, greater focus on strategic risks, since some routine tasks can be performed now in a more automated way.
- Improved assurance since:
 - Analytics reduce the margin for human error.
 - Allow for greater precision in assessing operational effectiveness of the control environment.
 - Determine the effectiveness of antifraud procedures.
 - Identify attributes that were previously unavailable.
 - Recognize relationships, anomalies and correlations that were never before visible.
 - Identify areas where poor data quality exists.
- Greater audit coverage.
- Potential time and money savings.

Furthermore to verify theory with actual results, we reproduce below extracts from the reported benefits, from three case studies of Internal Audit functions, which have incorporated the use of Data Analytics into their methodologies and practice (Chartered Institute of Internal Auditors, UK & Ireland, 2017):

The use of Data Analytics “frees up time particularly during the fieldwork stage but they (the auditors) try to use this extra time to make better use of the data in order to deliver a better quality, more focused, audit. The ability to test 100% of the sample is where the real value lies as the level of assurance is much stronger” (Richard Brasher, Corporate Audit Director – Coca-Cola Hellenic, p. 10).

“Data Analytics enables the Internal Audit function to do more with less data while increasing the quality of its output...It helps to enhance the function’s efficiency and effectiveness.” (Mark

Starbuck, Chief Auditor, Regulatory and People Risks and Stephen Magora, Director of Data Analytics, Credit Suisse, p.11).

“The overall benefits are that they are carrying out a significant amount of extra work that they weren’t doing a couple of years ago. They are doing more work with fewer bodies, and achieving much deeper audit penetration and the work is much more insightful” (Kevin Goulding, Group Head of Internal Audit, Dublin Airport Authority, p. 14).

Analytics have the potential to transform the Internal Audit function. From planning to risk assessment and reporting, analytics enables Internal Audit to do more and make more impact, and then to communicate the results visually and interactively (Deloitte Canada, 2016, p. 10).

5.5. Considerations of Data Analytics approaches

There are, however issues for consideration when implementing Data Analytics, as the availability and limits of the relevant budget and tools, data quality issues, risk, security and privacy concerns (protection and confidentiality), managing false alerts and others (ISACA White Paper, 2011). The project requires investment in time and resources.

Audit Departments who decide to incorporate Data Analytics into their operation should define the objectives for the use and function of Data Analytics, as they define the scope and objectives of an Internal Audit. They should also assess the audit team’s skills and experience, the organization’s technological capabilities and level of assurance required.

Data Analytics provide greater insight; still auditors will have to use the more “traditional” softer skills and techniques, as interviews and root cause analysis in order to understand and evaluate this insight (Chartered Institute of Internal Auditors, UK & Ireland, 2017).

Big Data and business analytics have changed significantly the business environment and the capabilities of business processes. The same has to happen to Internal Audit,” its rules need to be changed, its steps evolved, automation integrated to its basic processes, its audit analytical procedures enhanced, and its timing close to real-time in predictive and preventive modes” (Appelbaum, Kogan, and Vasarhelyi, 2015).

6. Continuous Audit

The business world and operations today are characterized by rapid changes, increased compliance regulation and complexity, advancements in technology, huge volumes of data and increased demands from stakeholders. In this demanding environment, it is critical for the enterprises to assess and confront emerging risks, find the most effective and efficient ways to deal with them and improve their performance. Data Analytics and Continuous Auditing are the means, if implemented properly, to assist Internal Audit and the business (KPMG, 2012).

6.1. What is Continuous Auditing?

According to IIA's Global Technology Audit Guide (GTAG) "Continuous Auditing is any method used by auditors to perform audit-related activities on a more continuous or continual basis". It encompasses all activities on the control-risk continuum. "Technology plays a key role in automating the identification of exceptions and/or anomalies, analysis of patterns within the digits of key numeric fields, analysis of trends, detailed transaction analysis against cut-offs and thresholds, testing of controls, and the comparison of the process or system over time and/or against other similar entities" (Coderre, 2005, p.7).

The more recent definition from GTAG 3, define Continuous Auditing as "the combination of technology-enabled ongoing risk and control assessments. Continuous Auditing is designed to enable the internal auditor to report on subject matter within a much shorter timeframe than under the traditional retrospective approach" (Bradley et al, 2015).

So Continuous Auditing is defined as the technology-enabled method used to perform control and risk assessments on a more frequent basis. Technology plays a key role, as is also stated below.

