The Perceived Usage Scenario's of Continuous Monitoring, Continuous Auditing and Continuous Assurance: an Explorative Study

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***Abstract*—Continuous monitoring, continuous auditing and continuous assurance are three methods that utilize a high degree of business intelligence and analytics. The increased interest in the three methods has led to multiple studies that analyze each method or a combination of methods from a micro-level. However, limited studies have focused on the perceived usage scenarios of the three methods from a macro level through the eyes of the end-user. In this study, we bridge the gap by identifying the different usage scenarios for each of the methods according to the end-users, the accountants. Data has been collected through a survey, which is analyzed by applying a nominal analysis and a process mining algorithm. Results show that respondents indicated 13 unique usage scenarios, while not one of the three methods is included in all of the 13 scenarios, which illustrates the diversity of opinions in accountancy practice in the Netherlands.**

Keywords-usage scenarios; continuous monitoring; continuous auditing; continuous assurance.

I. INTRODUCTION

The growth of business intelligence and analytics technology has increased in the last decades. It has helped organizations to get better insights into their operations, make better decisions and allow for evidence-based management. Still, it has been estimated that more than 50% of business intelligence and analytics implementations do not deliver the intended value [1]. Reasons for value dilution are not attributed to the technical perspective, but to the organizational alignment of business intelligence. For example, Hackathorn [2] identified the following three failures: 1) lack of relevance, 2) lack of actionable decision support technologies and 3) lack of alignment with the business. In a literature study by Trieu [3], a decade later, five themes emerged, also focusing on organizational alignment, namely 1) context/environmental factors, 2) business intelligence-conversion processes, 3) business intelligence-use processes, 4) business intelligence competitive process, and 5) latency effects. In this work, Trieu concludes that gaps are existing concerning how to focus on business intelligence development from an operational and competitive advantage and how do configurations and organizational routines impact business intelligence operational effectiveness [4].

A sector that depends highly on business intelligence and analytics technology is the accountancy sector. However, in current research, accountants hardly apply these specific terms. Accountants rather use the term Computer Assisted Audit Techniques (CAATs) [5]. CAATs is an umbrella term for software such as generalized audit software, utility software, test data, application software tracking and mapping, and audit expert systems, that help internal auditors directly test controls built into computerized information systems and data contained in computer files [4]. From a business intelligence and analytics perspective, the previously mentioned CAATs techniques can be seen as narrow business intelligence tools, which is because these tools have predefined data analysis that is defined and built in to support the accountants' tasks. Since recent years, the need for ongoing time assurance has increased [4], so has the need for real-time business intelligence and analytics. Accountants have formulated three different methods of real-time business intelligence namely, 1) continuous monitoring, 2) continuous auditing, and 3) continuous assurance (which will be further detailed in the following section). Research on continuous monitoring, continuous auditing and continuous assurance focuses mainly on technology usage in general [6], the application of business intelligence in specific environments [7], and taxonomy of technology and maturity models [8]. Despite the accumulation of literature, there is a surprisingly scarce amount of research that examines the manner in which the technology is applied, and in addition, whether accountants think that continuous monitoring, continuous auditing and continuous assurance are practically feasible. This presents a gap in current research since accountants are the actual end-users of the methods and underlying information technology. Taking previous statements into account, the following research question arose, which will be tackled in this paper: "*What are the usage scenarios of continuous*

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monitoring, continuous auditing and continuous assurance according to accountants?"

The current study extends previous research by researching from a macro level the usage scenarios of the three methods applied by accounting. It thereby adds to previous studies that have taken a micro-analysis approach.

The remainder of the paper is organized as follows. In Section 2, a discussion on the theoretical foundations of the background and related work is provided, being foundations on CAATs and accounting. This is followed by the elaboration of the research method in Section 3. In Section 4, the data collection and analysis is presented. Then, in Section 5, the results are presented. This is followed by the conclusions that can be drawn from our data collection and analysis in Section 6, the discussion with a critical view on this study and its results in Section 7, and lastly, a definition of future research directions in Section 8.

