Leveraging Technology to Enhance Audit Quality and Effectiveness
A country paper by SAI India

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Introduction

1. Technology has become an integral part of organisations- both Public and Private, with almost every activity conducted in an organization either enabled or impacted by technology in one form or another. In such a situation, it is nearly impossible to conduct an audit either efficiently or effectively without using technology.

2. Most of the core services of Governments have been or are in the process of being transformed through use of technology by means of various e-Government and ICT Applications. Undoubtedly, it has made the Government processes more efficient and transparent, allowing provision of improved quality of service to the citizens, and becoming more responsive to the needs of the citizens. However, ICT projects are fraught with the risks of failure, and also introduce new risks in the business process. SAIs were quick in realising this aspect, and have invested substantial effort in developing IT Audit capability.

3. The INTOSAI Working Group on IT Audit (WGITA) was established in 1989 by INCOSAI, with the inaugural meeting of the committee being held in October, 1992. The Comptroller & Auditor General of India is the Chairman of INTOSAI's Working Group on IT Audit since its inception. Over the last 22 years of operations, WGITA has assisted SAIs in developing their knowledge and skills in the use and audit of information technology, and in the process helped in establishing IT Audit as one of the important auditing functions performed by the SAIs. Recently, WGITA and the INTOSAI Development Initiative (IDI) have jointly worked on producing an updated Handbook on IT Audit with a view to provide SAI auditors with standards and universally-recognised good practices on IT Audit. IDI has also created a structured online training program for IT Audit based on the new handbook.

4. While the dominant role played by technology in functioning of Government has led to SAIs creating a new line of IT Audit, the bigger potential impact lies in the leveraging of Technology by SAIs to enhance Audit quality and effectiveness, which is the thrust of this paper. Much has already been written about IT Audit, and the gap if any is in adoption of the good practices for establishing IT Audit on a firm footing within SAIs. This paper emphasises on what specifically can be done by SAIs to improve audit quality and effectiveness through use of Technology.

IT Audits by SAI India

5. SAI India has been conducting IT Audits for over two decades now. A dedicated organizational unit for IT Audit was created in 2001 along with the creation of a separate office – International Centre for Information Systems & Audit (iCISA), in 2002. Over 400 IT Audits have been conducted since the start of IT Audit practice.

6. SAI India, with its experience in this field, conducts regular trainings on IT Audits, through its network of 12 national and regional training centers. The international centre- iCISA- conducts national and international trainings on IT Audit, and plays a key role within SAI-India in capacity building and providing technical support in the conduct of IT Audits. The curriculum is regularly updated to reflect to the changes Information Technology.

7. While SAI India has not engaged external experts in audit of specialized ICT Areas, this issue is under active consideration. The challenge is primarily perceived in the area of assessing the IT Security of important e-Gov applications.

8. SAI India does not have a formal role in the pre-implementation of e-Gov/ICT projects as advisors. On a case to case basis, officers from SAI do provide assistance in reviewing the controls proposed to be implemented in the e-Gov application.

9. Use of traditional CAATs such as IDEA, MS Access, MS Excel and SQL is firmly established within the SAI. The primary audit tool is IDEA, which has been in use in the SAI for almost two decades now. Licenses are frequently procured and updated to ensure use of the latest version. New generation business analytics tool – QlikView and

Tableau - have recently been inducted for use within the SAI. The role of these tools in improving audit quality and effectiveness is covered separately.

Leveraging Technology – An assessment

10.   Encouraging the use of IT Tools in audit is not a new idea, with most SAIs having adopted one or more CAATs tools for regular use in Audit. The General Technology Audit Guide (GTAG) series issued by IIA has one practice guide on Data Analysis Technologies, which makes a strong case for adopting such tools for improved audit effectiveness leading to increasing audit coverage, performing more thorough and consistent audits, and ultimately increasing the levels of assurance that can be provided to the audited organizations. The GTAG lists the following benefits as accruing from the use of data analysis technologies:

    a. Productivity and cost savings: Data analysis technology enables productivity improvements in audit planning, risk assessment, and increasing the breadth and depth of audit coverage during the engagement. In the process, audit departments are able to broaden the scope of their assurance activities, without having to increase audit staff, or effect cost savings through the reduction of staff necessary to complete the audit plan.

    b. Efficiency in data access: Data analysis technologies enable auditors to access and query data by themselves, thereby decreasing their reliance on busy IT personnel having to run data extracts. This helps provide a higher degree of confidence in the accuracy and completeness of the data population being analysed and introduces efficiencies in verifying the accuracy of that information.

    c. Audit risk: The use of data analysis can significantly reduce audit risk by honing the risk assessment and stratifying the population. By analysing data within key organizational processes, it becomes possible to identify emerging risk and better target audit resources.

