Staying a Step Ahead

Internal Audit's Use of Technology

TECHNOLOGY

Closer Look

Michael P. Cangemi

The IIA Research Foundation

CBOK

The Global Internal Audit Common Body of Knowledge

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Audit, Controls, & Analytics

About CBOK

SURVEY FACTS

Respondents	14,518*
Countries	166
Languages	23

EMPLOYEE LEVELS

Chief audit executive (CAE)	26%
Director	13%
Manager	17%
Staff	44%

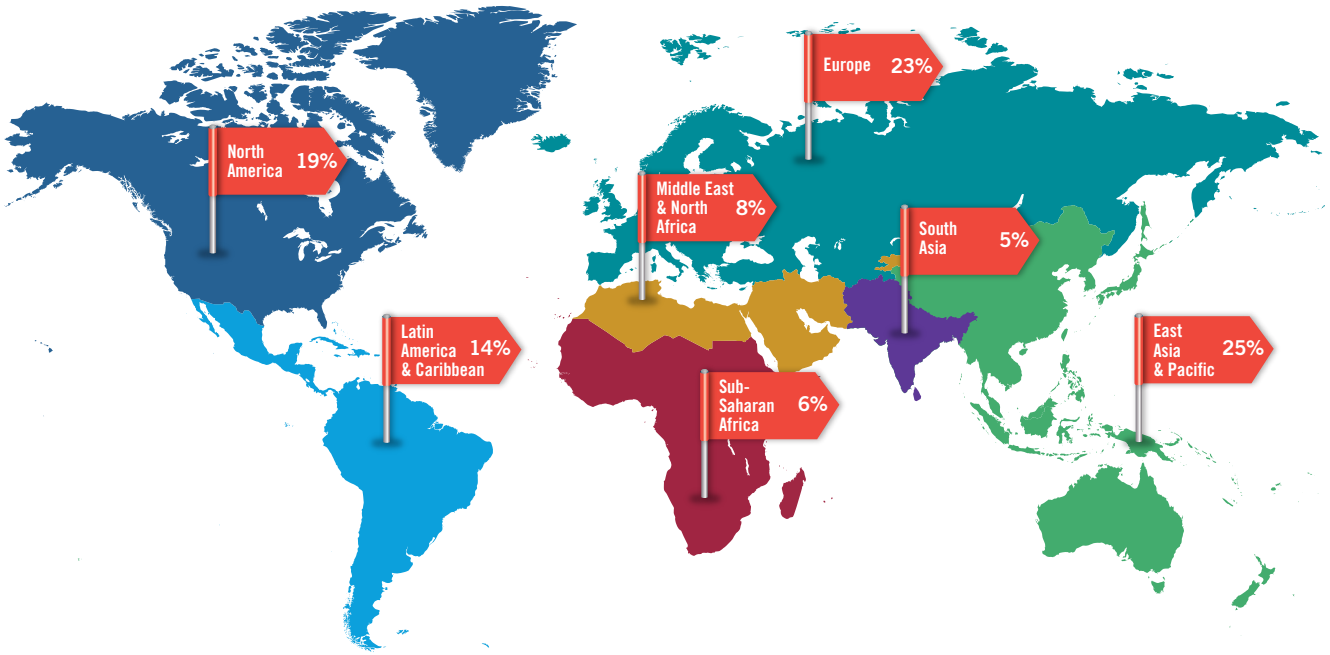
*Response rates vary per question.

The Global Internal Audit Common Body of Knowledge (CBOK) is the world's largest ongoing study of the internal audit profession, including studies of internal audit practitioners and their stakeholders. One of the key components of CBOK 2015 is the global practitioner survey, which provides a comprehensive look at the activities and characteristics of internal auditors worldwide. This project builds on two previous global surveys of internal audit practitioners conducted by The IIA Research Foundation in 2006 (9,366 responses) and 2010 (13,582 responses).

Reports will be released on a monthly basis through July 2016 and can be downloaded free of charge thanks to the generous contributions and support from individuals, professional organizations, IIA chapters, and IIA institutes. More than 25 reports are planned in three formats: 1) core reports, which discuss broad topics, 2) closer looks, which dive deeper into key issues, and 3) fast facts, which focus on a specific region or idea. These reports will explore different aspects of eight knowledge tracks, including technology, risk, talent, and others.