Continuous Auditing is considered "a mechanism performed by IA to conduct effective integrated auditing and monitoring by leveraging technology to continuously gather data. The timing of the audits is to report events in real time by continuously gathering data from management information systems and transition from sampling accounts and transactions to providing 100% coverage. This mechanism also helps to provide opinions on control breakdowns and changes" (Andriyevsky et al, Ernst & Young LLP, 2018).

6.2. Evolution, traditional vs. continuous

From the periodic, looking in the past, approach in order to identify issues and events – and make the relevant assessments and corrective actions, the shift in Internal Audit profession is now towards a more proactive stance.

With the advance made in the area of real-time business, through information systems technology and the Internet, the existing time delays in controls checking, information integrity verification, and the backwardly looking audit process looks rather “outdated” (Cangemi, 2010).

During the last decades along with increased use of technology and associated benefits and risks, came the increasing demand and need for Computer Assisted Audit Tools (CAATs), in order to assist in the automation of the audit process. Then followed standardized audit tools such as Audit Command Language (ACL) and Interactive Data Extraction and Analysis (IDEA), which offered significant advantages. After the Sarbanes-Oxley Act (SOX) in 2002, new regulations imposed changes and increased demands in business and audit. The financial crisis of 2008 and what followed made the need for Continuous Auditing, proactive stance and real time response, even more demanding (Al-Awadhi et al, 2015).

Traditional audit usually assesses a small sample of past transactions and items on a periodical basis and may either fail to identify existing problems or detect them with delay, in order for corrective actions to be implemented. The traditional approach includes identification of control objectives, assessment and test of controls, walk-through and sampling procedures (usually judgmental) in order to see whether they support the conclusions around control effectiveness.

This approach changes essentially with Data Analytics, since it is possible to look at every transaction and balance, and to apply a whole range of tests to that data. This provides greater assurance about the effectiveness of the controls and the validity of transactions and balances, and greater audit coverage (Verver, 2013).

One of the key features of Continuous Audit is the ability to provide the relevant information in real time context or in any case, more frequently and in shorter time than previously.

The “traditional” approach is less effective in this because it is based on sampling of records in identified risk areas; as a result it may fail to select and capture all relevant data. Moreover, there is often significant time delay between the event – problem occurring and the issue being detected and identified; thus potentially delaying the corrective action (Ames et al, 2015, pages 55-56).

The evolution to Continuous Audit is considered a maturity process related to the use of Data Analytics. Theoretically Continuous Audit can take place without automation; the perception though is that Data Analytics are moving this process. Actually they are part of an evolving course, which starts with an ad hoc use, moves to repetitive use and, finally, to Continuous Auditing.

When the consistency and value (results) of a certain analytic are recognized, then it is rational to try to determine if it can be applied on a regular basis and then continuously (Verver, 2013).

Once the effective use of Data Analytics is established and integrated into the audit work plan, it becomes a natural evolution to begin implementing repeatable and sustainable Data Analytics processes and, when ready, to evolve and move forward to CA practices (KPMG, 2012).

The concept of CA shifts the Internal Auditing paradigm from the routine periodic audit of limited transactions’ samples, to the continuing review of much larger volumes of data.

The value proposition for Continuous Auditing is “in its ability to provide assurance when it is actually needed—that is, delivering audit at the speed of business” (quotation by Norman Marcks, as cited in Tabuena, 2013).

6.3. Continuous Monitoring vs. Continuous Audit

Continuous Audit (CA) is often confused with Continuous Monitoring (CM) because they have similar characteristics. Progress in automation results in overlapping issues, between management and Internal Audit, since they both integrate a wide variety of organizational data and technology-enabled processes. The following table describes the issue in operational terms:

Table 6.1

Continuous Auditing Performed by Internal Audit	Continuous Monitoring Responsibility of Management
Gain audit evidence more effectively and efficiently	Improve governance—aligning business/compliance risk to internal controls and remediation
React more timely to business risks	Improve transparency and react more timely to make better day-to-day decisions
Leverage technology to perform more efficient internal audits	Strive to reduce cost of controls and cost of testing/monitoring
Focus audits more specifically	
Help monitor compliance with policies, procedures, and regulations	Leverage technology to create efficiencies and opportunities for performance improvements.

Reproduced from Bumgarner & Vasarhelyi, 2015, initial source KPMG Little & Costello, 2012.

Traditional audit thinking may reason that if the audit function performs the monitoring, then it becomes part of the control system, thus it affects its independence (Bumgarner & Vasarhelyi, 2015).

However CA and CM are distinctly different functions. The most apparent difference is that CA is a function of internal audit, while CM is the responsibility of management.