II. BACKGROUND AND RELATED WORK

Information technology is applied in most, if not all, occupations to support the execution of tasks. From an activity theory viewpoint, see Figure 1, three elements are applied to reason about this task [9]. These three elements are: 1) the tool applied, 2) the subject that performs the tasks, 3) and the object on which the task is performed. Each of the activities must be seen within the context that they are performed. From an auditing perspective, the subject that performs the activity are accountants.

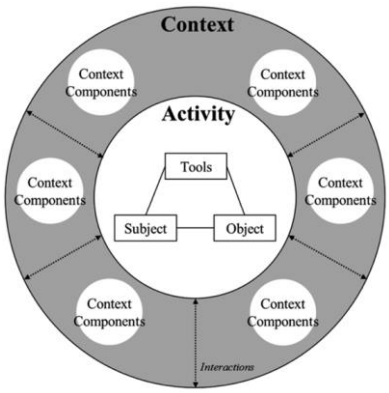

Figure 1. Human activity and context: activity theory and activity-centric view [9].

Accountants perform their tasks on various objects, for example, balance sheet items (e.g., inventory, cash, accounts payable, and accounts receivable), as well as all items from the income statement (e.g., cost of goods sold and sales). If an accountant is responsible for capitals other than purely financial capitals, CO_2 statements are also examined. The goal of performing these tasks on various objects is to provide reasonable assurance that all items are both accurate and complete. To provide reasonable assurance, multiple tools are applied by accountants. Examples of such tools are comprehensive relationship tests. An example of a relationship test is: *"Beginning Accounts Payables + Acquisition (Inventory) - Disbursements = Ending Accounts Payables"* [10]. In addition to generic tools, different information technology is applied by accountants. For example, generalized audit software, spreadsheet software, scripts developed using audit-specific software, specialized audit utilities, CAATs, commercially packaged solutions, and custom-developed production systems. Although information technology is applied, each of the activities executed by the accountant is done retrospectively [11]. From an information systems perspective, many of the tasks performed by accountants can be translated into three steps: 1) collect input data, 2) analyze input data, and 3) report results.

However, as stated in the previous section, accountants still rely heavily on spreadsheet software and only sparsely apply additional techniques. This is because the context variables in which an accountant performs his tasks allowed him or her to do so. Two trends have realized that the accountant has been looking to change from a retrospective to a more proactive approach. On the one hand, the pace of change of organizations and the fact that they have to respond more rapidly to change and emerging risk [12]. On the other hand, the advancements in information technology have made it possible to perform ongoing risk and control assessments [12].

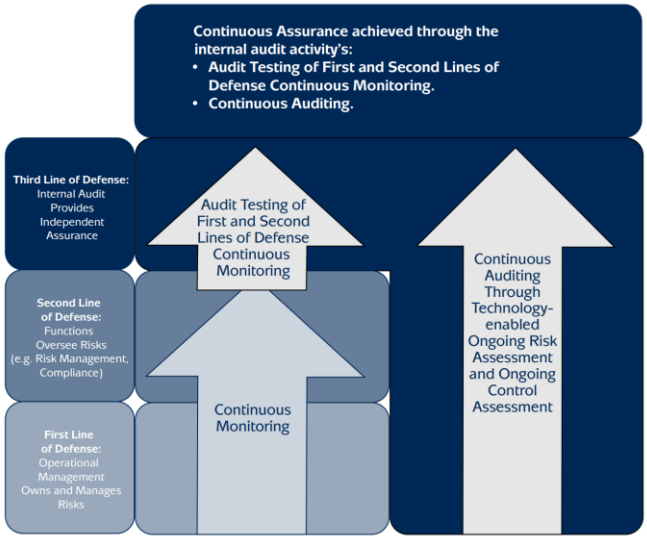

Figure 2. Three lines of defense [13].