Visit the CBOK Resource Exchange at www.theiia.org/goto/CBOK to download the latest reports as they become available.

CBOK 2015 Practitioner Survey: Participation from Global Regions



Note: Global regions are based on World Bank categories. For Europe, fewer than 1% of respondents were from Central Asia. Survey responses were collected from February 2, 2015, to April 1, 2015. The online survey link was distributed via institute email lists, IIA websites, newsletters, and social media. Partially completed surveys were included in analysis as long as the demographic questions were fully completed. In CBOK 2015 reports, specific questions are referenced as Q1, Q2, and so on. A complete list of survey questions can be downloaded from the CBOK Resource Exchange.

CBOK Knowledge Tracks

Future

Global Perspective

Governance

Management

Risk

Standards & Certifications

Talent

Technology

Contents

Executive Summary

Technology continues to evolve, and in some cases, surprise and upset many business models. In every business sector, technologies are changing the way businesses operate—from adding productivity to creating disruptions that revolutionize existing business and create new business segments. In the same way, the use of technology by internal auditors is under pressure to change and adapt to the new environment. The CBOK 2015 Global Internal Audit Practitioner Survey shines new light on the use of technology by internal audit and the technology skills that internal auditors have acquired.

The survey data shows that internal audit use of technology in the audit process continues to grow, but there is room for improvement. For example, the use of software tools for data mining increased by 14% among survey respondents from 2006 to 2015. However, fewer than 4 out of 10 chief audit executives (CAEs) worldwide feel their departments' use of technology is appropriate or better.

There are large differences between regions. In North America, only about 1 out of 10 say they rely on manual processes, but that ratio is more than 3 out of 10 in Sub-Saharan Africa and East Asia & Pacific.

Technology education and certification also play a role in internal auditors' use of technology. Globally, about 6 out of 10 respondents entered the profession with education in accounting, while only 1 out of 10 had education in information systems or computer science. However, South Asia and Latin America are leading the profession with 2 out of 10 including technology in their academic studies.

This report will help readers compare their internal audit departments with those of other organizations in their regions and provide insightful thought leadership on ways to improve skills and activities related to technology.

Introduction

> *"The effects of emerging technologies have been paradoxical. On one hand, emerging technologies have created a more difficult system to audit effectively. On the other hand, auditors have managed to use emerging technologies as audit tools and thus become more effective and efficient."*
>
> —Michael P. Cangemi and Tommie W. Singleton, from *Managing the Audit Function*

When computers, networks, and systems were first being developed and deployed by businesses, many auditors chose to audit around the computer using audit techniques from the past. However, as business use of information technology (IT) evolved and more complex automated business systems were deployed, internal auditors began to address the new technology. Specialized IT auditors were hired or developed, and other staff members were trained to audit the computerized systems. In addition, they began to audit data using computer-assisted audit techniques (CAATs).

The mainframe computer era was augmented by the advent of the personal computer (PC). The PC revolutionized the very young computer industry where computer terminals gave way to smart terminals using microcomputers. Eventually everyone at work would have a PC and, seemingly overnight, most everyone had a home computer, too.

This led to perhaps one of the most significant developments for internal audit and all business units: software technology for business and home productivity. New computer programs for word processing and spreadsheets for numerical data processing changed the paradigm of administration and documentation for internal audit, allowing substantial increases in productivity and improved documentation. These enhancements continue today with tablets and smart phone devices.

As computerization of financial, operations, and other business systems expanded, internal audit responded by expanding IT training for auditors and building IT audit functions within internal audit departments. Auditors learned how to review data center controls and audit software applications. They built data tests and deployed new tools for looking at data using generalized audit software, audit-focused data analytic software, and audit management programs. These technology advances continue to create challenges for business and assurance functions to provide IT security and controls.

Early in the development of IT auditing, some audit leaders believed all auditors would become IT auditors because the computer was so pervasive. Instead, as IT complexities continued to increase and other audit priorities developed, IT auditing developed into a department within internal audit, or as a prime area for outsourcing.

Expanding on the initial use of CAATs, one of the biggest advances in the use of IT in internal audit has been the increased use of data mining,[1] continuous auditing, and analytics for auditing data. As the survey responses show, this trend continues to advance the coverage and efficiency of internal audit.