This difference implies an even greater differentiator; the roles of CA and CM in the enterprise risk management. As CM is the responsibility of management, it assists the first two lines of defense—the business owners/management and the risk management/compliance and other functions—within an organization’s risk management framework. CM processes can be key elements of an internal control environment. CA’s main service though, is to provide the primary assurance within the third line of defense of a company, the Internal Audit (KPMG, 2012).

IIA’s guidance states clearly that “Continuous Monitoring is a management process that monitors on an ongoing basis whether internal controls are operating effectively (The Institute of Internal Auditors, 2013, PA 2320-4, p1).

Continuous Monitoring provides the feedback to Internal Audit to respond to changes in the risk and control environment. Continuous Auditing in contrast provides opinions on control issues and changes to the control environment, helping to provide increased assurance that key processes and controls are operating effectively and risks are appropriately mitigated (Andriyevsky et al, Ernst & Young LLP, 2018).

6.4. Requirements

The tone at the top is always important. If top management maintains an insufficient understanding of Continuous Audit operation and services, there is a reduced likelihood that employees at lower levels of the organization will be motivated to actively pursue such solutions (Ames et al, 2015, page 59).

Competencies and skills required in order to perform Continuous Audit include the following, as per a survey by the American Institute of Certified Public Accountants, Inc. (Ames et al, 2015, pages 53-58):

- Knowledge of business processes, controls, and inherent risks.
- Internal Audit experience (including forensic accounting, if dealing with fraud issues).
- An understanding of data extraction tools (as the IDEA and ACL)

- Data Analytics background (thus knowledge in data mining, SQL, probabilities)
- Knowledge in statistics (regression analysis)
- Technical skills (ERP, programming)
- Professional skepticism and judgment (critical, if we consider an IA department applying the appropriate standards and practices of the profession).

6.5. Automated methods to advance from the traditional audit to continuous forms (Al-Awadhi et al, 2015, p.79-82).

➤ The Embedded Audit Modules (EAM).

As the name implies, embedded refers to implant or insert a created block of program code within the enterprise's system code structure. The EAM is then monitoring the occurring transactions, in accordance with the construction of the code. When a suspicious item is identified, relevant event information is recorded in a log. The auditors review it, on an ongoing basis.

➤ The Monitoring and Control Layer (MCL).

The main function of the MCL method is to continuously analyze and compare data, obtained against specific benchmarks or other criteria. When exceptions are noted, alerts are generated and sent to the auditors for assessment and investigation.

Both methods have not yet received widespread acceptance in practice.

➤ Audit Data Warehouse

A data warehouse is a Big Data pool (repository), with tools to extract and analyze the data. It is linked with the various enterprise systems, in a way that it receives and integrates the relevant data generated throughout the organization. Data is extracted, processed, and installed continuously within the data warehouse. It is divided to smaller, specific sectors (the data "marts"), which contain various standardized audit tests that operate at specified time intervals (continuously, daily, weekly). These tests collect audit evidence and generate exception reports for the auditors.

➤ Audit Applications Approach

It is the more recent (2012) development. It involves the use of constructed or procured applications in alignment with audit plans and assertions, in order to effectively perform the audit.

It compares the information in defined categories with designated industry standards, and alerts the auditors when significant variations are identified.

6.6. Development and implementation of CA

Based on the available presentations and analyses used in this essay (Aquino, 2008 & KPMG, 2012 et al) and the relevant guidance of IIA (GTAG & Practice Advisory), we consider the following steps important in the development and implementation of CA:

- Determination of the audit objectives and prioritization of the areas for audit coverage. This activity should be an integral part of the annual audit annual plan and the company's risk management program. In this step, business processes are risk-rated and the critical ones are identified. For these areas, the availability of Continuous Audit data should be assessed, and the cost vs. benefit of the implementation.
- The analytics, in order to achieve these objectives, should be determined and selected (can be developed in-house or purchased). The rules of analytics that will guide the Continuous Audit activity must be defined, which need to be programmed, repeated frequently, and reconfigured when needed.
- The frequency of the process should be determined based on the audit objectives, the time requirements and availability of IT and auditors.
- The scope of Continuous Auditing routines should be defined and the CA parameters configured accordingly.
- Integrity and preparation of relevant data should be assessed.
- The treatment of alarms and detected errors should be decided. Follow up procedures should be set and responsible persons be arranged. The step is critical, for the success of the project, since there is no point in identifying probable issues and nothing to be done timely and/or effectively. Finally results should be communicated to related parties, in a timely, proper and consistent way.

We should clarify, that this is only a very short reference of CA's development points. The actual process, is much more extended and with various degrees of complexity.

