The Current State of Continuous Auditing and Continuous Monitoring[1]

Authors
Paul Eric Byrnes, CMA
Rutgers University – Rutgers Business School

Brad Ames, CPA, CISA
Hewlett-Packard Company

Miklos Vasarhelyi
Rutgers University – Rutgers Business School

J. Donald Warren Jr.
University of Hartford – Barney School of Business

AICPA Staff
Amy Pawlicki
Director, Business Reporting, Assurance and Advisory Services

Dorothy McQuilken
Manager, Business Reporting, Assurance and Advisory Services

Abstract

The purpose of this white paper is to discuss the current state of continuous auditing and continuous monitoring (CAM). This white paper is the first essay in the update to the 1999 *CICA and AICPA Research Report on Continuous Auditing*. This paper is published by the AICPA Assurance Services Executive Committee (ASEC) offering insight into what companies are currently doing with respect to continuous auditing and continuous monitoring. The subject matter outlined in this paper is of interest to AICPA members and those in the accounting profession as a whole.

[1] From the AICPA Assurance Services Executive Committee (ASEC) Emerging Assurance Technologies Task Force.

Introduction

The AICPA Assurance Services Executive Committee's Emerging A papers to serve as an update to the *Continuous Auditing* (CICA/AICPA 1999) research report. The primary project purpose of this introductory white paper is to facilitate an understanding of the extent to which the applications of continuous auditing and continuous monitoring (CA/CM) have changed during the previous 12-year period. In addition, this paper is designed to briefly explore related issues and set the stage for associated white papers that will be subsequently developed.

Data for this undertaking was collected using a two phase approach. First, a comprehensive, open-ended questionnaire was formulated and distributed primarily to the Big 4 accounting firms in an effort to assess variables pertinent to CA/CM usage and perspectives. Second, followup interviews were conducted both to clarify survey responses as well as to obtain complementary information. As the project unfolded, four primary questions emerged as the most relevant in addressing established objectives:

- What are firms doing with CA/CM?
- What CA/CM products and services could firms provide?
- What could organizations such as the AICPA or PCAOB do to facilitate the adoption and use of CA/CM?
- Do firms have the necessary internal expertise to provide the array of CA/CM options and what is the desired skill set for dispensing such services?

As data was accumulated and analyzed, some trends were observed that ultimately provided a snapshot of where CA/CM exists today. There are major challenges and barriers to achieving widespread adoption and proliferation of CA/CM practices. Interestingly, this is particularly evident in the area of external auditing, although there has been some limited progress in the internal audit area (Vasarhelyi, et al 2012). In presenting the relevant findings, each of the preceding primary questions will be addressed in order of original presentation.

Current Environment

The general view is that not much is currently being done with CA/CM. In reality this synopsis is not as pessimistic as it appears. Specifically, some positive gains in usage are being noted in the area of internal auditing. For the most part, this entails the collaboration of advisory services divisions of public accounting firms with internal audit clients in implementing CA/CM devices and methods. There are also instances where organizations are outsourcing their internal audit functions and this could conceivably create additional CA/CM opportunities for audit firms. On the other hand, direct CA/CM implementations by external auditors have not noticeably increased and there are specific reasons for this situation. The view is that CA/CM is a costly undertaking and payback period, which is often projected to be quite lengthy, is an important consideration. The perceived instability of audit relationships is an element that interacts unfavorably with the cost and payback period variables associated with potential projects. Another impediment exists because many businesses are protective of their data and, therefore, reluctant or unwilling to allow comprehensive and ongoing access to systems by outside parties, including external auditors.

On a positive note, the public accounting arena seems to be encouraging organizations to internally develop and implement CA/CM programs. In doing so, auditors are ultimately seeking to leverage the use of these devices in conducting external audits. For example, if an audit client has an effective CA/CM system in place, then the external audit team may be positioned to use data generated by this system in order to conduct the external audit in a more efficient and effective manner. In such cases, this has the potential to create beneficial situations for both parties. In other words, the auditing firm would have access to more comprehensive and timely information and would therefore be able to perform a higher quality audit that consumes fewer resources relative to traditional methods. In addition, because of increased efficiency, the audited organization would presumably sacrifice fewer resources in obtaining the external audit services. Clearly as more businesses recognize the value of CA/CM, one might expect to see an increase in this type of behavior, particularly if favorable outcomes are likely to exist for the involved parties. To facilitate an understanding of this collaboration process, the appendix of this white paper presents a recent implementation at Hewlett-Packard Company. At this point, with an understanding of the general state of CA/CM, an exploration of potential CA/CM products and services will now be investigated to provide an appreciation of the manners in which they could affect both the accounting profession and business community.

Products and Services

Initially, CA/CM tool usage might be envisioned as existing on a continuum, from relatively basic monitoring of a particular target area of risk such as accounts payable, to very elaborate auditing systems that yield continuous assurance capabilities such that audit opinions can be maintained in an ongoing manner. Specific CA/CM service opportunities include converting from manual to automated data, controls, and processes; designing controls around processes; formulating alerts and monitoring routines;

dispensing operational risk management services; and providing full service packages including tools, installation, setup, tr and maintenance.

CA/CM consists of many diverse elements and may be implemented at various levels of sophistication. One of the key features of CA/CM is its ability to provide relevant information in more of a real time context. If a solution is installed, maintained, and utilized as intended, it has the capability to assist in mitigating or preventing problems in identified risk areas. This is in sharp contrast to the reactionary context in traditional external auditing, whereby annual sampling and testing is conducted to discover whether problems occurred during the fiscal period under investigation.

The traditional approach is suboptimal for at least two reasons. First, the manual audit is based on a sampling of records in identified risk areas and therefore may fail to capture all relevant data. Second, even if problems are uncovered, the lag between event occurrence and detection may be too significant to allow for sufficient remediation and recovery. For example, Company X has an annual audit conducted in January relative to the previous calendar year. An examination of sampled transactions reveals a material fraud that was successfully perpetrated during the first quarter of the accounting period in question and resulted in significant diversion of assets. In this case, the damage went completely undetected for an extended period and, as such, the likelihood of the firm fully recovering from the loss is lower than if the issue had been identified sooner. An effective CA/CM mechanism would have uncovered the fraudulent activity in the formative stages and, as a consequence, resource loss could have been minimized or perhaps avoided entirely.

CA/CM has the potential to radically reformulate the manner in which businesses operate. The area shows real promise in contributing to organizational efficiency, effectiveness, and long term profitability. However, areas of CA/CM appear to be struggling for acceptance and are in a state of tenuous growth. Moving forward, perhaps more advocacy mechanisms are necessary.

Promotion Efforts

During discussions with survey participants, three items in particular emerged as potential keys for achieving increased implementation of CA/CM practices. First, standards modification by the PCAOB was cited as being important in facilitating a shift away from the old workplace mentality of manual sampling and testing audits to an automated and comprehensive approach with CA/CM as the foundation. For example, during the external audit, certain actions, such as physical observation of inventory, are required regardless of the robustness level of controls in place throughout the organization. The argument against such observation activities holds that, if controls are sufficient, particular verification routines become unnecessary and a waste of resources. Generally, some believe that auditing standards have not been defined appropriately as changes in technology, processes, and controls have evolved. Consequently, many of the current auditing standards are viewed as antiquated and irrelevant.