[1] Data mining is "the practice of searching through large amounts of computerized data to find useful patterns or trends" (*Merriam-Webster's English Dictionary*, online version).

1 Powering Audit Processes with Technology

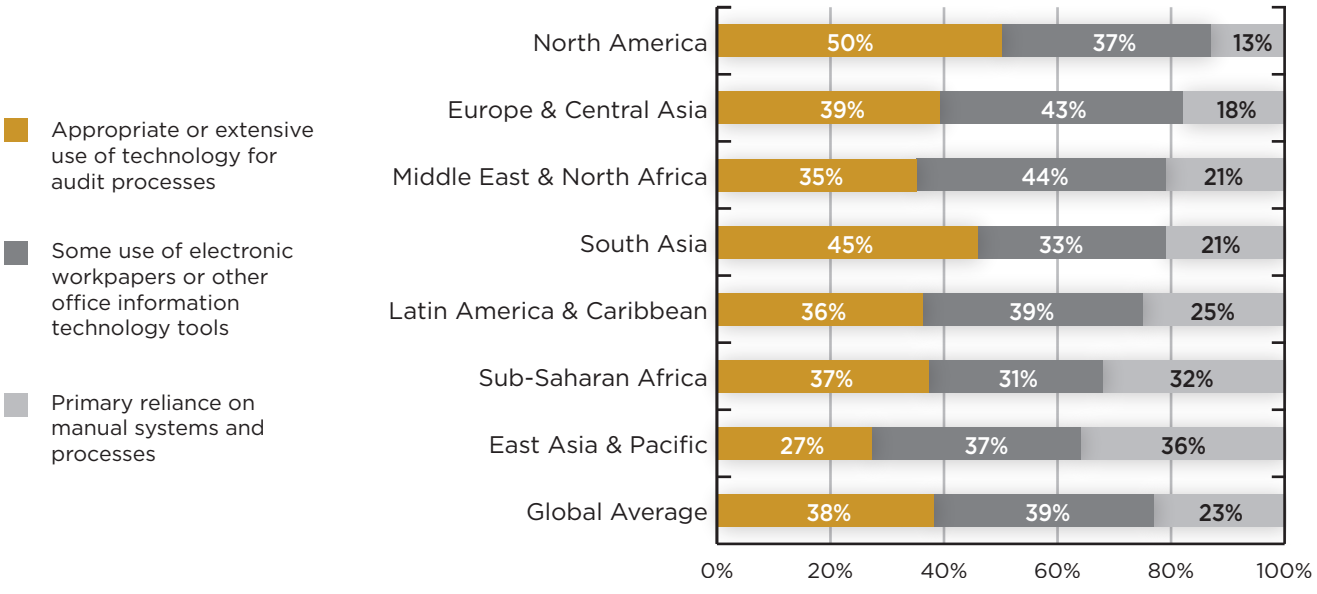
ACTION STEPS

1. Identify and inventory manual audit processes.
2. Identify near-term opportunities to automate processes to enhance efficiency and effectiveness.
3. Implement appropriate technology.
4. Assess effectiveness.
5. Identify the next opportunity.

Many CAEs feel that their departments could make better use of technology overall. Worldwide, only 4 out of 10 say they use technology at an "appropriate" level or higher, indicating obvious room for growth (see **exhibit 1**). In fact, 2 out of 10 CAEs say their departments primarily rely on manual techniques. Part of the reason may be a lack of IT expertise on staff. Another contributing factor could be that finding new ways to use technology requires greater risk-taking and creativity than general internal audit activities.

Exhibit 1 also shows that there are extensive regional differences in technology use. CAEs in North America report the most extensive use of technology (50% at "appropriate" use or higher), followed by South Asia at 45%. South Asia's strong use of technology is probably related to having the highest percentage of respondents with higher education in technology (see **exhibit 8**).

Exhibit 1 Overall Use of Technology for Internal Audit Processes



Note: Q44: How would you describe the use of technology to support internal audit processes at your organization? CAEs only. The category "appropriate or extensive use of technology for internal audit processes" included those who chose "extensive use of technology across the entire audit process, including data mining and analysis" or "audit methodology supported by appropriate technology." Due to rounding, some totals may not equal 100%. *n* = 2,959.