6.7. Benefits - Cases

“Continuous Audit enables Internal Audit to provide assurance, when it is needed, on the more significant areas of the organization's governance, risk-management, compliance, and related operational controls processes” (Tabuena, 2013).

It offers efficient and effective risk management against an ever-changing regulatory landscape and increasing stakeholder demands to improve governance capabilities (KPMG, 2012).

Continuous Auditing is changing or evolving the audit process, as we shall see in the following cases, where the actual benefits from the implementation of CA are presented.

➤ *Implementing a Continuous Audit Framework - Natural Resources Canada*

The case is based on the Presentation by Ziad Shadid, Director of Audit Operations, Natural Resources Canada, January 2016, and information provided from their site (www.nrcan.gc.ca).

Natural Resources Canada (NRCan) “develops policies and programs that enhance the contribution of the natural resources sector to the (Canadian) economy while conducting innovative science in facilities across Canada to generate ideas and transfer technologies” (www.nrcan.gc.ca/nrcan/about-us/10838).

Establishing a Continuous Auditing framework

The audit department needs to have a clear understanding of its goals and what it aims to achieve, what is the desired outcome. Other key elements include the appropriate tools, Data Analytics, commitment from senior management, and internal auditors with the appropriate skills and training. Frequent dialogue is maintained in order to ensure the mandate of engagement is clear.

The framework

Collaboration and support from CFO and Finance Branch was essential to the establishment of a Continuous Auditing Framework. A common goal was established with management to provide assurance that focuses on strengthening monitoring and core controls for a given process.

For 2014-15, NRCan’s Continuous Audit activities included providing assurance on core controls for Contracting and Supplier Payments, Payments, and Travel and Associated Events, based on risk and senior management input.

Continuous Audits were conducted within 3-4 months, concluding on key controls established in collaboration with management at the onset of the audit. Findings and recommendations are summarized in a Continuous Audit deck. An annual Continuous Audit report is prepared summarizing Continuous Audit activity and posted on their website.

Value-added through Continuous Auditing

Value added through Continuous Auditing has been near real-time audit results on the effectiveness and efficiency of key controls; enhanced internal control processes and a reduction of duplicate or redundant controls.

Challenges

Initially, different directors were responsible for different elements of Continuous Auditing and different managers were assigned to lead each Continuous Audit, resulting in limited continuity of knowledge and a different style/approach for each audit conducted. Also lack of consistency in the presentation of each deck had impacts on messaging and purpose.

These issues were later addressed by centralizing Continuous Audit activity under one director and one manager; standardized templates for planning and reporting; and providing a clear vision on the desired outcome.

Conclusion

The CA activities provided timely recommendations to management in order to strengthen specific management processes and controls. The implemented actions have enhanced significantly the internal control environment.

Notes

From the case, we can recognize as key success factors, the establishment of clear and common goals, regarding what we want to achieve with the implementation of Continuous Audit, the appropriate resources, Data Analytics, skills and training and the support from senior management. An interesting point is the timeframe of Continuous Auditing, which varies from company to company, for example, there is reference to a framework of 3-4 months. Key challenges refer to lack of consistency in presentation and limited, initially, continuation of the knowledge acquired. The main benefits realized included “near” real time audit, enhanced audit processes and timely recommendations.

➤ *Accenture’s case*

Accenture is a” leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations”, to clients in more than 120 countries in the world (Accenture, 2016).

Scope

Internal Audit team's vision was to "dramatically change the way they operate"; also to work with Accenture business functions to create improved business insights and promote change in the ongoing business operating model by incorporating the power of analytics. Internal Audit cooperated with other Departments as Procurement and Accounts Payable, in order to create analytics which improved business monitoring and the identification of value.

Accenture's target for implementing Data Analytics and Continuous Audit was to gain efficiencies and identify savings opportunities across the organization. Simultaneous analysis of data across multiple transaction systems tools provides the Internal Audit with insights about inefficiencies and saving opportunities.

Key themes

Strong support from Accenture executive leadership and cooperation with other Departments were key issues. Others were knowledge and specialized skills, provided by an extended global team and resources in various Accenture Integration Factories around the world.

The new internal auditing capabilities, included among others:

- Automating monitoring activity (related to regulatory compliance, potential fraud and others), supported by analytics which identify risks on an ongoing basis, for more effective controls.
- Increased audit coverage and assurance, by auditing a full data population versus the traditional "sample-based" approach, and analyzing data patterns across multiple transaction systems.
- Enhancing business operations and controls by continuously monitoring errors or adverse trends.

A key activity of the project was creating a direct link to Accenture's single, global SAP instance Enterprise Resource Planning solution, thus having a global and homogenized source of data. The resulting interfaces, load queried data into an enterprise-wide data warehouse.

