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Research paper

Data Mining: a Three-Step of Real-Time Audit Paradigm

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Abstract

One problem in business is the aspect of reporting through the process of financial audit. The problem with conventional audit is highlighted in this research through literature review of Statement of Auditing Standards (SAS) regarding to the issues of (1) risk assessment, (2) sampling methods, and (3) going concern analysis. This research further describes all these issues in the light of efficient audit process. The method used is exploratory, engaging comprehensive literature review from the perspectives of forensic accounting and information system. The output is to build a three-step financial audit paradigm embedding (1) exploratory data analysis and descriptive modelling in risk assessment, (2) predictive and association analysis in sampling, and (3) grounded professional judgement in going concern analysis.

Keywords: *Financial Audit, Real-Time Management, Risk Assessment, Audit Sampling, Information System, Data Mining, Fraud, Audit Efficiency.*

1. Introduction

Digital era is now emerging, many areas in business are innovating frameworks to simplify business process which commonly ends in huge gaps between simplicity and control, when business experts turns their eyes on profitability without considering the cost of management [1]. Real-time is the key. Numerous findings in natural science show its importance e.g. oceanic [2], forestry [3], and catastrophe [4] which are confirmed to be measurable [5]. Further, business involves corporate governance and accountability system relying on human's driving forces requiring framework defining its process [6]. Issues related i.e. inefficient audit [7], auditor negligence [8, 9], and auditor ignorance [10]. These problems can be addressed through the discussion of information system engagement embedding auditing processes which enhances reports reliability.

2. Methods

Researchers rely on qualitative method to build a framework. Through comprehensive literature review, researchers highlight common issues in financial auditing processes categorize those issues into stages, and discussing applicable data mining techniques for audit procedures. The output of this research is to build a framework of real-time financial audit using digital forensic tool: data mining techniques.

3. Literature Review

3.1. Obsolescence of Current Financial Audit

Financial audit is a corporate reflection of public disclosure and accountability. Brennan and Solomon [11] defines accountability as a mechanism that can be governed. There are two types of mechanisms: (1) internal (from board of directors to staffs and administrators) and (2) external (customer, vendors, creditors, debtors, and state government) [11]. Financial audit must be able to provide true information regarding to companies' fairness in reporting. external stakeholders rely to auditors' capability to perform examination in certain standards. In other words, it can be assumed that stakeholders hand business risk mitigation to trustees who are prone to slip and error [8]. According to Statement of Auditing Standards (SAS) there are three activities involved in auditing process i.e. risk assessment, audit sampling, and going concern analysis. All these phases require auditors to subjectively perform their professional judgement [12]. Below is the table explaining audit stages in accordance with SAS and its related issues

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Table 1: Issues Regarding to Financial Audit

Audit Stages	Issues on the Field
Risk Assessment (SAS No.55) There are two areas of risk consideration in analytical procedure: 1. Financial statement analysis 2. Internal control test [13]	• Preliminary analytical procedure is exercised through unrealistic (unaudited) financial reports [14] might obscure true financial representation of auditee [15]. • Substantive test of internal control involves procedures examination using normal sample provided by auditee [16] might cover bigger transaction infringing related procedures [17].
Audit Sampling (SAS No.1) There are two approaches: 1. Statistical technique	• There are no certain applicable standards in sampling treatment (outlier might indicate fraudulent schemes or show infrequent-normal transaction of auditee) [19]. • Audit risk of material misstatement is higher (called as control risk), due to auditors'

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2. Non-statistical technique [18]	tendency to use personal judgement regarding to sample size and items selected for test group [20].
Going Concern (SAS No.59) There are two areas for which auditors must consider their opinion: 1. Management plans towards opinion 2. Financial statement and auditors' report effects to related stakeholders [21]	• There is a slight apprehensiveness in providing audit opinion due to investors responses regarding to company's future performance especially companies with blue-chip stock [22]. • Audit opinion might affect stakeholders' viewpoints regarding to the transactions' safeness [23] in which, there is a risk of conflict of interest between auditors and auditee related to going-concern analysis [24].

3.2. The Idea of Real-Time Audit

As per date the audit commenced, auditors are expected to conduct all tests and analysis efficiently. Time lag is one of the hint of inefficiency. In the field of financial audit, the term "audit delay" is a time span between financial date and opinion date [25]. Eghlaiow et al [7] summarizes the most dominant variable for audit delay tested from different countries i.e. company size, internal control, company year-end, audit firm size, extraordinary items, and audit opinion. Especially, it is argued that specific examination technique might be applied only to controllable factors within audit phases (internal control and audit opinion), not the default factors [7].