11.   The recent developments in Information Technology – especially in the area of Data Analytics influenced by the Big Data Hype has radically changed the way these tools need to be looked at by Auditors. A recent white paper by AICPA titled Reimagining Auditing in a Wired World takes a fresh look at this aspect. The paper observes: *"Although auditors embrace and make extensive use of information technology, little has been done to consider how auditing might be transformed by it. For the most part, IT has been used to computerize and improve the efficiency of established processes rather than transform or replace them. Consequently, improvements have been incremental rather than transformative."* The nature of auditing is impacted by two technology enablers – i) a globally connected world where the past model of vertically integrated audit teams of local office resources can be replaced by deconstructing many audit procedures into tasks that can be performed wherever it is most effective, and ii) Advancements in Data science and related technologies.

12.   The AICPA paper identifies the following opportunities for significantly improving audit effectiveness as well as efficiency, which are assessed to be of direct relevance to SAIs:

    a. More effective Data Analytics: Audit Data Analytics is the science and art of discovering and analysing patterns, identifying anomalies, and extracting other useful information in data underlying or related to the subject matter of an audit through analysis, modelling, and visualization for the purpose of planning or performing the audit. This approach is significantly different from the conventional use of CAATs by SAI Auditors, as explained in a separate section of this paper.

    b. Big Data approach to analytics: There are certain characteristics of Big Data analytics that are causing a rethink on data usage. The first is that it is increasingly possible to analyse the entirety or almost all data rather than just a small, carefully chosen subset or sample. This can lead to more robust models, reduced reliance on sampling, and hence a greater level of assurance in audits. Whereas in the past, a high degree of care was necessary to eliminate bad data, when all the data are available, a certain degree of pollution is acceptable for many applications. A second shift in thinking is that instead of trying to understand the fundamental causes of complex phenomena it is increasingly possible to identify and make use of

correlations. In their book – Big Data, the authors[1] comment on this trend by stating *"causality won't be discarded, but it is being knocked off its pedestal as the primary fountain of meaning"*

    c. <u>More assurance</u>: Technology can be used to achieve the same level of assurance but more efficiently at a lower cost, or it can be used to achieve a higher level of assurance via a more effective audit at similar cost. The focus needs to shift from efficiency goals of cost reduction to improved effectiveness by increasing assurance.

    d. <u>More Effective Fraud Detection</u>: Audit Data Analytic techniques using large data sets, correlating data from multiple sources, data mining algorithms and data visualisation have revolutionized fraud detection. Patterns and connections that might never have been discovered in the past can be much more easily identified, analysed, and visualized.

13.   The need for increased assurance in Audit engagements is likely to be demanded from SAI's too. SAI's enjoy a monopoly in public sector auditing. A recent article in the Economist, titled, "Accounting Scandals- The dozy watchdogs", has commented on the yawning "expectations gap" in relation to the auditors work in the private sector. "*In popular imagination, auditors are there to sniff out fraud. But because the profession was historically allowed to self-regulate despite enjoying a government guaranteed franchise, it has set the bar so low—formally, auditors merely opine on whether financial statements meet accounting standards—that it is all but impossible for them to fail at their jobs, as they define them*". SAI's need to increase the level of assurance provided through audits by using Big Data technologies and approach.

Why Big Data analytics is a game changer

14.   Most definitions of Big Data[2] can be summed up to data that is difficult to extract value

from due to volume, variety, and veracity. One simple definition is: "collection of data sets so large and complex that it becomes difficult to process using traditional data processing applications". By this definition, SAIs across the world are already facing the Big Data challenge.