The Continuous Audit solution was successfully implemented. Internal Audit has now a toolbox of over 120 analytics that run on a periodic basis, across nearly all business functions.

Results and benefits

The use of analytics has changed essentially the operating ways of Internal Audit. Analytics are used on more than 75% of audits. Improved detection of potential policy violations in less time, and more efficient identification of exceptions (both in larger datasets and in faster analytic processes) have been effected.

An 80 percent reduction in audit time spent for gathering and cleansing data, has been realized. Thus auditors are able to focus more time on analyzing and creating new analytics, as promoted by Accenture's leadership.

The Continuous Audit and Analytics solution upgraded Accenture's internal auditing capabilities "by enabling the Internal Audit organization to provide business insight and perform more valuable auditing, in less time, and with more objectivity, all delivered in an agile way at-speed," as per Bob Kress, Managing Director of Global IT Audit.

Conclusion

The solution provides full population coverage consistently, rather than relying on sample-based testing. It automates processes considerably, supports compliance to company policies and provides a capability to flag potentially fraudulent transactions, by applying global analytics on a timelier basis. This approach has enabled Accenture to transform its internal auditing capability.

Notes

Once again cooperation and support from senior management and other departments are recognized as a key success features. Other key issues were specialized technical skills and knowledge, combined with the available or developed technology and Data Analytics. The scope for implementing Continuous Audit was to change "dramatically" the way Internal Audit operate, by leveraging the use of Data Analytics. It did accomplish greater audit coverage and assurance by full population coverage, automated processes, more valuable auditing in less time

The following three cases (included in the DA chapter), present also some areas for consideration, to which we will refer later in the essay.

➤ *Richard Brasher (Corporate Audit Director) – Coca-Cola Hellenic*

"Continuous Auditing would enable auditors to spot anomalies in large quantities of data but Continuous Auditing is at an early stage. They have started to run some scripts continuously, but

have found that they need to define the parameters very accurately otherwise simply too much data is generated”.

- *Mark Starbuck (Chief Auditor, Regulatory and People Risks) and Stephen Magora (Director of Data Analytics) – Credit Suisse*

“The overall objective is to transform the function from a traditional, judgement-based, sample driven, time-intensive and reactionary audit process to one that is risk-based, continuous and wholly data-centric and is carried out in real time”.

- *Kevin Goulding (Group Head of Internal Audit – Dublin Airport Authority)*

“The use of Data Analytics does enable Continuous Auditing on specific business cycles but not necessarily all of them, especially in the case of smaller audit functions. Within business cycles there will be specific areas that Continuous Auditing works well with but it is important to weigh up the costs and benefits of introducing Continuous Auditing”.

Notes

These very brief statements, provide us with valuable insight regarding concerns about the implementation of CA due to the need of a fine tuning of technical parameters (scripts) for the analytics to be used, otherwise data generated will be cumbersome, and the need to consider cost vs. benefits before introducing CA, as it may not be necessary to smaller audit functions (or not so efficient). However the objective is (again) to transform the audit function, towards a continuous, real time, data focused, risk based approach.

- *The Hewlett-Packard (HP) case (Ames et al, 2015, p.60-70)*

The implementation of the Decision Support and Analysis Service Internal Audit (DSAS/IA) Database Project, by the Hewlett-Packard Company is a very good example of how firms are leveraging the use of technology in conducting monitoring and auditing activities.

Utilizing the SAP environment, the SAP key performance indicator (KPI) solution has been implemented to capture and communicate the related KPI measures as required.

Information is then made immediately available to the Internal Audit staff via Web download and retained in the DSAS/IA Oracle database for future access and usage. In order to extract the relevant transactional data and files from the DSAS/IA database, auditors use the SAS/Audit Command Language (ACL).

The DSAS Database Table Content Query Screen's functionality greatly simplifies the generation of queries (search reports-lists) via a user-friendly point-and-click environment.

The system contains an Internal Audit Dashboard feature. With this feature, key metrics and trends are captured and displayed in ways that enable auditors to identify and detect possible issues with relative ease. It also provides significant operational information, accounting data, business reporting analyses compliance and performance metrics, and others. For example the General Ledger (GL) Account Wise Analysis function collects and presents information by account type to display various metrics.

In addition, the system is able to perform statistical analyses and use methods such linear regression, in order to identify outliers that need further investigation.

With the use of the system," the auditor is optimally positioned to detect issues promptly as they occur, which may ultimately serve a predictive or preemptive purpose" since it accumulates key metrics, statistics, and other relevant information in an ongoing manner (p.70).