To response, there must be a new perspective of real-time management in the context of financial audit. real-time management can be defined as a process managing raw data in an automatic manner that delivers useful information for which the users could strongly be assured in decision making. Based on this definition, researchers assume that it is necessary for auditors to embed tools as a decision support system (DSS) reducing time-span and increasing accuracy. The question emerged is "how good the toolkit could minimize several risks that might not be covered by SAS?". One common audit risk is dealing with an overview of big data analysis including both the existed and deleted.

This research proposes data mining as a solution. There are three reasons grounded on SAS: (1) through thorough examination on the total data population, data mining fulfills audit requirement stated on SAS no.99 "…gathering and evaluating sufficient convincing information through necessary methodology to consider the risk of material misstatement due to fraudulent activity" [26, 27], (2) data mining technique is not to be separated from financial audit processes, due to sampling activity involving smaller scale of mining [18, 28], and (3) information regarding to internal control breaches could be used qualitatively to make going-concern analysis including in restructuring audit program pinpointing interviewed parties [21, 29].

4. Result and Discussion

According to Hand, Smyth, & Mannila [30] digital forensic is an area where the process of identification, extraction, and analysis of electronic digital devices can be done without any requirement of multiple procedures. This applied science also addresses the preservation of findings for informal (organizational evaluation and research and development) and/or formal (legal disputes' chain of custody) purposes. Data mining is a big data analysis to reveal undisclosed fraudulent schemes or unintentional errors done by system's users [30]. In the light of audit activity, data mining techniques suggested must bridge the requirements of explorative and predictive (risk assessment), depictive and investigative (audit sampling), and analytic and reliable (going concern analysis).

Initially, Exploratory Data Analysis (EDA) is suggested to explore the whole companies' accounting track records which is at the early stages of risk assessment. The EDA's feature is to explore data even in the condition where users have no preliminary understanding regarding to types of data located at data base [31]. As its ability to explore, EDA deals with big data analysis to bring out the whole picture of the company which may cover the range of data recovery. Further, when necessary, descriptive modelling shall assist users to describe all explored data using density estimation, cluster analysis and segmentation, and dependency analysis [30]. Through EDA, two identical entries might be compared, resulting in another area of risk of misstatement. Auditors could make analysis towards financial data, and decide which version is true through management inquiry, internal audit statement, and financial confirmation as to fulfil documentation requirement for audit [32].

One example is solvability analysis. Through EDA, auditors can capture data of long-term loan, interest payment, and loan disbursement to make an assumption regarding to management accuracy in sales target setting and efficiency in loan expenditure [33]. Based on those circumstances, auditors may employ descriptive modelling to assess auditee's solvability risk. inclination in future cash disbursement due to loan maturity and interest cause in the increasing the fraudulent disbursement or company becoming insolvable e.g. Livent in August 1997 [34], Enron in December 2001 [8], and WorldCom and Tyco in July 2002 [10, 11]. Auditors' comprehensive view is pivotal so that auditors shall not vacate more times to sample in an area with low risk and turn away from high-risk transactions [8].

Furthermore, proportional audit program is executed through effective examination through audit sampling. Based on SAS no.1, auditors must consider statistical or non-statistical approaches in sample consideration. In other words, SAS requires sampling based on particular mathematical methods [18, 35]. Two models are recommended in this research: (1) predictive modelling and (2) association modelling. Predictive modelling is a fully statistical consideration allowing users to depict relationships between category to ensure its normality [30].

Statistically, classification and regression analysis can be used as far as all quantitative variables are measured in the field. For example, the auditors might search for abnormal distribution of operating expenses, they might consider to examine fixed assets' chart of accounts [33]. When users find positive correlation and linearity between fixed assets and operating expenses, then auditors must consider the risk of fraudulent expenditure of property capitalization [36]. The next stage is using method to understand patterns between variables where outliers are located. This technique is considered as non-statistical, due to utilization of timeline analysis is more preferably than descriptive statistical analysis [37].

At the last stage of auditing processes, going concern analysis does not depend solely on all data mining results. Many researchers found that auditors sometimes ignore all risk consideration and rely on external sustainability factors i.e. customer relationship and brand image [38], shareholders' trust [39], managerial competency [40,41], board leadership and decision making [42, 43, 44], and future cash flow analysis [45, 46]. Moreover, many case studies provided facts regarding to auditors' leniency in audit opinion due to external pressure from both benefited creditors (loan-interest revenue or trading of dishonored notes) [47, 48] and debtors (cash or stock dividend) [49, 50, 51]. However, such factors have affected in delay, which harms other stakeholders [25].

