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Effects of Business Intelligence on the Continuous Auditing Process

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Abstract:- Business organisations have evolved significantly in recent decades with constant developments in the area of business-oriented digital technology solutions. The trend that started with simple computing and record keeping software tools has now been extended to the point of intelligent software tools that leverage on business intelligence. Popular business intelligence tools like SAP and Oracle take all varying types of business information into account to produce valuable intelligence and information for managers to make use of. In this research study, the case of one of the most popular business software tools category available today is presented. The paper makes a literature-based analysis of the advantages and limitations that business intelligence tools have in the field of helping businesses develop a culture of continuous auditing. It is identified that an integrated business intelligence suite has immense potential when used for the purpose of continuous auditing; however, its use-case will depend on what price a company can afford to implement such an expensive tool set.

Keywords:- *Business Intelligence, Continuous Auditing, Business Automated Auditing.*

I. INTRODUCTION

In recent decades, businesses have evolved to a significant degree by relying on internet technologies and adoption of business management software tools. In this area of management, business intelligence (BI) tools provide some of the most promising developments in business management. Business intelligence tools allow managers and businesses to make use of business information, market data and historical transaction data in order to generate information that helps in making more-informed business decisions (Sharma & Dijaw 2011). The sheer scope of BI tools in businesses is very large as BI tools can be implemented in a very flexible manner in organisational structures for such purposes as cost reduction, identifying business opportunities, identification of inefficiency in business operations, customer trend assessment, and evaluation of business data (Bernardino & Tereso 2012). These are some of the most noteworthy use-cases of BI tools in businesses.

II. INTRODUCTION TO BUSINESS INTELLIGENCE (BI)

Business intelligence or BI refers to inclusion of various advanced digital technologies and strategies in a business scenario that are comprised of data analysis in the context of the business. Use of BI tools enables managers to have a detailed view of historical, current and a predictive outlook of future business operations, which can be very lucrative for businesses as a way of gaining an advantage through more-reliable and accurate decision making.

In a business scenario, organisations make use of business intelligence technology and relevant tools to enhance business operations and make better decisions. In the most common practice of BI tool integration in businesses, BI technology is most commonly adopted in areas such as performance management, optimal resource allocation, event processing, mining of information, predictive sales trend analysis, data mining, online sales analytics, financial management, and reporting (Groomer & Murthy 2018). The role of BI tools is to take as input of large volumes of data generated by a business from the likes of sales, financials, customer interactions and then use this data to identify patterns and extract critical business information. Having access to mission-critical business information can be very advantageous for a business in making the right decisions and leading the industry with a competitive edge over rival companies (Kuhn Jr. & Sutton 2010). BI tools are designed with efficiency in mind, allowing businesses to allocate resources in the most optimum way to achieve maximum output in both short-term and long-term scenarios.

III. WHY DO BUSINESSES NEED BI TOOLS?

Where technology trends are concerned, BI has become one of the most dominant and is witnessing promising advancements. However, taking in massive volumes of data and then accurately analysing it in a way that a business manager can make important business decisions requires a deep understanding of the business processes and the use of BI tools armed with sophisticated logic in-built and ability to process large data sets quickly and reliably. In addition to this, BI is still a relatively new technological advancement so only a few of the biggest tech companies offer sophisticated market-ready BI tools that are able to effectively account for all the different aspects of a business, from manufacturing to sales operations (Deloitte 2010). Presently, implementing

business intelligence requires a very large financial investment for any business and making a wrong decision in the selection of a BI tool will incur extreme financial and strategic penalties if it needs to be replaced. For these reasons, making the right decision for BI tool selection is very important.

IV. POTENTIAL USE OF BI TOOLS IN CONTINUOUS AUDITING

A. Introduction to Continuous Auditing (CA)

In a traditional system, auditors have been forced to rely on only the periodically provided samples of transactions combined with financial information of the company being audited. This system in traditional approaches presents a credible method of evaluating whether or not the financial situation of a company is presented fairly or not. However, an issue with periodic sampling is that it does not always allow for identification of patterns in company financials that are able to showcase a potential failure in the provision of internal controls (Alles et al. 2006). Some of these issues include unexpectedly high report of expenses, duplication of some payments, very high credit on cards, and payment-related charges in retroactive situations.