Notes

Technology and the relevant analytics tools and metrics, are the main element in this case, used by HP to implement CA. The use of technology allowed audit to have a predictive or preemptive insight. In order for the technology to be applied and used effectively, the relevant skills, training and knowledge should have been developed and acquired.

- *Implementing Continuous Auditing and Continuous Monitoring in Metcash Change, Capabilities, and Culture* (Hardy & Laslett, 2015, p.157-166)

Metcash, an Australian based company, operates in four market areas: food and grocery, liquor, hardware, and automotive.

Benefits associated with the implementation of a CA/CM system included:

- An upgraded environment for automating manual tasks. For example Metcash processes high volumes of transactions; Accounts Receivable processes nearly 700,000 transactions each month.
- Value adding activities such as more efficient and focused audit planning, closer cooperation with management, improved capacity for Data Analytics, were realized during the process.

Challenges to the implementation included:

- Long lead times.
- Complicated technical environments.
- Significant use of resources
- Benefits were not easily recognizable in the beginning (early stages)
- Resistance to change from business owners.
- In addition, the Internal Audit was responsible for the acquisition, maintenance, and security of the CA/CM infrastructure.

In order to overcome these, active leadership and extensive consultation was required from the Internal Audit group, in order to transform the audit approach. Early realized savings from automating routine audit procedures, for example, potentially duplicated invoice processing, provided an "early win" for demonstrating the system's value to management.

The outcome was, as stated in the essay "the benefits delivered so far have exceeded the cost of achieving them" (p.159).

The solution

The adopted CA/CM architecture resembles data warehouse solutions. It has three component areas: data extraction, data transformation; and the loading of exceptions' data into user accessible exception management software. In order to achieve this, a combination of commercially available software was used, integrating ACL and ACL Direct Link for SAP, CaseWare Monitor, Windows Scheduler and Excel, each one intended for different uses.

In summary, ACL Direct Link is used to extract data from the ERP (SAP) system, while for non-SAP data, other extraction techniques were used. The CaseWare Monitor software handles exceptions, notifications of exceptions, actions taken and results, in the appropriate time frame.

An application example useful to understand how CA operates is the following:

Metcash has more than 100 applications in a range of areas. One considered "relatively unique" relates to the monitoring of personnel leaves, due to sickness, vacation, and other reasons, and how they are accounted for.

The major points of the (complex) leave CMR algorithm and process are presented below:

Log-in data is captured from all sources across the business. Workers who have not logged in for two or more business days are identified as exceptions. These are checked with HR department.

If there is no leave record, the exception is flagged, and the CMR continues to check the leave records for the next 14 days. If no leave record is processed during these 14 days, the exception is processed to the exception management workflow system.

The employee's manager is informed by an automated email (related to HR) and is requested to review the exception and advise the human resources department. Once a clarifying response is received, the exception is considered closed. A reason and action code for further analysis and reporting are recorded. If the exception however remains pending, the system continues to produce follow-up emails, requesting from the manager to review it and respond.

For those exceptions closed as "leave owing", the CMR checks to verify that leave has actually been processed. Again exceptions are forwarded to HR department. The system also makes an integrity test, by reviewing the cases where exceptions have been closed as "no leave owing," but leave was actually processed.

The experience with this application and others showed that the value of the CA/CM is reduced if there is no "robust" mechanism to deal with the exceptions and if the algorithms do not address effectively the suppression of false positives (another consideration).

Conclusion

CA/CM has evolved into a valuable system in Metcash. Its success required a combination of skills, the right technology, an open culture, collaboration and time (it has evolved in the enterprise for more than a decade). CA/CM represents new ways of doing things, challenging existing practices. By successfully integrating technology, audit is not limited to the examination of past events, but provides value added activities and insight for the future.

Notes

The case provides us with information about the main challenges related to the development and application of CA. These we consider as some of the most common challenges or obstacles faced by organizations and companies that want to apply Continuous Audit through the use of Data Analytics. The project requires considerable time and resources to materialize. This is directly related to the complicated technical processes for the data extraction, transformation and the identification of exceptions. As already demonstrated if the generated volume of false positives is

not decreased and effectively managed, it will create a cumbersome burden to audit, business and, in the end, in the CA implementation process. Moreover the use of multiple programs and applications, increases complexity. Another important point is the resistance to change by business owners, something that is to be expected, for which strong support and cooperation are the ways to deal with.

The results, on the other hand, can upgrade and enhance the role of Internal Audit to a key partner in managing risk and leading to success, as the case of Metcash concludes.