Second, many concerns about CA/CM relate to its apparent level of sophistication. As such, another suggestion is that the AICPA could assist with advocacy efforts by periodically issuing guidance or white papers on various topics of relevance. More specifically, such subjects could include explaining CA/CM in terminology that facilitates enhanced understanding, training relative to implementation and usage, demonstrating application value, and specifying how CA/CM might ultimately transform business operations. Basically, if practitioners are made more aware of CA/CM, understand its concepts and applications, and identify with the overall value proposition, these individuals will be more likely to embrace and pursue CA/CM initiatives. This white paper and the series of ensuing AICPA CA/CM white papers are intended to start addressing this opportunity to educate the market concerning the potential of CA/CM as well as identify with the inclusion of audit data standards within this domain.

Third, it is believed that a formal endorsement of the desirability of CA/CM by standard setting bodies such as the PCAOB would be useful for transitioning organizations from traditional manual auditing methodologies to the more automated domain. However, until a greater level of awareness is achieved, it is probable that CA/CM will continue to struggle for acceptance. Whether or not significant momentum is eventually generated, discussions logically transition to skill set considerations and whether accounting practitioners possess the capabilities necessary to handle CA/CM initiatives.

Skills Required

Preliminary indications are somewhat mixed concerning whether current accounting professionals maintain the competencies to perform CA/CM services. One view is that the present generation of accountants lacks the requisite skill set to sufficiently provide these services. Another perspective contends that the desired expertise is scattered throughout the firm and, as a result, there is no single individual who would typically be regarded as a CA/CM expert. These viewpoints may initially appear somewhat discouraging. However, even if these perceptions are able to be generalized, they still do not pose an insurmountable threat, particularly when one reflects upon the desired skill elements as defined by accounting firms in this study. The competencies identified by survey participants include the following:

- An audit foundation
- Knowledge of business processes, controls, and inherent risks
- Internal audit experience
- Familiarity with audit planning, audit processes, and forensic accounting
- An understanding of data extraction tools (IDEA, ACL)
- Data analytics background (regression, ANOVA, data mining, SQL, probabilities)
- Knowledge in statistics
- Technical skills (ERP, programming)
- Professional skepticism and judgment

The areas delineated in the preceding list certainly present challenges for many current accounting students and practitioners. Some of the elements are not substantive components of traditional four year accounting programs (for example, technical and analytical areas) and certain items, such as forensic accounting, reflect relatively recent additions to the accounting discipline. Some capabilities would also be primarily developed through relevant and extensive field experience. Consequently, a CA/CM specialist would most likely be a well-seasoned practitioner who has developed extensive audit experience, pertinent technical and analytical expertise, and the ability to employ professional skepticism and judgment as necessary. Such an individual would also need to engage in ongoing education relative to emerging concepts, trends, and technologies in auditing and accounting. Therefore, the combination of diverse attributes needed to be considered a CA/CM expert is such that this designation might be expected to be held by a small minority. Whatever the case, it may actually be more realistic to envision that many CA/CM initiatives of the near future would be handled by cross-functional teams, especially when the scope of activity is substantial. In such cases, perhaps a CA/CM specialist with proven project leader experience could be enlisted to guide the team in completing all necessary objectives.

Supplemental Findings

Respondents also communicated other points of interest concerning CA/CM. The results were generally mixed and suggested that additional efforts are needed relative to the promotion and adoption of CA/CM practices. More specifically, participants provided revealing commentary in areas such as recruitment tactics, client perceptions, and prioritization issues.

Only half of the firms indicated they actively recruit for CA/CM. It is, however, generally larger firms that emphasize hiring individuals with CA/CM backgrounds and skills. Furthermore, audit automation is currently in a state of development and is slowly increasing in terms of application. Taken collectively, this might indicate that smaller firms will eventually be more inclined to recruit for CA/CM as adoption and utilization continue to expand.

Some respondents felt that client understanding of CA/CM was quite limited, particularly at the top management or board levels. This is a disconcerting situation for several reasons. Initially, it is well documented that the tone-at-the-top is a dimension that has a significant influence upon organizational culture and resulting perspectives and behaviors (Merchant and Van der Stede 2007). Furthermore, this tone can be a key factor in determining whether or not certain initiatives are promoted, valued, and explored at lower management and operational levels. If top management maintains an insufficient understanding of CA/CM products and services, there is a reduced likelihood that employees at lower levels of the organization will be positively motivated to act pursue such solutions. Therefore, if CA/CM is to move forward more fluidly, it is vital that personnel at the board and top management levels better understand and identify with the benefits of CA/CM products and services.

Participants clearly stipulated that a high priority exists relative to improving the use of CA/CM in conducting financial statement audits. Furthermore, it is believed that the accounting profession needs to establish a vision for the future concerning the CA/CM domain. Related to this vision concept, respondents provided three important guidelines. First, they mentioned that audit processes need to be modified as changes occur with respect to technology and information availability. Second, they indicated that a greater utilization of CA/CM products and services is essential. Third, respondents argued that robust CA/CM is ultimately desired such that audit opinions may be available on a continuous basis and removed when substantive negative evidence surfaces. This final viewpoint has been alternatively referred to as the evergreen opinion and might well reflect the optimal state concerning application of CA/CM in practice.

Conclusions

In summary, organizations are not yet reaping the entire array of benefits that CA/CM could yield. Although some noteworthy gains have been made in internal auditing, there has not been a corresponding increase in external audit applications. In addition, there is an extensive set of products and services that may be provided by practitioners under the CA/CM umbrella. However, these offerings require a diversified skill set for effective implementation and management. At this juncture, there is a level of incongruence between the competencies needed and the skills being acquired by the typical modern accounting graduates. CA/CM has also not yet established a fully successful marketing campaign. In response, if the value of this approach can be effectively demonstrated, documented, and disseminated, and if groups such as the AICPA and PCAOB become key players in the education and advocacy efforts, it is plausible to envision that CA/CM will eventually realize its full potential.

References

Alles, M., Brennan, G., Kogan, A., and Vasarhelyi, M. A. 2006. Continuous monitoring of business process controls: A pilot implementation of a continuous auditing system at Siemens. *International Journal of Accounting Information Systems* 7 (2): 137–161.

CICA/AICPA 1999. *Research Report: Continuous Auditing*. Toronto, Canada: The Canadian Institute of Chartered Accountants, American Institute of Certified Public Accountants.

Elliott, R. K. 1994. The future of audits. *Journal of Accountancy* 178 (3): 74–82.

Elliott, R. K. 2002. Twenty-first century assurance. *Auditing* 21 (1): 139.

IIA 2005. *Global Technology Audit Guide (GTAG) 3: Continuous Auditing: Implications for Assurance, Monitoring, and Risk Assessment*.