From an information technology/data science perspective, this change can be categorized as a change from stand-alone analytics to infused analytics [14]. Standalone analytics is defined as analytics that is performed outside the production system on the data extracted from the production system, the current way of working within accountancy practice. Infused analytics are performed ongoing and real-time. This is where multiple forms of data analyses are applied, such as process mining

and decision mining. Within the audit community, three forms of ongoing assessment are recognized, namely: 1) continuous monitoring, 2) continuous auditing and 3) continuous assurance.

Continuous Monitoring (CM) is a method that monitors, on an ongoing basis, whether internal controls are operating effectively [13]. During this monitoring, they assess business risks, financial and operational results and to re-prioritize and rank audit trigger events and risks to control intervals (daily, weekly, monthly, quarterly). Responsible for CM are the operational management, risk management and compliance business functions. When continuous monitoring has been realized the next phase is continuous auditing [13]. Continuous Auditing (CA) is a method that combines technology-enabled ongoing risk assessment and ongoing control assessments. CA enhances the ability of accountants to identify risk indicators, evaluate risk parameters by analyzing systems for changes, security incidents, outliers, and transactions. The goal of CA is issuing audit reports simultaneously with, or a short period after, the data that is entered into the information system or evaluation of the current system. To realize continuous auditing, multi-information systems are applied, for example, generalized audit software, spreadsheet software or scripts developed using audit-specific software, specialized audit utilities, CAATs, commercially packaged solutions, and custom-developed production systems. CA has been broadly researched by multiple researchers [10][15][16]. For example, Kogan et al. [17] researched the continuous monitoring of transactions with a hospital supply chain, utilizing patterns within the business processes to supply information to internal auditing. In addition to research, multiple guidance reports by regulatory bodies also have been published, for example, GTAG 3 Continuous Auditing: Implications for Assurance [13], Monitoring, and Risk Assessment [13] and Information Systems Audit and Control Association (ISACA) its IT Audit and Assurance Guidelines [18]. In 2010, the Australian Institute of Chartered Accountants also published its Continuous Assurance for the Now Economy [19]. Still, multiple studies show that the adoption has been lacking [17][20][21]. Continuous Auditing is the responsibility of both internal auditing and external auditing business functions. When an organization has realized CM and CA, the next phase is Continuous Assurance (CAS). CAS is performed by internal or external audit and is a combination of CA and testing of first and second lines of defense CM. It does so, using technology, by processing information immediately to produce audit results simultaneously or within a short period after the occurrence of relevant events [12]. The CM, CA, and CAS processes are integrally visualized in Figure 2.

III. RESEARCH METHOD

The goal of this study is twofold: firstly, to identify the perceived use of different methods by accountants and secondly to study if accountants are able to make a distinction between different methods. As stated in the introduction of this paper, the utilization of continuous monitoring, continuous auditing, and continuous assurance is mostly studied from the perspective of various data engineering-related roles, lacking the view of the end-user, the accountant. Because the context of the subject under research is widely researched, a quantitative approach is appropriate, which allows us to, on a relatively large scale, research the accountants' perspective with regards to the three techniques. To do so, a survey is selected as a modus operandi for this study. The survey enables, in an empirical manner, to translate the views of accountants into the analysis and development of narrative scenarios [22], [23].

The survey will be conducted among members of the Dutch national accountant's association, spread over several accountancy agencies in the Netherlands. To increase the validity of the results a combination of two accountant-types were included in this study. The first type of accountant included concerns the accounting consultants/auditors (AA in Dutch), which are responsible for, e.g., compilation engagements, advisory regarding tax consultancy, and bookkeeping. The second type of accountant included concerns the chartered auditor (RA in Dutch), which are responsible for, e.g., statutory audits and other assurance engagements.