15.   The exponential growth in data volumes in the last decade is well known. The then Google CEO Eric Schmidt had said in 2010: *"There were 5 Exabytes of information created between the dawn of civilization through 2003, but that much information is now created every 2 days."* The growth in data volumes has largely been in unstructured[3] data. For instance, Facebook database which is primarily unstructured data residing on Hadoop clusters, was reported in 2012 at over 100 PB, with daily addition of over 500 Terabytes. In contrast, structured database growth does not exhibit the same trend. This is of relevance to SAI's, as most of audits conducted by SAIs are in relation to structured databases. It has been the experience of SAI India that most datasets originating from such structure databases are in the Gigabyte range, with a single dataset exceeding 1 Terabyte being a very rare event.

16.   Along with the growth of data volumes came investment in technologies that could handle large data volumes and derive business insights in real time. One such technological innovation is in the area of In-memory analytics based Business analytics tools. The inexorable progress of Moore's law has led to an exponential increase in computing power, and reduction in the price of data storage and RAM. With 64 Bit computing becoming the norm, there is almost no limit to the amount of RAM[4] that can be attached to a computing device. These three developments- greater computing power, lower cost of RAM, and 64 Bit computing have fuelled the development of in-memory analytics. With in-memory analytics, the data to be analysed is stored directly in the RAM, which leads to extremely high

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[1] Viktor Mayer-Schönberger and Kenneth Cukier's book, Big Data

[2] Gartner defines Big Data 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.

[3] Data that resides in a fixed field within a record or file is called structured data. This includes data

contained in relational databases and spreadsheets. The phrase "unstructured data" usually refers to information that doesn't reside in a traditional row-column database, and often includes text and multimedia content. (http://www.webopedia.com)

[4] A 64-bit Windows 8.1 device can support upto 512 GB of RAM.

performance. Two such business analytics tools, which feature near the top in the leader's quadrant of Gartner's report – Magic Quadrant for Business Intelligence and Analytics Platform (See figure-1 below)- are QlikView and Tableau Desktop. SAI India has recently started using these in audit engagements, and the results are extremely encouraging.

Figure 1: Gartner's Magic Quadrant for Business Intelligence and Analytics Platforms

17.   The limitations of traditional CAATs in use in SAI India – IDEA, MS Excel and MS Access, in handling large data volumes had started becoming apparent in the last few years. MS Excel has a limit of roughly one million rows of data, MS Access cannot handle more than 2 GB of data, and IDEA, though stated to have no hard limit on data volume, can become extremely sluggish when handling over 10 Million rows of Data, with queries taking multiple hours to execute. In contrast, the same analytical tests on the in-memory analytics tool were seen to return results in seconds – a thousand fold improvement in performance. Apart from speed, the in-memory analytics tool are also seen to be more efficient in storing data, with extremely high compression of data making it possible to analyse raw data many times the multiple of the physical RAM available on the auditor's laptop/desktop. With this, even auditor's laptop can be used to analyse most large datasets obtained in the course of audit. The true power of the newer generation analytics tool, which is expected to impact audit quality and effectiveness is their ability to both handle large data volumes, and in the use of Visual analytics to derive audit insights.

The role of Visual Analytics in Audit

18.   The data analytics literature distinguishes between two different modes of analysis, exploratory and confirmatory. Exploratory data analysis should be the first stage of data analysis, it is bottom-up and inductive. It starts with the data and the auditor asking questions such as, What do the data suggest is going on here? Do the data suggest something might have gone wrong? Where do the risks appear to be? Are there potential fraud indicators? On what assertions should we focus? What models and approaches appear to be optimal for analytical procedures? Exploratory ADA is most useful in audit planning—understanding the entity and its environment, identifying and assessing the risks of material misstatement, and designing further audit procedures. Confirmatory data analysis, on the other hand, is top down and deductive. It starts with audit objectives and assertions.

19.   The use of visual exploratory techniques can help auditors see patterns, trends, and outliers that are otherwise hidden, and reveal relationships between variables that could be the foundation for a confirmatory model. Confirmatory techniques are more formal and tend to be more mathematical and analytical.