Such pressures might be inevitable, but the auditing time-frame is expected to be narrowed through implementation of efficient risk assessment and sampling. Another perspective is in accordance with principle of independency [23], unbiased information [33], and clear methodology [52], including the implementation of audit

with a degree of professional skepticism [27], all techniques are dependable for audit's disclosure requirement, measurable analysis, and empirical consideration which can be justified as the highest degree of professional judgment and valued with objective measurement .

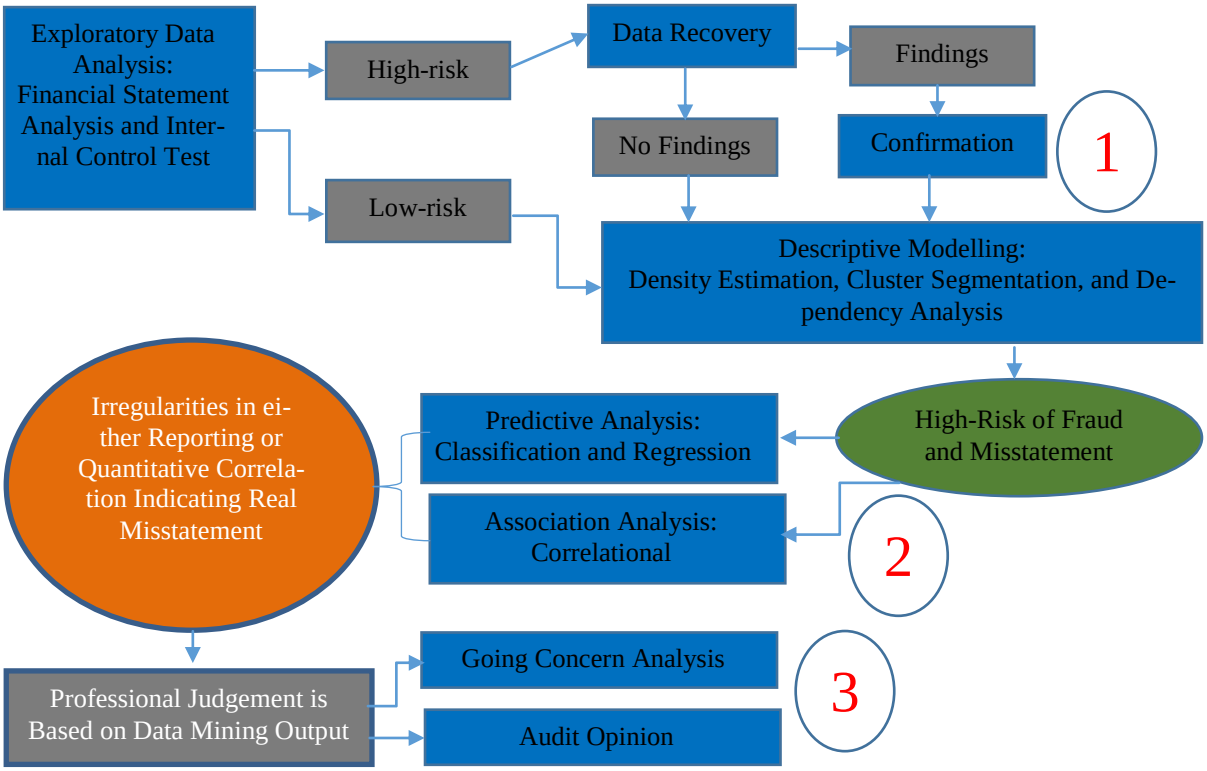


Chart 1: Flowchart of Three-Steps of Real-Time Audit Paradigm

5. Conclusion

This research provides arguments how data mining implementation could impact audit efficiency. All data mining techniques are offered in a conceptual framework on the basis of SAS requirement, with the purpose of audit efficiency and effectiveness without sacrificing data reliability which results in audit opinion. As a requirement in fraud and misstatement risk, rigid risk assessment and sampling are suggested although, auditors may decide other factors rather than the output of data mining. However, this model is built in a limitation of SAS requirements highlighting issues in audit processes which rely on auditors' professional judgement. This model open a new way of financial audit paradigm to enhance innovation of researches in information and technology (IT) which could embrace IT construct, IT testing, or even new suggestion for other data mining techniques.

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