ISACA 2010. *IT Audit and Assurance Guidelines G42 Continuous Assurance*.

KPMG 2009. *What is Driving Continuous Auditing & Continuous Monitoring Today?* White Paper. KPMG LLP.

Merchant, K. A., and Van der Stede, W. A. 2007. *Management Control Systems: Performance Measurement, Evaluation and Incentives*, 2nd ed. Harlow, England: Prentice Hall.

Vasarhelyi, Miklos A., and Fern B. Halper. 1991. The Continuous Audit of Online Systems. *Auditing: A Journal of Practice and Theory* 10 (1): 110–125.

Vasarhelyi, M., Romero, S., Kuenkaikaew, S., and Littley, J. 2012. Adopting Continuous Audit/ Continuous Monitoring in Internal Audit. *ISACA Journal* 3.

Appendix ½ CA/CM in Action

Introduction

An excellent example of how firms are leveraging the use of technology in conducting monitoring and auditing activities may be noted at Hewlett-Packard Company (HP). In this context, HP's internal auditing department has been devising an automated system to capture, analyze, and communicate key business data, metrics, and transactions to support better decisions regarding risk. Furthermore, HP demonstrates ongoing commitment to embracing current technologies in conducting business analysis and oversight, giving the organization a definite competitive advantage. One recent implementation example is the Decision Support and Analysis Service Internal Audit (DSAS/IA) Database Project, which comprises several important features. At the onset, it should be noted that all data presented in subsequent figures is completely fictitious and designed only for illustrative purposes.

SAP Key Performance Indicator (KPI)

Initially, utilizing the SAP environment, the SAP key performance indicator (KPI) solution has been deployed to capture and communicate pertinent KPI measures as needed. This 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. This clearly provides for the dissemination of critical data analytics to users such that they are readily positioned to promptly respond to changing business conditions and circumstances.

DSAS/Audit Command Language

SAS/Audit Command Language (ACL) is used for extracting relevant transactional data and files from the DSAS/IA database, as well as accumulating facts from other points such as unstructured data from external feeds. In addition, when an instance of data extraction occurs, the material is presented through a Web site. From this location, the information is able to be transferred to and accessed by authorized internal audit staff, external audit personnel, and business unit management to assist with oversight or operational activities. Furthermore, the data provided to external audit is prevalidated by the internal audit staff and, therefore, may be readily relied upon. This is an extremely important feature that builds trust in the data and facilitates audit effectiveness and efficiency.

DSAS Database

The DSAS Database Table Content Query Screen enhances query development and processing via a user-friendly point-and-click atmosphere containing convenient drop downs, lists, selection windows, selection bubbles, and so forth. In addition, query information is presented in the Standard XML Excel Spreadsheet for Reports environment from which the material may be exported to, analyzed, and evidenced in the Microsoft Excel Spreadsheet context according to an audit data standard. Furthermore, this query building mechanism is often used in providing information to external auditors. These auditors are then able to perform an array of relevant operations with the information such as benchmarking activities. Overall, the above functionality greatly simplifies query generation and empowers users to better harness the capabilities that query building offers (figures 1 and 2).

Figure 1

The DSAS Database Table Content Query window assists users in the query development process with various prompts, selection options, and dropdown lists. In addition, it allows for providing information in accordance with audit data standards to external auditors.

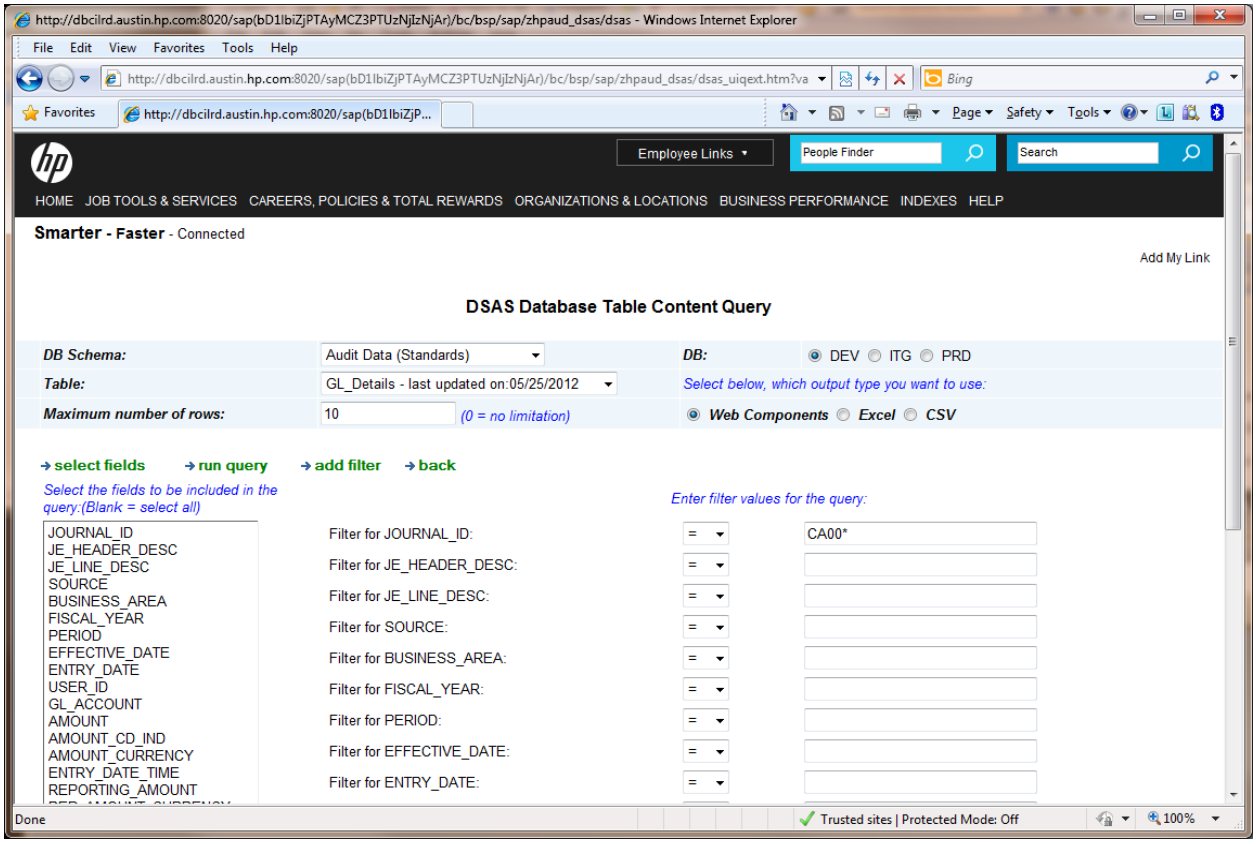
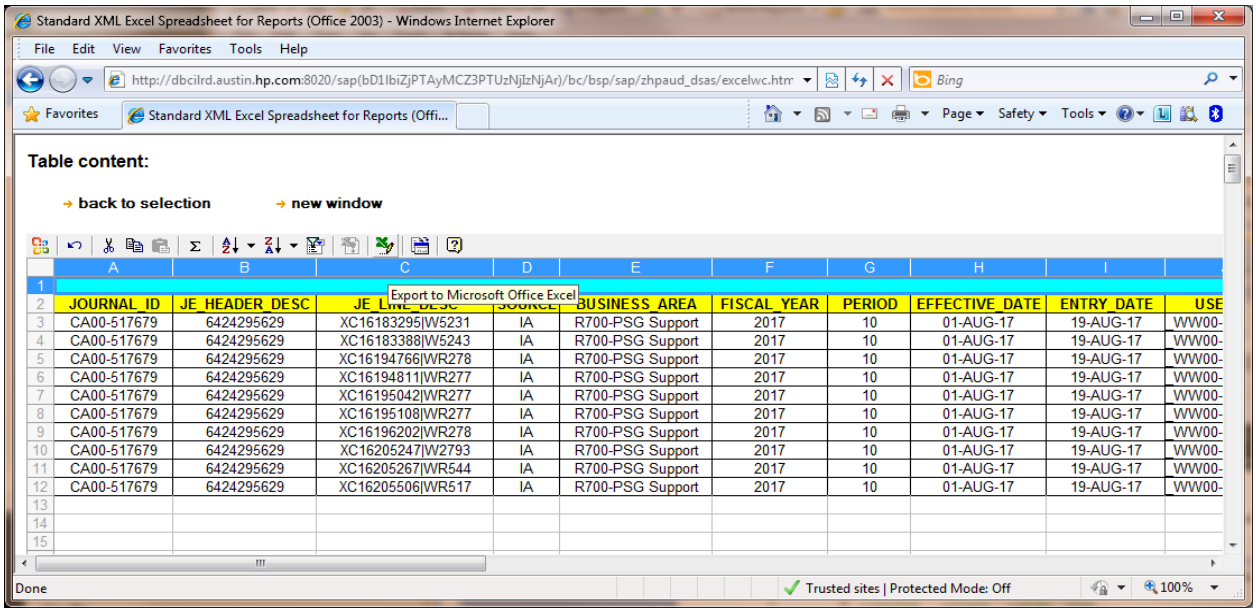