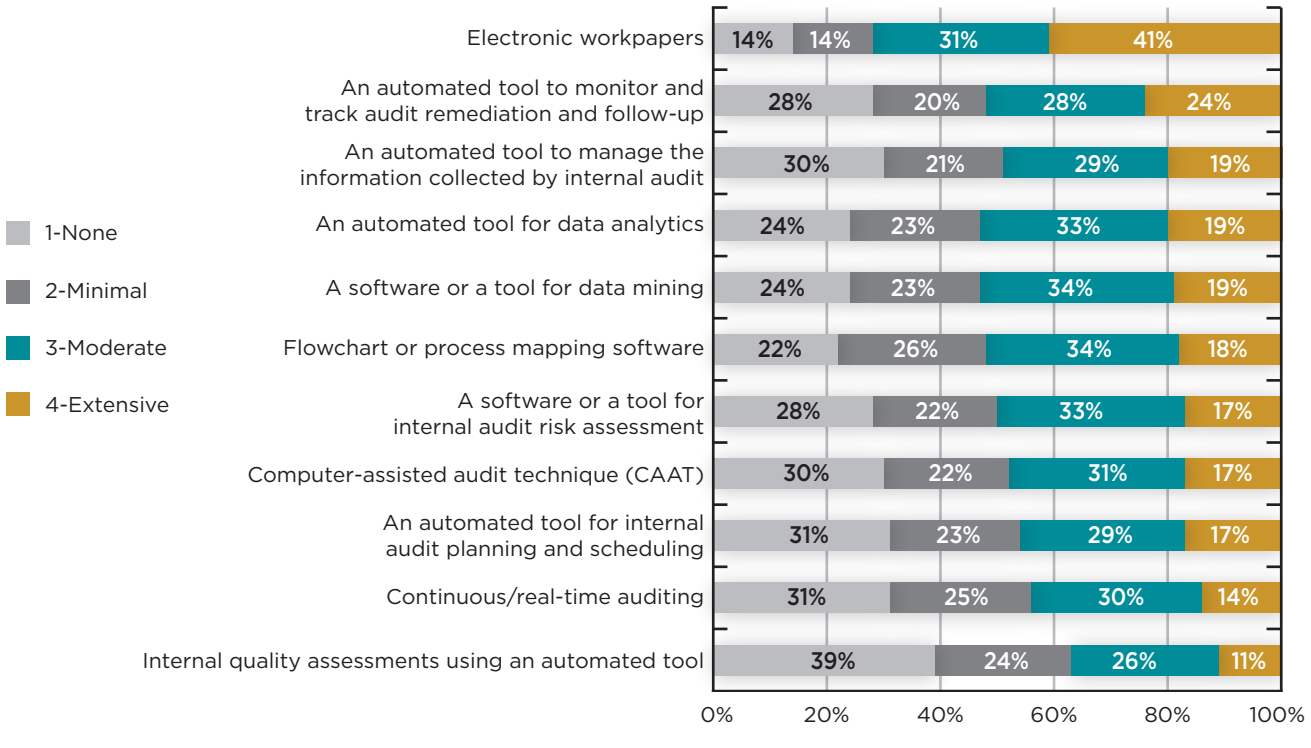
2 Technology Tools Used by Internal Audit

ACTION STEPS

1. Assess your overall use of technology tools.
2. Develop a vision for use of technology tools over the next two to three years.
3. Develop a strategic plan to attain your vision.
4. Communicate the vision and plan to the internal audit group.
5. Implement the plan and periodically assess performance.

The CBOK survey also asked respondents to evaluate their use of specific technology tools and techniques. Responses clearly show that extensive use of technology is the exception, not the rule. For about half of all respondents globally, usage of most technology tools is "none" or "minimal" (see **exhibit 2**). The only exception is electronic workpapers, which has a much higher usage rate than all other categories (7 out of 10 respondents). One explanation might be that respondents interpreted the question to be a reference to general software tools (such as word processing and spreadsheets), rather than specialized software for internal audit workpapers. While one could question whether internal audit use of technology should be more extensive, it is worth remembering that not all internal audit work lends itself to the use of technology, and there are many challenges to automating processes, as well as competing priorities.

Exhibit 2 Current Use of IT Tools and Techniques by Internal Audit



Note: Q95: What is the extent of activity for your internal audit department related to the use of the following information technology (IT) tools and techniques? *n* = 9,953 to 10,425.