20.   In a recent paper on Data Analytics for Internal Audit, KPMG has observed that the traditional focus of Internal Audit departments on transaction based analytics to identify exceptions in populations when applying selected business rules-based filters in key areas of risk such as revenue or procurement. These transactional, rules-based analytics, or "micro-level" analytics, can provide significant value for known conditions where assessment of the frequency and magnitude of the conditions needs to be performed. The popular CAATs usage in SAI is also micro analytics oriented, and is thus good only for evaluating known conditions. These are ill designed to meet the exploratory data analysis needs, or macro level analytics which deliver value by identifying broader patterns and trends of risks.

21.   John Tukey, the noted mathematician and statistician well known for his work on exploratory data analysis had once observed that *"… the picture-examining eye is the best finder we have of the wholly unanticipated.".* With visual analytics through use of tools like Tableau and QlikView, the auditor can obtain insights leading to improved

quality of audit which are not possible through traditional CAATs.

22. The purpose of Data Visualisation can be simply stated as moving information from point A to point B. Whereas in exploratory Visualisation, it is from the Dataset (point A) to the Designer's mind (point B), in Explanatory Visualisation, it is from the Designer's mind (point A) to the Reaer's mind (point B). Both exploratory and explanatory visualisations are of importance to the auditor, for the auditor's job does not end with obtaining the correct insight, it ends only when it is effectively communicated to the management for taking necessary action either for improved governance or accountability. For achieving the latter, explanatory visualisation becomes critical. In his seminal book- The Grammar of Graphics, Leland Wilkinson had stated: *"I believe the largest business market for graphics will continue to be analysis and reporting, despite the enthusiastic predictions for data mining, visualisation, animation and virtual reality. The reason, I think, is simple. People in business and science have more trouble communicating than discovering"*. This is likely be as true for the auditor; SAIs can leverage visual analytics tools for better communicating their audit findings.

Capacity Building approach

23. With the growth in data, and the availability of tools to analyse the same, SAIs need to encourage multi-disciplinary skills in their ranks to fully exploit the audit potential of technology. Data Science, which is all about extracting value from data, recognizes this aspects, and typically shows it to be residing at the intersect of three different disciplines as shown in figure-2 below.
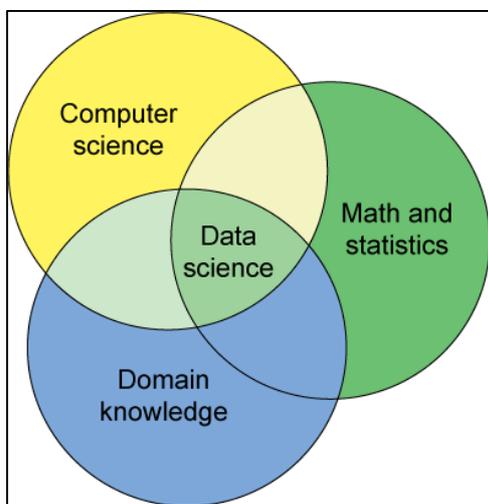

Figure 2: Key disciplines of the data scientist

24. In case of auditors, this would translate to knowledge of the analytical tools, the domain knowledge, and basic statistics. The most value comes when such skills are available with the same person, failing which, the audit team can be made as a self-contained unit.

25. One approach is to create a central analytics support which would provide assistance in handling the large data volumes, and making the data accessible over a secure network through a suitable analytics interface.

26. SAI India has arrived at the following technologies to be a part of Analytics toolbox :
   a. Transaction Analytics: IDEA/ACL, MS Excel, MS Access, SQL
   b. Big Data/Visual-Descriptive Analytics: QlikView / Tableau
   c. Advanced Analytics for Data Mining: R – an open source software environment for statistical computing and graphics.

27. All Auditors need to have competence on at least one each of Transaction Analytics and Descriptive Analytics tool. The advanced analytics skill set can be a centrally located resource shared with all audit teams.

References:
   i. Reimagining Auditing in a Wired World – AICPA White Paper – August 2014
   ii. Data Analytics for Internal Audit – KPMG – 2013
   iii. Global Technology Audit Guide (GTAG) 16- Data Analysis Technologies – August 2011
   iv. Accounting Scandals, The dozy watchdogs – The Economist- 13 December 2014 print edition