Figure 2

According to audit data standards, the following is a query result set as a function of values and options chosen in the DSAS Database Table Content Query Window.

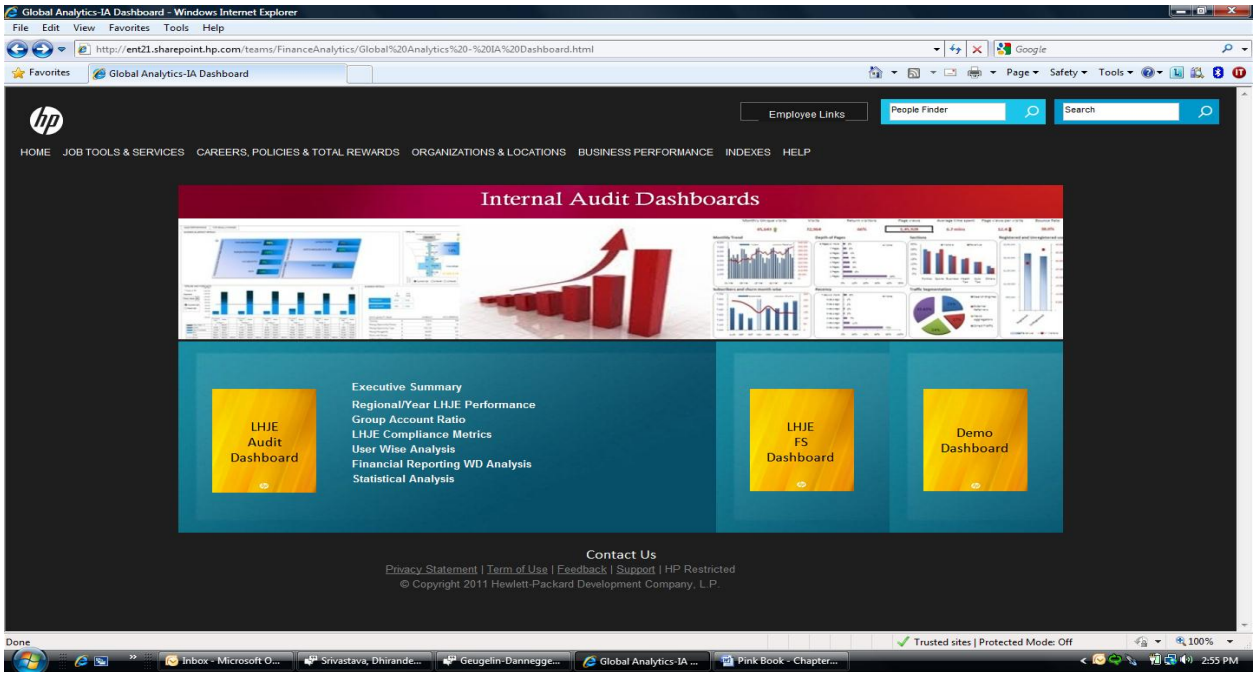


Dashboard Feature

The system contains an internal audit dashboard feature whereby key metrics and trends are captured and displayed in a variety of graphical and tabular formats that enable users to easily visualize pertinent information and detect problems at a glance. The main internal audit dashboard window also maintains other functionalities including, but not limited to, executive summaries (figure 3).

Figure 3

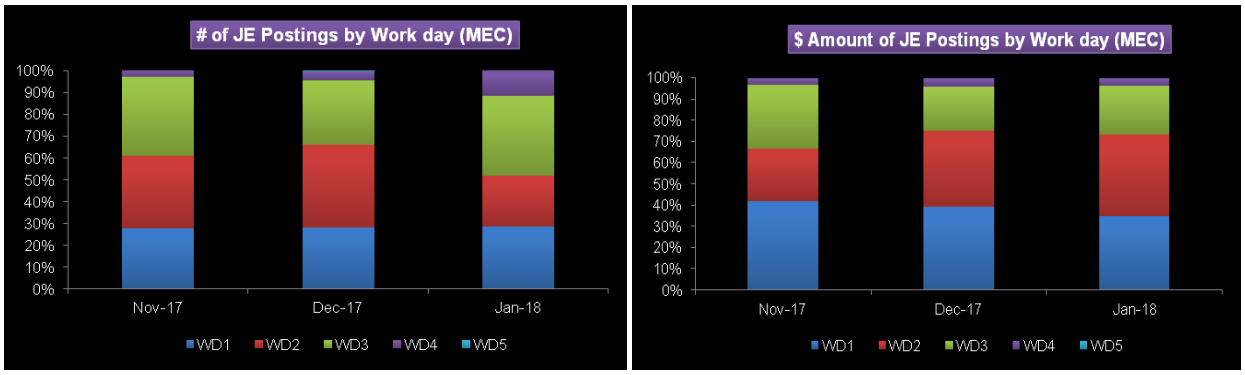
The Internal Audit Dashboard window displays pertinent metrics in a convenient fashion.