ACTION STEP

The results in **exhibit 3** can be used to compare technology use for your internal audit department to other organizations in your region, as well as to the global average.

Regional Differences for Technology Tools

There are some interesting insights in the usage worldwide by technology category. Respondents in South Asia and Latin America & Caribbean report higher than global average activity for every technology tool. One reason may be that these two regions also have the highest percentage of respondents who studied computer science or IT as part of their higher education (about 20%, see **exhibit 8**).

On the other end of the scale, respondents in Sub-Saharan Africa and East Asia & Pacific report lower than average use of almost all technologies (see **exhibit 3**).

Exhibit 3 **Internal Audit Use of Tools and Techniques (Regional Differences)**

Note: Blue text indicates responses that are significantly higher than the global average, and red text indicates responses that are significantly lower than the global average.	Latin America & Caribbean	South Asia	Europe	North America	Middle East & North Africa	Sub-Saharan Africa	East Asia & Pacific	Global Average
Electronic workpapers	80%	76%	78%	77%	71%	64%	58%	72%
An automated tool to monitor and track audit remediation and follow-up	62%	57%	60%	53%	51%	41%	41%	52%
An automated tool to manage the information collected by internal audit	61%	56%	49%	49%	50%	42%	42%	49%
An automated tool for data analytics	62%	67%	49%	56%	55%	48%	47%	53%
A software or a tool for data mining	56%	63%	53%	58%	56%	48%	46%	53%
Flowchart or process mapping software	68%	65%	51%	52%	51%	42%	46%	52%
A software or a tool for internal audit risk assessment	57%	62%	52%	47%	54%	48%	44%	50%
Computer-assisted audit technique (CAAT)	59%	60%	38%	48%	51%	48%	48%	48%
An automated tool for internal audit planning and scheduling	56%	54%	47%	42%	52%	44%	43%	46%
Continuous/real-time auditing	54%	61%	38%	35%	45%	39%	50%	44%
Internal quality assessments using an automated tool	45%	52%	34%	29%	41%	34%	37%	36%

Note: Q95: What is the extent of activity for your internal audit department related to the use of the following information technology (IT) tools and techniques? The exhibit shows respondents who chose "3-Moderate" or "4-Extensive." Blue text indicates significantly above global average. Red text indicates significantly below global average. *n* = 9,848 to 10,315.

3 Ten-Year Trends

"The internal audit profession should be pleased to see that the reported use of technology by internal audit appears to be growing nicely since prior surveys. While the numbers remain lower than many would like to see, over the years more internal audit departments are making productive use of analytics, including forms of continuous auditing and risk monitoring, to enhance the value and efficiency of their work."

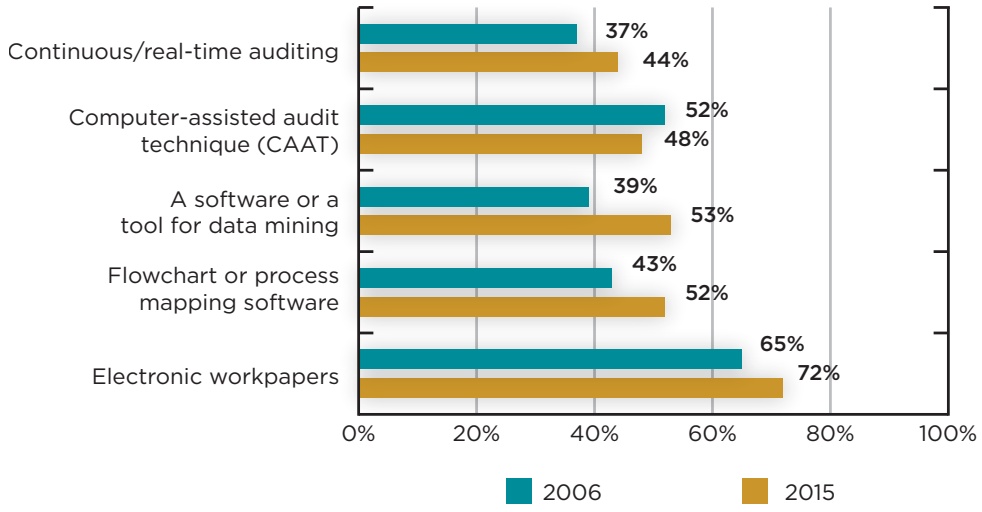
—Norman Marks, retired CAE and author of *World-Class Internal Audit* and *World-Class Risk Management*