➤ *The Arrow case* (Whitehouse, 2013, p.10).

Arrow Electronics is an American Fortune 500 company (29.7 billion USD revenues in 2018), specializing in distribution and value added services relating to electronic components and computer products. In 2010, it decided to change its audit approach to Continuous Audit.

The scope was to exploit the massive collected amounts of data, by its Internal Audit function in a meaningful way that is to analyze transactions on a continuous and usually automated basis, rather than at a point in time and identify probable issues timely.

The approach was initially implemented on travel and entertainment costs and accounts payable, where issues are commoner and easier to identify. It provided quick results, which otherwise might have gone unnoticed. For example, there were cases where the same invoice was found to be paid more than once. Except problems, it also identified opportunities for improvement. For example, the company realized that it was more cost-effective to pay sales agents for standard mileage than for direct cost of gasoline. A relevant policy change was implemented. Another improvement related to some vendors' payments. Immediate payment terms, were turned to 30 days, which resulted to significant cash flow improvement.

Continuous Audit and the use of Data Analytics, assisted audit to identify the highest risk transactions, especially at remote locations, by allowing data extraction, general ledger examination and various accounting data processing.

Overall the company identified nine separate audit projects where Continuous Audit or Data Analytics would provide significant support to the audit function. From the sample testing of transactions, audit has evolved to be able to identify and test the highest risk transactions.

Notes

The case presents an example of the exploitation of the huge volume of collected data by analyzing transactions timely - on a continuous and usually automated basis - rather than occasionally. Besides identifying problems, the CA approach provides opportunities for improvements.

The study of these cases provides useful insight on the ways Continuous Audit was considered and applied, the results produced, the challenges encountered and the ways to deal with them. We proceed and conclude, with a reference of considerations and challenges, established through this essay and collected information.

6.8. Considerations

- The implementation of Continuous Audit includes significant costs and the payback period is estimated to be quite prolonged. It requires significant time and effort. It has the potential to produce significant benefits, though they may take considerable time to materialize and become apparent to business partners and stakeholders.

Significant technical skills, knowledge, training and IT infrastructure may be required, depending on the organization. These can be developed inside the company or acquired externally, through purchasing or outsourcing. All options have a cost vs. benefit aspect.

- The term continuous is also under interpretation. Various enterprises define it, as activities performed more often than every three months, while others refer to repeated process. IIA's definitions refer to audit related activities performed "on a more continuous or continual basis" (2005) and "ongoing risk and control assessments" (2015).

Others consider Continuous Auditing essentially only a variation of traditional auditing. The main difference is that of "performing some type of risk and control assessment on a more frequent, ongoing basis," (Verver, as cited in Whitehouse, 2013).

IIA's Practice Advisory 2320-4 for Continuous Assurance (The Institute of Internal Auditors, 2013, p2-3) clearly states that the frequency of Continuous Auditing activities will range from real-time to periodic analysis of detailed transactions. This depends on the risks' level of the examined matter and the level and adequacy of continuous monitoring performed by management. The regulatory requirements and potential impacts should be considered.

- Through the application of DA large volumes of false positives may arise. Those who "oppose" the development of CA will be strengthened by the delivery of unusable volumes of exceptions, which prove to be false positives.

The case of large volumes of exceptions has another dimension also. If a system identifies and characterizes thousands of exceptions and only some of them, the "exceptional exceptions", are being examined by auditors, this may be considered as lack of due consideration (Bumgarner & Vasarhelyi, 2015).

- We already mentioned about the misperception related to Continuous Auditing and continuous monitoring. The clear communication of their differences will help to avoid confusion and resistance to Continuous Audit as a redundant effort (Aquino, 2008).
- A key concern relates to the impairment of independence and objectivity of Internal Audit. It is considered that Continuous Auditing will lead to a loss of independence and objectivity, because auditors are often placed in the middle of the transaction flow and (may) become operationally involved in the process (Aquino, 2008).

Then, if audit reviews and responds on alerts of the CA or intervene in the process, this is an audit or a management function? And when auditors do respond, they lose their independence but still maintain their objectivity, as internal auditors (?) (Elder et al., 2013 as cited in Bumgarner & Vasarhelyi, 2015).

The answer to these questions lies probably in a change on the ways we consider and view independence (and its impairment), as well as a change in the applicable standards.

“Likely the need for understanding large systems, partnership with internal organizations, and a dramatic set of environment-changing events may change the view of independence impairment and may revert to some degree of auto-policing and the redefinition of independence conflict.” (Bumgarner & Vasarhelyi, 2015, p.38-39).