These are the issues associated with periodic auditing that a continuous audit (CA) aims to mitigate by replacing traditional auditing procedures. The process of CA, rather than relying on periodic sampling of company information, continues to audit on a regular basis using data relating to company operations and financials. Today, as most large businesses are adopting some form of BI solution, continuous auditing is becoming more accessible and feasible for implementation (Rezaee et al. 2018). After inclusion of a BI tool, adding CA is a logical next step to help and improve the internal process of auditing.

Adoption of continuous auditing provides the greatest benefit in the form of timeliness of assessment. Performing a thorough audit in traditional form is indeed accurate as long as all financial statements are provided; however, such auditing reports only come out months after starting the audit process. In such cases, if the audit report identifies any deficiencies in the company operations and finances, the deficiency may already have caused considerable damage by the time the audit report is made available (Alles, Kogan & Vasarhelyi 2018). Adoption of a continuous auditing approach can find deficiencies and exceptional patterns in company finances as and when they occur, and even allow for immediate mitigating actions, such as cancelling a payment, catching an embezzler, or stopping a shipment.

Adoption of change in the accounting industry is often very slow and new methods or technology, despite being effective, do not see a quick uptake. This has also been the case with continuous auditing procedures. The most notable barrier to quick adoption of CA is the cost of implementing it, which consumes considerable monetary and time resources (Rezaee, Elam & Sharbatoghlie 2001). In addition to this, auditors also need to make changes in their well-established practices and procedures. One additional barrier associated with adoption of CA is that its costly adoption is only justifiable usually in long-term scenarios.

Not counting the barriers to CA, continuous auditing has proven its effectiveness in enhancing compliance with regulations and mitigation of risks in large companies in early-adopters. A Brazilian bank, Unibanco, started with the adoption of continuous auditing process in 2000, and found success with it, noting in a case study that the continuous auditing practice has been working as both a ‘detective’ and ‘deterrent’ in the company structure (Lopes 2009). For Unibanco auditors perform auditing checks every day to ensure no issues or fraudulent activity, such as return of checks, advances on checks, overdrafts, electronic fund transfers, and tax payments.

B. Suitability of Business Intelligence in Facilitating Continuous Auditing

Business intelligence (BI) technologies are customized and developed to perform tasks such as continuous auditing in a business. BI tools enable a dashboard with record of all activities to facilitate manual auditing, performing a continuous automated oversight on all financial transactions to detect any KPI report irregularity or an exception case. Adoption of BI for the purpose of CA allows for identification of any non-complying activity or personnel, virtually immediately.

Use of BI in continuous auditing is not targeted entirely towards auditors and can be used by businesses as a form of internal control. For instance, the Office of Internal Controls at the University of Michigan has successfully deployed a business intelligence tool that continuously examines all financial processes of the University to mitigate or minimize risks in new opportunities and operations (University of Michigan 2016). Adoption of BI for continuous ‘upstream’ auditing in this manner allows a business organisation to predict and identify scenarios of exception patterns and financial losses early on.

There are some limitations to the continuous auditing process using BI tools as not all tasks can be converted into automated tasks, for instance, looking reading financial documents not digitally available, or insertion of old data in paper format. Furthermore, when a fraudulent activity is detected, the BI tool will only be able to mark it as fraudulent activity for review by a professional. The BI tool will not have any ability to understand ground reality. BI tools for continuous auditing are very effective and useful; however, complete removal of manual intervention is not possible at this time.

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Adoption of continuous auditing is a major paradigm shift for any organisation that involves a major overhaul of systems and high consumption of resources. Such an overwhelming change rarely happens overnight. For maximum efficiency and ease of use, a common practice in the industry is to deploy continuous auditing in small doses in different departments of the company. There is immense value in an auditing system that makes assessment of company documents and financials on a daily basis. This is a highly demanded process in business industries as it directly enhances compliance with regulations, promotes responsible behaviour, and discourages any fraudulent activity.

C. Scenarios of BI Use in Continuous Auditing

A business intelligence (BI) tool can be used for the purpose of auditing in many different scenarios in an organisation. Some of the most notable examples include the following:

- Fraud detection in accounting: use of BI tools in detection of fraudulent accounting is a real-world use of BI tools for companies. Benford's Law presents an observation on accounting that revolved around the predictability of leading digit frequency distribution in real-world organisations. According to this Law, the leading digit in many of the naturally forming sets of numbers is usually small (Silverstein 2014). For instance, in a set of data that adheres to this law, 1 is found to appear about 30% of the time and 9 appears only 5% of the time. In contrast to this, if a randomizer is used to distribute numbers, the probability for each digit to appear would be set at 11.1%. As Benford's Law presents a common trend followed in real-world accounting, it has a use in detection of fraudulent entries in accounting. Using this law, or a similar other approach, a BI tool can detect suspicious activities based on observation of the first digits of the numbers and amounts in records. After flagging by the BI tool, these suspicious activities can be double-checked by an auditor to identify a fraud. The figure drawn below shows an outline of PO amounts against the distribution frequency model of Benford.