The use of technology by internal auditors has increased over the past decade, and that trend needs to continue and accelerate. A comparison of survey responses from CBOK 2006 and CBOK 2015 shows increases in the use of technology tools for nearly all measures, particularly in the use of data mining (increased by 14%). Currently, 53% of respondents say they are moderately or extensively involved in data mining (see **exhibit 4**). At the same time, 80% of CEOs say data mining and analysis is strategically important to their organizations, according to the 2015 global CEO survey conducted by PwC.[1] Based on the CEOs' priorities, internal auditors should accelerate their use of data mining.

As shown in **exhibit 4,** internal auditors have also increased activity for most other technology tools, except for computer-assisted audit technique (CAAT), which may be explained by a change in the scope and usage of the term CAAT in the past decade.

[1] "A Marketplace Without Boundaries: Responding to Disruption" (PwC's 18th Annual Global CEO Survey, 2015).

Exhibit 4 Increase in Internal Audit Use of Technology Tools



Note: Q95: What is the extent of activity for your internal audit department related to the use of the following information technology (IT) tools and techniques? This exhibit compares those who chose "3-Moderate" or "4-Extensive" in 2015 (*n* = 9,953 to 10,425) with those who chose "Average Use," "Very Much Used," or "Extensively Used" in 2006 (Q50, *n* = 6,399 to 6,581).

4 A Closer Look at Data Mining and Data Analytics

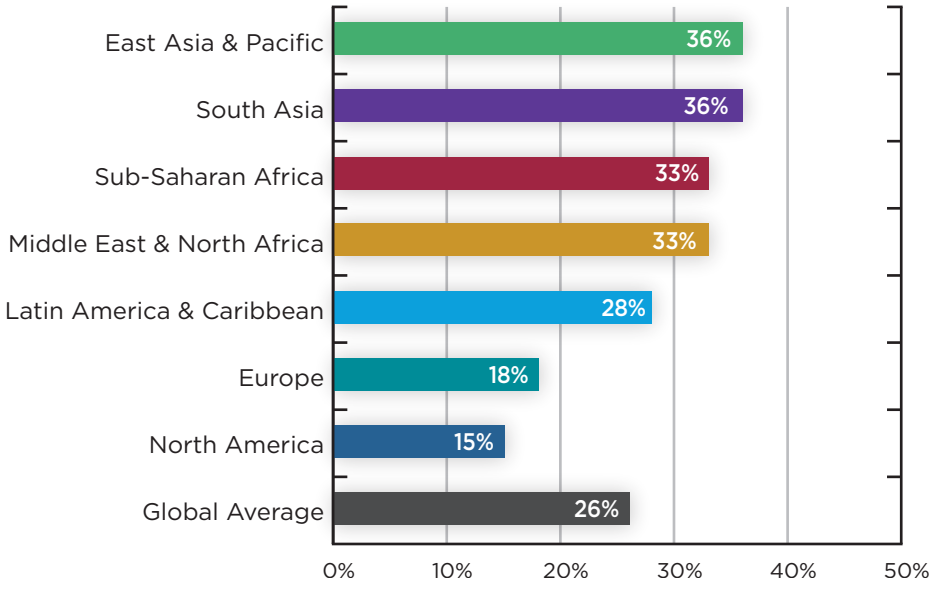
ACTION STEPS

1. Identify and inventory all manually performed audit tests.
2. Assess each test to determine whether it can be performed using data mining/analytics.
3. Develop a plan to evolve specific manual tests to automated data mining routines, based on organizational benefit.
4. Implement the plan for a specific manual test.
5. Assess effectiveness.
6. Identify the next opportunity to move from a manual test to an automated routine.

With the continued expansion of data—both structured (from software applications) and unstructured (from text and the explosion of social media)—the term "big data" has come into common usage. Although most internal audit departments only do basic data mining, a few are starting to use advanced analytics to detect relevant patterns and predict future trends and behaviors. Regarding their objectives for data analysis, about 5 out of 10 respondents say they use data mining and analysis for fraud identification, risk and control monitoring, or tests of entire populations (rather than samples). About 4 out of 10 test for regulatory compliance, and about 3 out of 10 look for business improvement opportunities (Q96, n = 11,116).