The internal audit dashboard also provides critical operational information, group account data and ratios, compliance and performance metrics, business reporting analyses, and so forth. First, the auditors believe that manual journal entries (MJEs) applied during the standard closing process carry more risk than other MJEs. With this in mind, the Workday Analysis feature depicts MJE activity occurring during the accounting closing period and is able to display this information for three accounting periods at a glance. In general, MJEs generated during the first day of closing (WD1) represent less risk than those posted on subsequent days. Furthermore, the risk and day attributes maintain a positive relationship such that risk increases as MJEs are applied later in the closing process. As such, periods having a greater percentage of MJEs applied near the conclusion of closing may be targeted for further investigations. For added utility, the audit tool displays MJE activity by account category to assist in areas where deeper inspections are warranted (figure 4).

Figure 4

Financial Close Workday Analysis: In the upper charts, closing period MJE activity is displayed for each accounting period by workday (WD) using a color coding scheme. In the lower table, MJE metrics are presented by account category. In this example, the account most impacted by post-closing MJEs in each period is Cash. This finding, in addition to the fact that Cash is inherently a high risk account, suggests that further analyses may be advised in this area.



	Nov-17		Dec-17		Jan-18	
Month *	JE Amount ($)	% of JE Amount	JE Amount ($)	% of JE Amount	JE Amount ($)	% of JE Amount
02.Cash	91	36%	67	46%	69	41%
08.Short Term Liabilities	29	11%	20	14%	25	15%
04.Receivables	25	10%	20	14%	25	15%
01.Long Term Assets	29	11%	12	8%	12	7%
06.Equities	35	14%	3	2%	4	3%
05.Other current Assets	20	8%	6	4%	9	5%
12.Misc Income	9	4%	5	3%	9	6%
11.Cost of Sales	4	1%	3	2%	3	2%
07.Long Term Liabilities	4	2%	3	2%	3	2%
13.Expenses	3	1%	2	2%	3	2%
03.Inventory	3	1%	2	1%	2	1%
09.Revenue	1	1%	1	1%	1	1%
10.Contra	1	0%	1	1%	1	1%
Grand Total	**252**	**100%**	**145**	**100%**	**166**	**100%**

(Amounts in Billions)

Second, the GL Account Wise Analysis function aggregates information by account type to display various pertinent metrics. In fact, multiple levels of aggregation are available to facilitate drilldown operations. For example, a level 2 view, which is a single drilldown from level 1, results in GL account groupings identical to those shown in figure 5. Similar to other IA dashboards, emphasis is again placed upon looking at MJE activity. However, additional information is captured relative to trial balance (TB) and manual journal voucher (MJV) values.

Figure 5

The GL Account Wise Analysis screen depicts pertinent TB, MJV, and MJE information by account type. As an example, MJE debits in the Cash account group represent 75 percent of the TB debit amount (MJV Debit amount or TB Debit amount). In this example, the MJE information in the Cash and Equities groups is highlighted for further investigation.

GL Group	TB Debit Amount	TB Credit Amount	TB Annual Movement	MJV Debit amount	MJV Credit Amount	MJV Net Amount	% of MJE Amount-Debit	% of MJE Amount-Credit	% of MJE Amount-Net
01.Long Term Assets	423	(405)	17	151	(134)	17	36%	33%	100%
02.Cash	1,239	(1,239)	(1)	927	(925)	2	75%	75%	-311%
03.Inventory	516	(516)	0	28	(34)	(6)	5%	6%	-4982%
04.Receivables	846	(843)	3	272	(321)	(49)	32%	38%	-1586%
05.Other current Assets	274	(275)	(1)	106	(112)	(6)	39%	41%	754%
06.Equities	111	(100)	11	84	(76)	8	76%	76%	76%
07.Long Term Liabilities	54	(58)	(4)	36	(40)	(4)	68%	69%	83%
08.Short Term Liabilities	821	(829)	(8)	278	(229)	49	34%	28%	-638%
09.Revenue	67	(263)	(196)	19	(24)	(5)	29%	9%	3%
10.Contra	331	(230)	102	17	(17)	(0)	5%	7%	0%
11.Cost of Sales	405	(327)	78	42	(37)	4	10%	11%	6%
12.Misc Income	121	(137)	(16)	83	(97)	(15)	68%	71%	91%
13.Expenses	84	(70)	14	32	(28)	3	38%	41%	23%
Grand Total	**5,292**	**(5,292)**	**0**	**2,074**	**(2,074)**	**(0)**	**39%**	**39%**	**-1%**

(Amounts in Billions)

Third, the Key Performance Indicator (KPI) tool provides specific risk measures, displaying each in terms of percentage of total MJEs and aggregate number of postings. Furthermore, for each attribute, the system divulges the 5 countries that contribute most significantly to the associated KPI value. For example, in figure 6 there were 318 MJEs posted by terminated users during the period in question. Also, the 5 countries contributing most to the accumulation of these entries were 34, 59, 213, 101, and 1. Given the high risk associated with this KPI, the entire array of transactions might warrant further analysis. In addition, all or a subset of the 5 identified countries might be subjected to more indepth outlier analysis, particularly those countries demonstrating a pattern of riskiness with other analytical procedures. Country 34, for example, is also reported more frequently in other KPIs and this suggests that this region deserves a closer examination. Taken collectively, the KPI feature contributes to making sampling decisions related to detailed testing operations as well as identifying locations having the highest risk factors.