Fig 1

- Quality of data: a BI tool can get designed in such a way that it can form a pattern for quality and consistency of data inserted in company systems and create alerts whenever new data is not on par with the usual standard of data quality. This use of a BI tool helps in identifying errors at early stages and for them to be fixed before any other errors are caused by such quality issues. The immense processing power and continuous working schedule of a BI tool such as OBIEE ensures that quality control can be managed in a continuous manner, relieving pressure that is put on the auditors, while also significantly enhancing the continuous auditing process.

- Business process auditing: in a well-implemented BI tool, the design of the BI tool can be implemented in such a way that it can continuously monitor all business operations and processes of an organisation throughout their life-cycle. Using this monitoring process, the BI tool can raise alerts for any discrepancy or flaw detected by the system. This kind of detection is very useful in auditing procedures to rectify issues and discrepancies at the earliest opportunity.

D. Common Use of BI KPI's in Continuous Auditing

Business intelligence tools are capable of assisting in the process of continuous auditing. In this process, the business tool is not just able to keep track of all the financial data and records stored, the system also continuously monitors the financial records' actively in real-time and is thus able to raise alerts and discrepancy in the financial data of a business by analysing the data in real-time and identifying an issue, flaw or missing transaction in the financial data records. An alert raised by the business tool can instantly make accountants and finance managers aware of the issue, making it significantly easier to detect fraud and even minimize the impact of frauds or mistakes in financial records by means of recognizing a fault as soon as it happens. For this purpose, business intelligence relies on a number of different KPIs (key performance indicators), which are popular financial ratios and measures of financial performance of a company that can be useful in continuous auditing. Some commonly used KPIs in the process of auditing through business intelligence tools such as OBIEE are discussed below.

- *Cash Flow Forecasting*

In a business scenario, cash flow forecasting is a highly valuable KPI, accurate and reliable information of which helps a cash flow manager to make better-informed decisions for the business. The information on cash flow forecasting for a business is used in numerous financial decisions of a business including management of liquidity, maximizing interest gains, funding, risk management against foreign exchange fluctuations, and management of capital expenditure.

- *KPI specifications:*

Area	KPI	Criteria	Source
Finance – Cash Flow Management	Cash Flow Forecasting	Ratio = (AR Due + Cash - AP Due) / AP Due	

Table 1

➢ *Accounts Payable (AP) Turnover Ratio*

- *Description*: The AP turnover ratio is a measure of short-term liquidity of a business. This ratio presents a quantified measure of the rate at which a business is paying credit off to its customers, suppliers and dealers over a fixed period of time (commonly in a monthly or bi-annually arrangement). A higher value of the AP turnover ratio is viewed favourably for a business as it represents that the business is paying off its lenders and creditors in a quick time.

- *KPI specifications:*

Area	KPI	Criteria	Source
Accounts Payable	AP Turnover Ratio	Accounts Payable Turnover = Total Supplier Purchases/Average Accounts Payable Accordingly, in BI, turnover is calculated as follow Total Purchases/(AP Opening Balance + AP Closing Balance)/2)	
Accounts Payable	AP Turnover in Days	Duration of periods (days)/ AP Turnover Ratio	

Table 2

➢ *AP Aging*

- *Description*: In a business scenario, unpaid bills and invoices are a common occurrence that need to be managed and handled carefully and in a well-defined manner. It is a common practice to use 'aging' attribute with the accounts payable (AP) as a way of setting up all the unpaid credit memos and invoices into different timeline ranges i.e. age. Developing and operating real-time maintenance of the AP aging report allows a business to keep track of its financials in alignment with the payments that are due based on the due-dates. Collectively, an accounts payable aging report and an accounts receivable aging report presents managers with a complete and realistic financial report and forecast of the business, including both incoming and outgoing money transactions before the due dates.