In total, the survey comprises seven elements, represented by one question each. The first question focuses on deriving the workplace and is used to ensure a proper spread of respondents is achieved amongst our total sample. The second question focuses on the responsibilities of the accountant, concretely, whether the accountant has decision rights (e.g., by mandate) or is a member of the board of directors of the workplace in question. Then, the following three questions focus on the utilization of the three methods, being continuous monitoring, continuous auditing, and continuous assurance. Additionally, the respondents were asked to elaborate on the timeframe they think the methods, for each method, are used or will be used. For this question, the following four answers were possible; 1) I don't know, 2) currently applying the method, 3) will apply the method in one to five years, or 4) it will take more than five years to apply the method. Lastly, two questions were posed that focus on the respondents view of the application of the methods in the accountant's practice in general as well as how the respondent rank themselves against the application of the methods by the accountant's practice in general.

IV. DATA COLLECTION AND ANALYSIS

The survey was distributed to a sample of 8,393 respondents in total, of which 727 responded, which is a response rate of 8.66%. The respondents could return the survey starting from July 11, 2019, until October 16, 2019.

To establish the narrative scenarios from the data collected, a process mining algorithm is applied in Microsoft Power BI. To do so, three input variables were

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utilized; 1) the case ID, represented by the respondent ID, e.g., 004, 452, 2) the activity ID, represented by the application of the method, i.e., continuous monitoring, continuous auditing, continuous assurance, and 3) the timestamp, represented by the timeframe the respondent thinks the method will be applied, e.g., currently applying the method and one to five years.

V. RESULTS

Regarding the data analysed in an overall sense, thirteen scenarios were discovered, see Figure 4. The majority of respondents (n=466, 64%) indicated that either continuous monitoring, continuous auditing and/or continuous assurance is going to be applied within the accountancy practice. The remainder of the respondents (n=261, 36%) indicate that they either do not know if one of the techniques is going to be implemented or state it is not relevant. Looking at the distribution of the scenarios amongst the respondents, 86.1% indicated their preference for either scenario one, two or three. We argue that the collection of the first three scenarios significantly represent our sample. Therefore, only the first three scenarios are reported in this section.

A. *Board of directors vs. non-board of directors*

As described earlier in this paper, one of the questions in the survey focused on the decision rights of the respondents. In Figure 3, the largest scenarios are depicted, further drilled down to the number of respondents that have decision rights versus respondents that do not have decision rights.

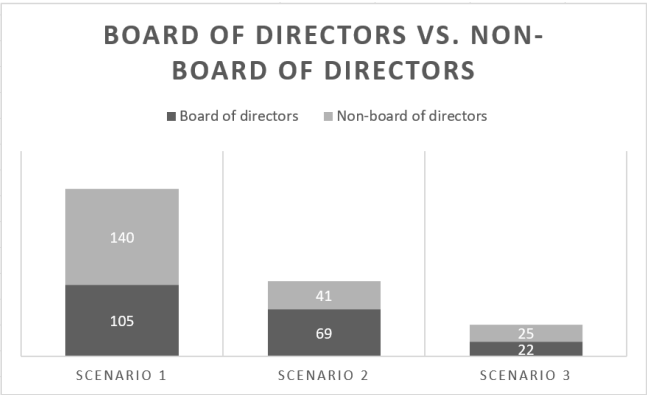

Figure 3. Board of directors versus non-board of directors.

Although the number of respondents with both roles entered all three scenarios similarly, 35 respondents without decision rights more than respondents with decision rights entered the first scenario. The differences between both groups are smaller for the second and third scenario.