Figure 6

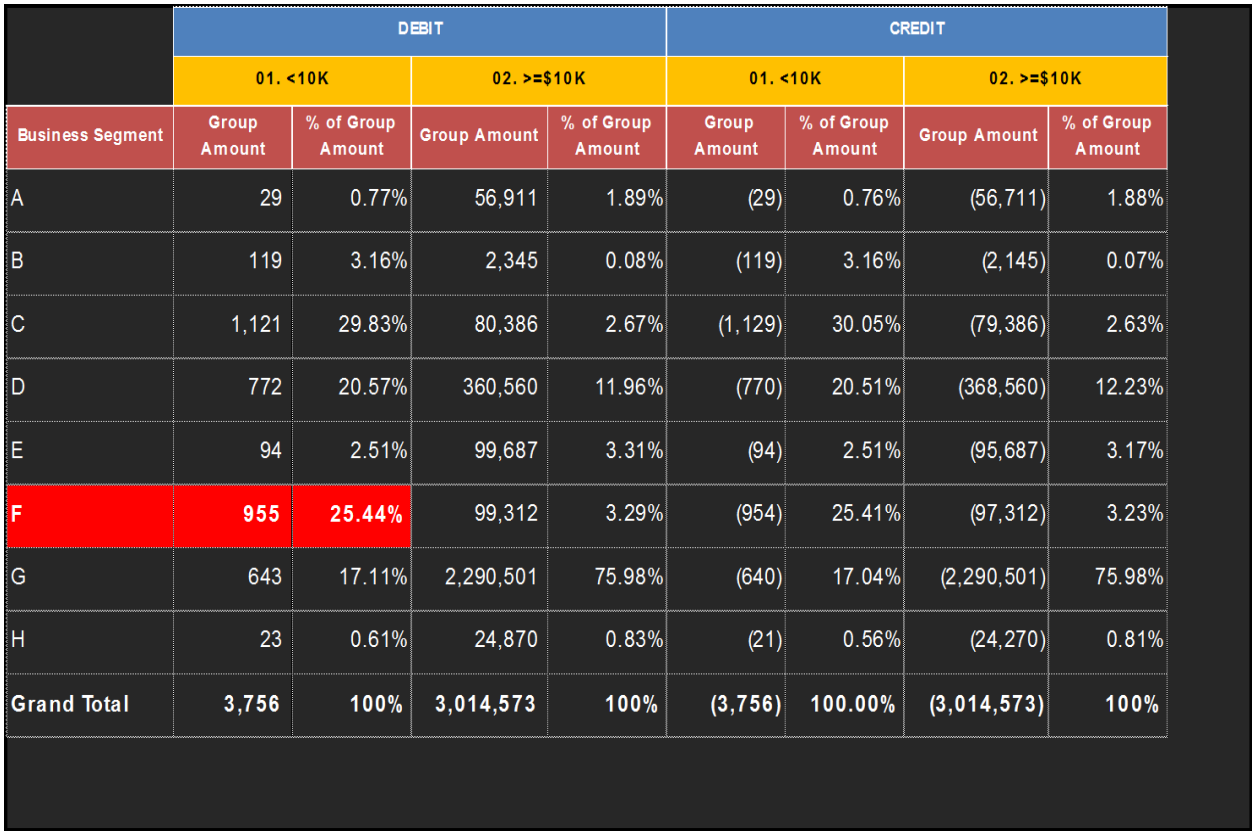
The KPI Performance tool supplies useful metrics for various risk assessments and assists with the coordination of detailed testing routines.

KPI Description	% of Total MJE	No. of Postings	Top 5 countries Contributing to the KPI
1. Amount > $50MM	0.2%	3,593	Country123, Country 34, Country56, Country144,Country2
2. Amount rounded to zero	0.5%	9,518	Country2,Country34,Country209,Country66,Country101
3. Postings on Holidays	5%	87,153	Country2,Country59,Country144,Country87,Country9
4. Amounts with 99 (potential split transactions)	0.05%	860	Country2,Country34,Country74,Country109,Country38
5. Postings by Terminated Users	0.02%	318	Country34,Country59,Country213,Country106,Country101
6. Postings without the Description	32%	594,709	Country2,Country34,Country144,Country96,Country12
7. Posting Date and Document date in different months	2%	37,681	Country2,Country34,Country166,Country94,Country9
8. MEC Postings on first 3 days & last 3 days of the month	47%	870,990	Country56,Country67,Country209,Country101,Country12
9. Fiscal month and Posting month are not Same	0%	-	-
10. JE's Created date beyond WD Calendar	0.004%	65	Country2,Country34
11. JE's Posted with Group Currency only	2%	33,080	Country209,Country101

Fourth, the Business Area Analysis functionality isolates pertinent MJE debit and credit values by business segment and amount range and this contributes to optimizing efficiency relative to auditing processes. For example, for the accounting period depicted in figure 7, business segment F generated $955 million in MJE debit postings wherein each entry was less than $10,000. Whether this was problematic would depend upon a number of factors, such as recent acquisitions or large accruals. Whatever the case, having the capability to assess MJE activity via the dimensions of business unit and amount grouping offers yet another valuable view when conducting audit activities.

Figure 7

The Business Area Analysis window presents MJE debit and credit information by amount range at the business unit level.