- *KPI specifications:*

Area	KPI	Criteria	Source
Accounts Payable	AP Aging	For each open invoice, Due Days is calculated as follows Due Day = AP Due Date - Current Date Then, invoices are grouped into categories as per their Due Days. The AP Aging categories can be specified as per corporate requirements. The following is an example of AP Aging categories a. (Not Yet Due) b. (0 - 30 Days) c. (30 - 60 Days) d. (60 - 120 Days) e. (More than 120 Days)	

Table 3

V. ORACLE BUSINESS INTELLIGENCE SUITE FOR ENTERPRISES (OBIEE): INTRODUCTION AND FEATURES

Oracle Business Intelligence Enterprise Edition (OBIEE) is a collection of business intelligence (BI) tools offered by Oracle Corporation. Oracle is one of the most reputed companies in the field of BI tools and business management solutions, and OBIEE is one of the premier business solution products offered by the company. OBIEE Version 12c currently offers features for businesses (Oracle Corporation 2017) *an interactive dashboard, integration with Office suite, query response, and real-time predictive analysis.*

The working mechanism of OBIEE is similar to many commonly used BI tools used in the industry, which is described in Figure 1 drawn.

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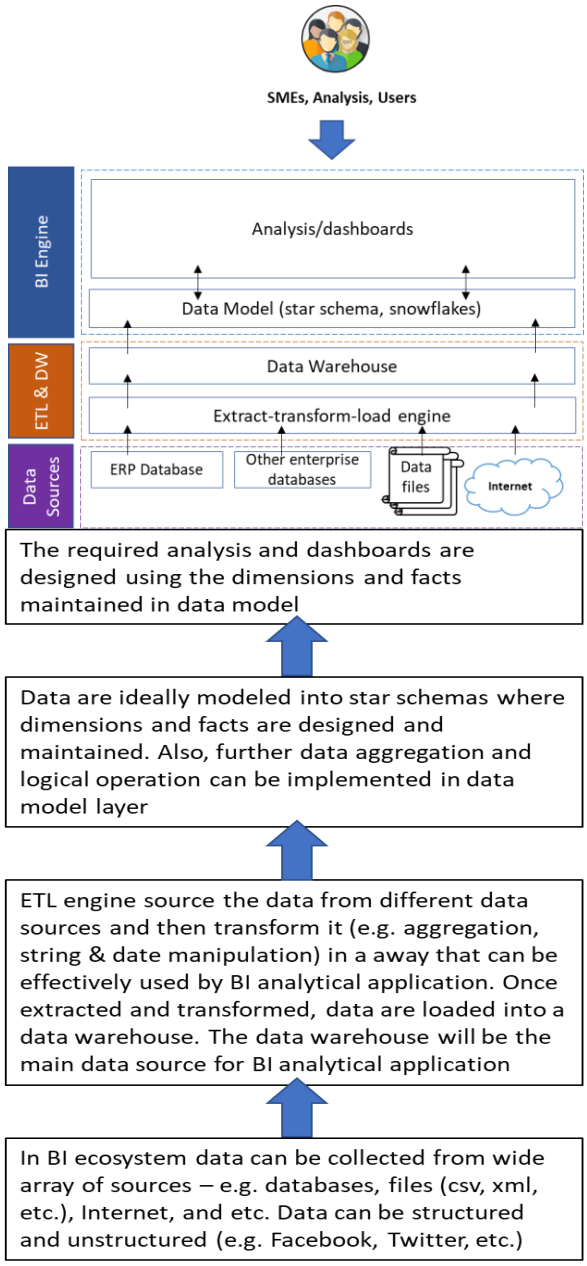

Fig 2:- Working of OBIEE for a business organisation in continuous auditing

As shown in Figure 2, the OBIEE BI system takes data about the organisation from a number of different sources of the business ranging from sales records in database formats, traditional work sheets in spreadsheet format, and web-forms in xml formats. To produce intelligence, the system accepts data in both structured and unstructured formats. This data from different sources and in different formats is then converted by the ETL engine in a way that is most suitable for use by the BI tools to store in the warehouse and analyse. This form of data is used for BI analytics. The common modelling approach for BI analytics is the star schema model that keeps the dimensions and facts from data sources integrated. In this model layer of the analytics tool, BI tools and managers can perform logical operations as well as aggregation. The data present in the data model is available for interaction and access in the interactive dashboard of the Oracle BI tool, helping the auditors significantly, while also performing pre-defining auditing triggers in an automated fashion.