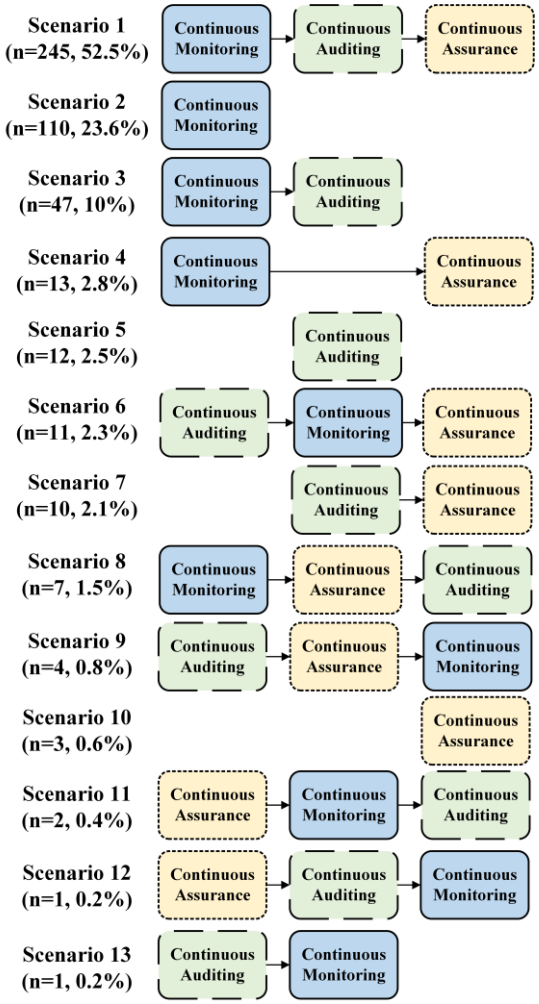

Figure 4. Overview of the discovered usage scenarios.

B. *Type of accountancy practice*

As it can be observed from Figure 5, a large portion of the sample operates either from the public practice or commercial practice.

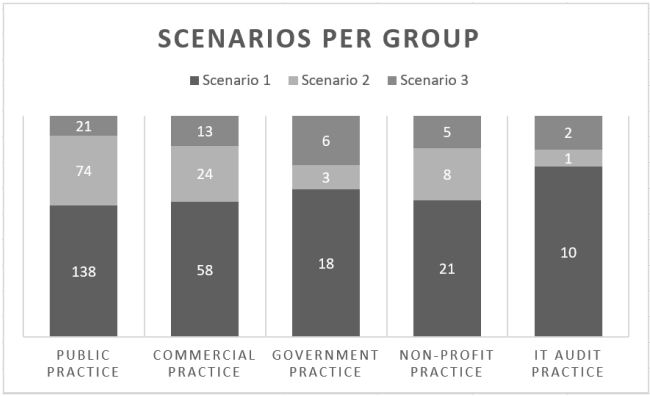

Figure 5. Scenarios per type of accountancy practice.

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Across all groups, most indicated the first scenario. Furthermore, although the IT audit practice type of accountants are represented by a relatively small amount of respondents in this study, the distribution of the scenarios seems more skewed towards the first scenario compared to the other types of accountants.

C. *Perceived usage of IT by accountancy practice in general*

The survey also considered the view of respondents with regards to accountancy practice in general. As described earlier in this paper, this was operationalized by a question that focuses on the perceived usage of IT in accountancy practice.

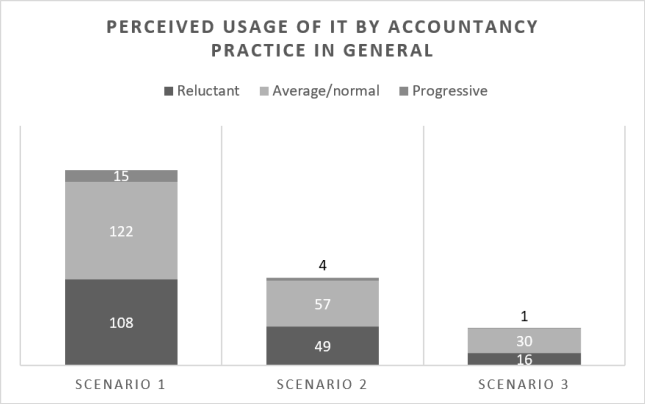

Figure 6. Perceived usage if IT by accountancy practice in general.

As it can be observed from Figure 6, a relatively small number of respondents indicate that the accountancy practice, in general, are not progressive in their IT usage. A similar number of respondents indicated both reluctant and average/normal IT usage.