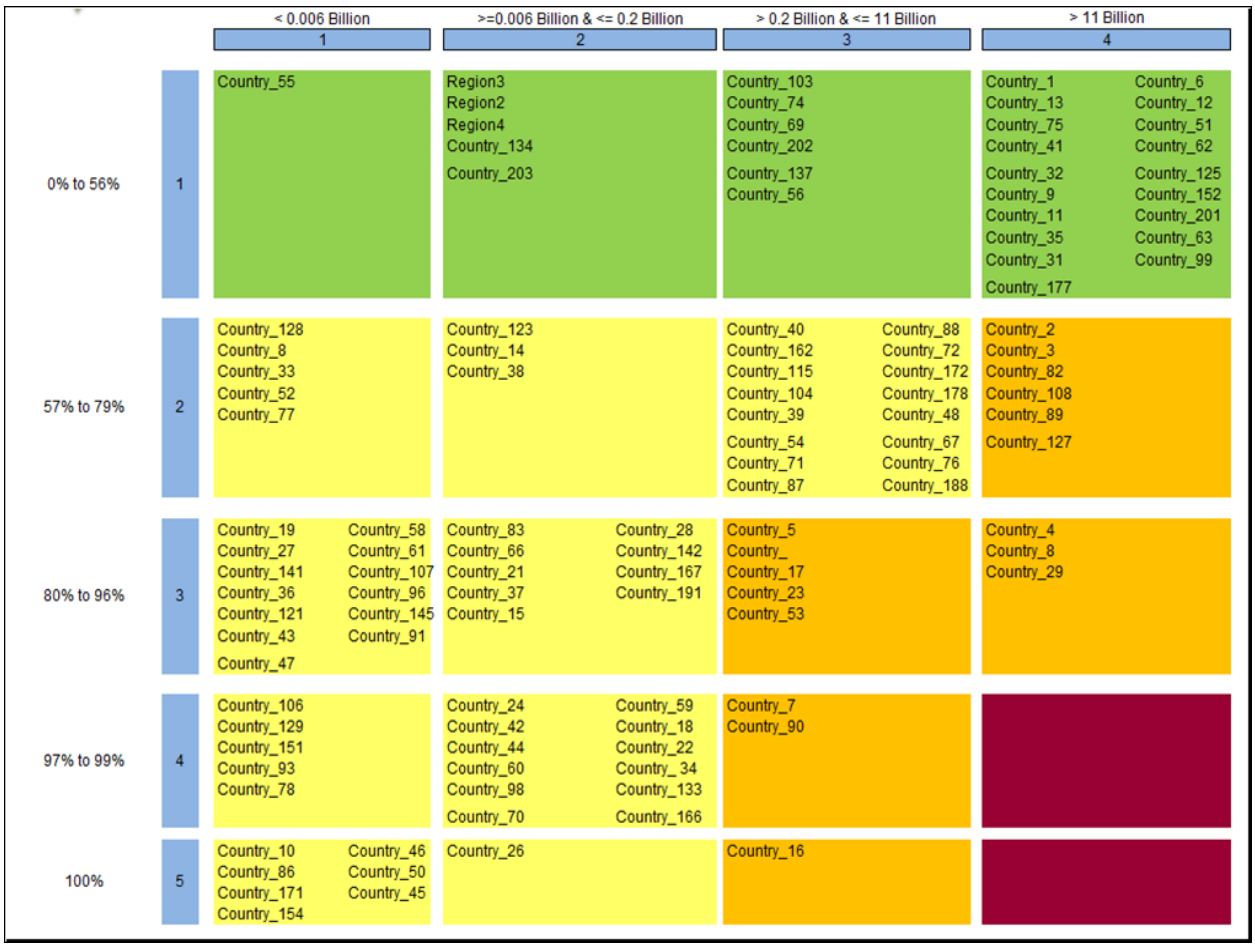


	DEBIT				CREDIT			
	01. <10K		02. >=$10K		01. <10K		02. >=$10K	
Business Segment	Group Amount	% of Group Amount	Group Amount	% of Group Amount	Group Amount	% of Group Amount	Group Amount	% of Group Amount
A	29	0.77%	56,911	1.89%	(29)	0.76%	(56,711)	1.88%
B	119	3.16%	2,345	0.08%	(119)	3.16%	(2,145)	0.07%
C	1,121	29.83%	80,386	2.67%	(1,129)	30.05%	(79,386)	2.63%
D	772	20.57%	360,560	11.96%	(770)	20.51%	(368,560)	12.23%
E	94	2.51%	99,687	3.31%	(94)	2.51%	(95,687)	3.17%
F	**955**	**25.44%**	99,312	3.29%	(954)	25.41%	(97,312)	3.23%
G	643	17.11%	2,290,501	75.98%	(640)	17.04%	(2,290,501)	75.98%
H	23	0.61%	24,870	0.83%	(21)	0.56%	(24,270)	0.81%
Grand Total	**3,756**	**100%**	**3,014,573**	**100%**	**(3,756)**	**100.00%**	**(3,014,573)**	**100%**

Last, the Grid Analysis feature classifies countries and regions according to total TB amounts as well as the percentage of total MJVs. More specifically, in figure 8 the 5 categories delineated down the left side of the matrix correspond to the percentage of total journal vouchers that are manually created. Similarly, the 4 groups displayed across the top of the grid represent total balance dollar values. Essentially, each country or region is ranked on these 2 dimensions such that riskiness may be readily observed. In figure 8, Country_55 exclusively occupies the block representing the intersection of row 1 and column 1 (category least risk). For the period under analysis, this country has less than $1.06 billion in total TB value, generated no more than 56 percent of its journal vouchers manually, and would be perceived as the least risky country via the Grid Analysis operation. In addition to evaluating riskiness, this procedure also facilitates the discovery of better performing countries and regions such that best practices may be identified and disseminated.

Figure 8

The Grid Analysis function categorizes countries and regions by total trial balance amounts and manual journal vouchers as a percentage of total journal vouchers.

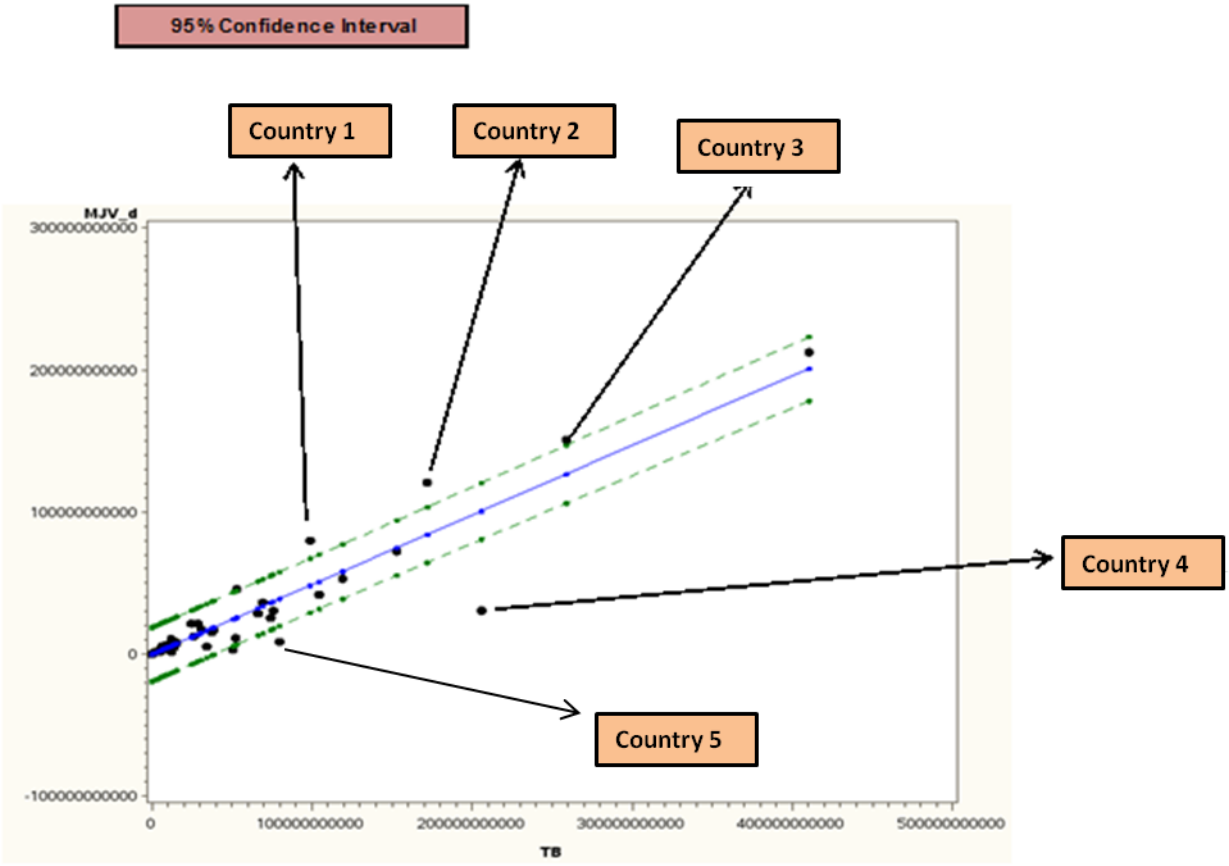


		< 0.006 Billion (1)	>=0.006 Billion & <= 0.2 Billion (2)	> 0.2 Billion & <= 11 Billion (3)	> 11 Billion (4)
0% to 56%	1	Country_55	Region3 Region2 Region4 Country_134 Country_203	Country_103 Country_74 Country_69 Country_202 Country_137 Country_56	Country_1 Country_13 Country_75 Country_41 Country_32 Country_9 Country_11 Country_35 Country_31 Country_177 Country_6 Country_12 Country_51 Country_62 Country_125 Country_152 Country_201 Country_63 Country_99
57% to 79%	2	Country_128 Country_8 Country_33 Country_52 Country_77	Country_123 Country_14 Country_38	Country_40 Country_162 Country_115 Country_104 Country_39 Country_54 Country_71 Country_87 Country_88 Country_72 Country_172 Country_178 Country_48 Country_67 Country_76 Country_188	Country_2 Country_3 Country_82 Country_108 Country_89 Country_127
80% to 96%	3	Country_19 Country_27 Country_141 Country_36 Country_121 Country_43 Country_47 Country_58 Country_61 Country_107 Country_96 Country_145 Country_91	Country_83 Country_66 Country_21 Country_37 Country_15 Country_28 Country_142 Country_167 Country_191	Country_5 Country_ Country_17 Country_23 Country_53	Country_4 Country_8 Country_29
97% to 99%	4	Country_106 Country_129 Country_151 Country_93 Country_78	Country_24 Country_42 Country_44 Country_60 Country_98 Country_70 Country_59 Country_18 Country_22 Country_ 34 Country_133 Country_166	Country_7 Country_90	
100%	5	Country_10 Country_86 Country_171 Country_154 Country_46 Country_50 Country_45	Country_26	Country_16	