VI. BENEFITS AND LIMITATIONS IN USING BI TOOLS FOR CONTINUOUS AUDITING

Business intelligence tools are rapidly being adopted in large-scale business organisations as these provide effective ways of monitoring business resources, processes and financials. Adoption of a BI tool for the purpose of continuous auditing has massive implications for a business organisation as the tool provides the ability to essentially replace periodic/annual audits in favour of a continuous auditing process (Davis & Woratschek 2015). The prime advantage of this procedure is that a business organisation would be able to identify the risks and deficiencies immediately rather than later when damage has already been done.

A. Advantages in using BI Tools for Continuous Auditing

A BI suite is a big set of different software systems that includes business tools of various kinds that all contribute to a worthy foundation for provision of both automated and assisted continuous auditing (Oracle Press Release 2010). The following are some of the main capabilities and advantages of using a BI tool in continuous auditing tasks –

- The interactive dashboard component of a competent BI tool provides automated monitoring of all business operations and financials, and makes it accessible to an auditor in a continuous and immediate manner (Chaudhuri, Dayal & Narasayya 2011). These data points and dashboard fields are customizable and interactive, enabling the auditor to effectively keep track of all processes in a continuous and convenient manner.
- The visualization component of a BI suite provides an intuitive and very sophisticated system to keep track of trends in organisational functions and operations, which are easy to measure and compare in this form (Trigo, Belfo & Estebanez 2014). For all of these reasons, it is beneficial to use a BI tool for facilitation of continuous auditing with an auditor professional.
- Automation is an inherent functionality of any good BI suite. The combination of a BI Delivery tool and a Real-time Decision System allows an automated continuous auditing of the business operations that can track various forms of mismatches, pattern identification, and detection of any exception in the pattern, with no manual intervention (Singh et al. 2014). Furthermore, the in-built alert system in a BI tool provides the ability to immediately inform the managers of an exception case or suspicious activity in the organisational structure.

- All of the BI tools that are included in any major BI system share a common server for all of the information collected, and share this information with other software packages. This mechanism allows for an enhanced implementation of automated continuous auditing.

B. Limitations in use of BI Tools for Continuous Auditing

While BI tools have a wide variety of features and functionalities to facilitate continuous auditing, there are still some limitations to their capabilities. These limitations can be minimized somewhat, or mitigated in the future with updates and enhancement in machine learning and automation.

- A BI tool can function to a great degree in an automated system and raise alerts within management systems. However, this approach cannot be performed in an entirely automated system and it will certainly require some form of manual intervention.
- A BI tool can only reveal and observe fact-based information and produce a discrepancy report based on the BI system information set. The information may not always be entirely accurate as the 'ground reality' of any discrepancy cannot be understood by the automated system and manual intervention would be undoubtedly needed.

VII. DISCUSSION OF FINDINGS

From an evaluation of the capabilities of a BI suite for businesses, it is clear that BI tools present a suitable option for businesses to adopt continuous auditing. Implementation of a BI tool is a costly affair for any organisation; however, the positive aspect is that a BI tool is not limited to just auditing tasks, rather it allows for a complete business management process ranging from record keeping to aiding the decision-making process. For medium-to-large organisations, implementation of a BI tool is highly appropriate for the comprehensive business management support systems that it provides. Continuous auditing is a very appealing process for any business and implementation of a BI tool makes it more cost friendly in the longer term and easy to implement from the start.

VIII. CONCLUSION

Auditing is an essential part of business management as it ensures that a company is complying with regulations and that all business operations and financials are in order. Companies perform the process of auditing to identify compliance with regulations, to keep track of financials, and detect any deficiency such as embezzlement of money. Traditional auditing processes take place in a periodic manner, most commonly annually. Traditional auditing has an inherent issue of timeliness as this process detects most issues after those issues have caused damage to the company. However, taking the traditional professional auditor-based auditing process and substituting it with a continuous one is very costly, even though the benefits are very significant.

BI has proven to be a highly effective solution for businesses in making business processes more refined and efficient than ever before. Large-scale businesses have already started to adopt BI tools like SAP and Oracle for business process monitoring. The potential of BI tools is immense in the area of continuous auditing. Business intelligence tools already provide many features like real-time integrated view of business operations, resources and financials in a sophisticated manner, such as visualization of data, automated monitoring, and detailed interactive analytics. For all of these reasons, business intelligence tools are highly suitable tools for continuous monitoring and auditing in any business.

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