VI. DISCUSSION

Like all research studies, this study has several limitations that should be considered when interpreting the results and conclusions. The first limitation concerns the percentage of respondents that filled in the survey. Out of the 8.393 surveys sent, 727 respondents completed the survey, which results in a response rate of 8.66%. Considering the fact that a third party database with email-addresses was used to send out the questionnaire, we consider 8.66% percent as a respectable return rate [26]. In addition to the number of respondents, another limitation is the population to which the survey was distributed. This population exists out of registered accountants, of both types described, in the Netherlands. Previous research has shown that accountants in the western world have a likewise adoption of information technology. However, this research can therefore only be generalized towards the Dutch population of accountants. Lastly, one could argue that the results presented in this paper offer a view into what accountants 'think about' the use of CM, CA and CAS in combination with technology, therefore producing a possible difference between 'empirical' experience, opinions and perception. This does not compromise the findings of this preliminary empirical research that should be utilized to further research the actual usage (hard figures) of technology to perform CM, CA and CAS by accountants.

VII. CONCLUSION

In this paper, an answer is provided to the following research question: *'What are the usage scenarios of continuous monitoring, continuous auditing, and continuous assurance according to accountants?'* To answer this question, a survey is distributed amongst a large sample of Dutch accountants. In this study, because of the nascent nature of the perspective of the accountant in a mature research domain, no inferential analysis was utilized. To ground the conclusions, it is important to note that, from a literature point of view, the scenario of 1) continuous monitoring, 2) continuous auditing, and 3) continuous assurance is the most fundamentally researched and proven approach, e.g., see [13][24][25]. The same holds for the practical application of IT in accountancy, where it is, from a technical point-of-view, impossible to first establish continuous assurance before continuous monitoring is implemented. This also validates the decision to only include the first three scenarios in the analysis as some combinations of scenarios four to thirteen are impossible to implement in practice. An explanation for combinations that seem impossible to implement in practice could lie in the fact that respondents believe that only part of the methods of 1) continuous monitoring, 2) continuous auditing, and 3) continuous assurance lies within their responsibility. For example, an accountant might think that continuous monitoring and continuous auditing should be conducted by a client so that the accountant him or herself can provide continuous assurance. Although this explanation validates scenarios in which only one or two of the three methods are indicated, it does not explain practically impossible scenarios in which the sequence is scrambled.

Based on the descriptive statistics of the board of directors versus the non-board of directors, differences are observed between the number of respondents that indicated the first scenario, although they do not insinuate significance. The same holds for the scenarios indicated per type of accountancy practice. Taking a closer look at the differences in scenarios indicated by types of accountancy practice, the IT audit practice seems to suggest a stronger preference for scenario one compared to the other types of accountancy practice. This is interesting as it could suggest that more technology-savvy accountants understand the sequence and dependencies between the three methods. Lastly, the results regarding the perceived usage of IT by accountancy practice, in general, seems to depict a negative attitude towards IT adoption by accountancy practice in general. This could be part of the explanation for the impossible scenarios because many accountants could lack

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awareness of the possibilities that technology brings for them to support the methods of continuous monitoring, continuous auditing and continuous assurance.

VIII. FUTURE RESEARCH

The first direction for future research concerns the addition of accountants registered in other countries, whereby western as non-western countries should be included in the sample, as practices can differ. The second direction for further research is triggered by the scenario's that only apply continuous auditing and/or continuous assurance. One possible explanation for these scenarios can be that the accountants believe that continuous monitoring and/or continuous auditing should be implemented by their clients. To investigate this possible explanation further, future research should include the expected usage of the previously mentioned methods by audit clients. Since this research is characterized as explorative, additional research should be performed. Future research should focus on an analysis of the situational factors to assess the minimal number of situational factors necessary to classify the continuous auditing, continuous monitoring and continuous assurance problem space, which in term can be used to define specific implementation scenarios. Lastly, the relationship between combined assurance (see e.g., [27]) and the results of this study could be further investigated in future research.

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