In addition to the preceding capabilities, the CA/CM system is able to perform statistical analyses employing methods such as Benford's Law and linear regression. For example, a linear regression may be performed to construct a line of best fit via linear regression. A confidence band may then be established for this line and resulting outliers identified. Any points falling above the confidence interval would be regarded as problems requiring closer investigation. Conversely, any points located within or below the confidence band would not be perceived as troublesome. However, such points would likely be explored in an effort to discover and communicate pertinent information relative to best practices. In the specific example illustrated in figure 9, a positive relationship has been noted by country between trial balance amounts and number of manual journal entries. As such, a regression equation was constructed that reliably represents this association. Then, a 95 percent confidence interval was created around the regression line. When the line, confidence band, and actual data points were plotted, issues became glaringly apparent.

Figure 9

The following figure represents use of linear regression in continuous data analysis. The three points identified outside and above the confidence band pertain to "unfavorable" outliers needing investigation. The point outside and below the confidence band pertains to "favorable" outliers that would likely be viewed as best practices" information.



The ability of the preceding regression procedure to assist in the discovery of outliers and exceptions clearly makes the overall process significantly more efficient.

In addition to the previously noted internal audit dashboard benefits, the module offers other noteworthy strengths:

1. Any of the pertinent data may be readily provided to external audit personnel and other interested parties through an intranet website.
2. Extensive drilldown capabilities facilitate data disaggregation tasks. For example, in conducting global analytics, a user may start with region (for example, the Americas) and proceed to drilldown through the layers of geography, business unit, process, and so forth (figure 10). Ultimately, the individual could isolate a particular record of interest to obtain detailed information such as the name of the employee who posted or approved the transaction.

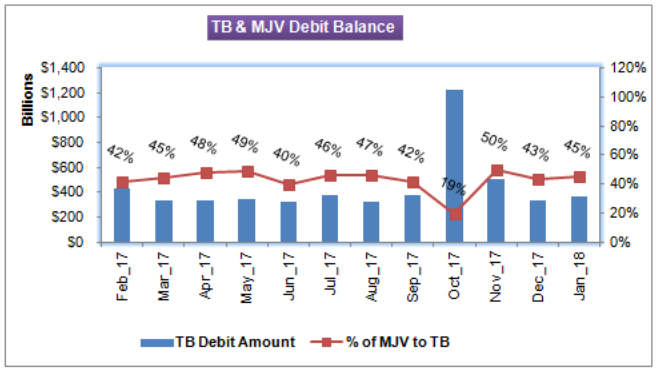
Figure 10

The global analytics Monthly Analysis tool contains drilldown functionality for data disaggregation tasks. In the following figure, aggregated monthly accounting period information is displayed pertaining to trial balance amounts and manual journal voucher values and percentages.

Region Name	(All)
Country	(All)
Company Code	(All)

Values

Month- Fiscal	TB Debit Amount	MJV Debit Amount	% of MJV to TB	LH System Amount	JE Tool Amount	Manual Entries	Auto Sys Amount
Feb_17	$426,618,994,698	$177,420,016,368	42%	$ 6,963,635,784	$ 45,437,961	$ 170,410,942,623	$ 249,198,978,330
Mar_17	$340,723,455,554	$152,561,668,725	45%	$ 8,567,154,435	$ 169,826,767	$ 143,824,687,523	$ 188,161,786,829
Apr_17	$336,391,702,874	$160,921,089,877	48%	$ 13,149,957,404	$ 88,891,967	$ 147,682,240,506	$ 175,470,612,997
May_17	$341,782,825,412	$166,717,278,217	49%	$ 9,631,433,419	$ 183,692,488	$ 156,902,152,310	$ 175,065,547,195
Jun_17	$329,839,217,401	$130,460,383,118	40%	$ 11,757,731,762	$ 479,472,031	$ 118,223,179,325	$ 199,378,834,282
Jul_17	$381,819,567,014	$174,946,194,982	46%	$ 10,585,450,618	$ 1,957,956,263	$ 162,402,788,102	$ 206,873,372,031
Aug_17	$327,924,663,818	$152,830,859,739	47%	$ 6,979,315,331	$ 885,876,739	$ 144,965,667,669	$ 175,093,804,079
Sep_17	$379,288,985,993	$159,071,016,035	42%	$ 20,433,243,173	$ 3,916,967,770	$ 134,720,805,092	$ 220,217,969,958
Oct_17	$1,220,294,717,726	$236,469,487,424	19%	$ 20,674,451,948	$ 5,503,462,519	$ 210,291,572,957	$ 983,825,230,302
Nov_17	$502,263,961,145	$252,049,061,432	50%	$ 14,204,538,896	$ 7,094,321,632	$ 230,750,200,904	$ 250,214,899,713
Dec_17	$335,228,418,949	$144,547,425,557	43%	$ 8,509,897,928	$ 5,931,323,918	$ 130,106,203,711	$ 190,680,993,392
Jan_18	$369,618,461,102	$166,368,964,503	45%	$ 8,044,859,530	$ 7,119,765,340	$ 151,204,339,634	$ 203,249,496,599
Grand Total	$5,291,794,971,685	$2,074,363,445,978	39%	$ 139,501,670,228	$ 33,376,995,395	$ 1,901,484,780,355	$ 3,217,431,525,706



As with query reporting, functionality is present in many situations to export information to the Microsoft Excel Spreadsheet environment for further analysis and modeling.

Clearly, the IA dashboard significantly simplifies the management, monitoring, and oversight functions and produces a vast array of useful, reliable, and timely information for decision making purposes.

In summary, the DSAS/IA Database Project is focused on the leveraging of current technologies to automate organizational management, monitoring, and auditing. By accumulating key metrics, statistics, and other relevant information in an ongoing manner, the system positions users to respond to changing business circumstances as associated events and transactions occur. Furthermore, the auditor is optimally positioned to detect issues promptly as they occur, which may ultimately serve a predictive or preemptive purpose. At this point, the auditor is poised to ensure that its business units are appropriately deploying the firm's scarce resources and thus, assist in optimizing profitability and profit growth moving forward.