It is essential for internal auditors to make certain that the Continuous Audit process has a system of checks and balances to maintain the independence and objectivity of their work throughout the audit (Tabuena, 2013). As long as Internal Audit does not subordinate its judgment to that of the end users, any potential conflict can be mitigated effectively (Hardy & Laslett, 2015, p.165).

- *Impact on Personnel*

Implementation of Continuous Audit requires specific knowledge and skills in the area of information technology, and others. These skills must be acquired either through training or hiring. These can be difficult due to restrictions in resources (budget and available personnel). Moreover, Continuous Audit is a demanding process with many issues to be resolved. This can create big pressure to available personnel resources, and might require from the audit manager to apply sufficient authority in moments of exceptions (Aquino, 2008).

Another consideration relates to potential labor replacement issues, as manually performed tasks (audits) will be done automatically. However as we have also pointed in the Data Analytics section, the integration of analytics and audit, will allow audit to deal with other more strategic issues. Continuous automated audit may replace manually performed tasks, but not the entire audit work; still many and important tasks of “manual” work will have to be done. In addition, technologically advanced solutions are not very closely tied to labor replacement, as it has been argued (Hammer, 1990; Davenport, 1992, O’Leary, 2000 as cited in Bumgarner & Vasarhelyi, 2015).

Finally we should emphasize that Continuous Audit and Data Analytics are the tools to evolve and improve the “artificial intelligence” of Internal Audit function. The “emotional intelligence” is still the human factor.

These considerations should be addressed in order for the implementation of the Continuous Audit to be successful. Ideally, this should be done in the planning phase.

6.9. Challenges and obstacles

Historically, there have been a number of challenges to the implementation of sustainable CA processes by Internal Audit, through the integration of Data Analytics (KPMG, 2012).

- One of the primary challenges is the access to quality data and the lack of understanding of the way to effectively leverage Data Analytics in order to achieve the audit objectives. Analytics will not be very helpful, if they are not an integral part of the audit work and function (if they are applied in a stand-alone way without connection to, or integration with the audit work plan).
- There are various issues related to data availability and quality, as limited access, privacy and security issues, many different systems with different format, incomplete data and others.
- Difficulties with the use of Data Analytics range from identifying, designing, and building the analytics in the first place, to problems in defining and processing the exceptions and addressing the cases of false positives
- We should keep in mind that identification of exceptions and irregularities is only one step in the process. Audit and management need to review and assess this information. Considerable effort and resources are required in order to identify the significant false positives and “calibrate” the system in order to ensure that only the high-risk activity is flagged. When configuring the Continuous Audit procedure, the costs and benefits of error detection should

be considered, and the follow-up activities that will be required, by audit and management (Tabuena, 2013).

- Another matter is resistance to change in the new processes and new ways of doing things, something common to various business owners and the auditors, as well.
- Finally, we should repeat that the resources to apply and execute Continuous Audit are considerable (human, IT, financial and others), while availability is usually limited.

Continuous auditing (and continuous monitoring) should not be regarded as a short-term effort, but as commitments toward a new way of doing business. This will not eliminate the traditional approach, which still will be used, as auditors need the core skills that manual testing “teaches” and the expertise to evaluate risks and controls (Tabuena, 2013).

7. Conclusion

The overall benefits of implementing a Continuous Auditing system prevail over the significant costs related to it, as the mentioned cases demonstrated, though mainly for medium and large companies. It may be considered as a long term strategic investment, which will elevate the role of Internal Audit in the organization. Of course the aspect of cost vs. benefit should always be considered.

It is not a completely new audit method; it is more an evolution of the traditional audit function, using technology and the asset of Big Data. However this evolution need time, funds and support from senior management. Internal Audit function and management that are looking to implement a Continuous Audit approach need to be willing to move beyond their traditional audit activities (Aquino, 2018). This does not mean of course, that auditors will have to abandon their soft skills, their personal communication and their practices, in order to identify the cause of an issue.

The mission of Internal Audit is “to enhance and protect organizational value by providing risk-based and objective assurance, advice, and insight” as per the International Professional Practices Framework (IPPF, 2015). Continuous Audit with the use of Data Analytics enhances (or have the potential to enhance) this mission by providing greater assurance and audit coverage, insight that was not available or identifiable before, on a continuous or more frequent basis, than previously.

Concluding, this dissertation thesis has been both an opportunity and a cause to study further, analyze and understand the issue of Continuous Audit and the related themes of Data Analytics

and (big) data. In the end, the aim of this essay was to provide a comprehensive overview of these topics, deepen the knowledge about this subject and provide the incentive for more consideration.

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