Not all data mining and data analytics projects are performed by internal audit staff. On average, about one quarter of data analysis is performed outside of the internal audit department, although this varies by region. Less activity is done outside the internal audit departments in Europe and North America and more in East Asia & Pacific and South Asia (see **exhibit 5**).

Exhibit 5 Percentage of Data Analysis Performed Outside of the Internal Audit Department



Note: Q97: What percentage of the data analysis activities for internal audit is performed outside of your internal audit department? n = 3,097.

5 A Closer Look at Continuous Auditing

ACTION STEPS

1. Review your inventory of CAAT routines that are currently being run as part of periodic audits.
2. Consider which of these routines could be taken out of a periodic audit and instead run separately as continuous audit routines.
3. Also identify audit routines that can be shared with or moved to management to enable management to conduct continuous monitoring for certain of their controls.

For more information, see The IIA's Global Technology Audit Guide (GTAG) 3: *Coordinating Continuous Auditing and Monitoring to Provide Continuous Assurance,* 2nd Edition, 2015.

The use of continuous auditing (CA) is one of the most important trends in technology for internal auditing. "Continuous audit work started years ago as a substantive improvement, but soon it will be a necessity for the assurance of modern systems," says Miklos Vasarhelyi, director of the Continuous Auditing & Reporting Lab for Rutgers Business School (New Jersey). However, continuous auditing is only used extensively by 14% of survey respondents, making it one of the least used technology techniques in the survey (see **exhibit 2** for details).

Continuous auditing offers internal auditors an excellent opportunity to add value to their organizations. In particular, internal auditors should look for opportunities to migrate their automated or continuous auditing routines to management so that management, as the first line of defense, assumes more responsibility for conducting their own continuous monitoring activities. In that way, internal audit helps management improve processes and also enhances the overall control environment of their organizations.

This activity falls nicely in line with how CAEs perceive that internal audit adds value to their organizations. According to 8 out of 10 CAEs worldwide, assurance of internal controls is one of the top ways to add value, while 5 out of 10 also say business improvement adds value (Q89, n = 2,636).

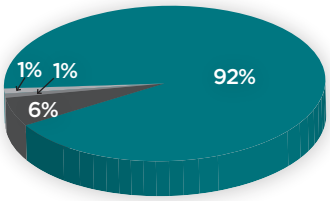
Using Continuous Auditing in the Three Lines of Defense

It's helpful to use the Three Lines of Defense model to understand the relationship between continuous auditing and continuous monitoring in an organization. In the Three Lines of Defense model, operational management is considered the first line of defense; compliance and risk management are the second line; and internal audit is the third line.[1] The first and second lines of defense use continuous monitoring as a technology-supported process with data analytics to identify exceptions to policies, control failures, fraud, and breakdowns in business processes or to improve information integrity and transaction quality. The third line of defense (internal audit) uses continuous auditing as a technology-supported process to help provide independent objective assurance over the effectiveness of governance, risk management, and internal control. The important difference is that continuous auditing systems should be implemented independently from continuous monitoring systems.

[1] IIA Position Paper, *The Three Lines of Defense in Effective Risk Management and Control*, January 2013, pages 3-5.

6 Technology Education and Certifications

Exhibit 6 Higher Education Among Internal Auditors



92% Bachelor's degree or higher

6% Undergraduate diploma or associate degree (less than four years)

1% Secondary/high school education

1% None of the above

Note: Q5: What is your highest level of formal education (not certification) completed? *n* = 12,716.

INTERNAL AUDIT STUDIES INCREASE

Studies of internal audit increased from a global average of 13% in 2006 to 43% in 2015 (see **exhibit 7**). Responses per region for 2015 are:

- Latin America & Caribbean 70%
- South Asia 69%
- Sub-Saharan Africa 56%
- East Asia & Pacific 53%
- Middle East & North Africa 46%
- Europe 33%
- North America 13%

How does one prepare for a career in internal auditing? According to the CBOK 2015 practitioner survey, a university or college degree is the norm, with more than 90% of survey respondents worldwide holding four-year degrees or higher (see **exhibit 6**). The higher education of an internal auditor typically includes studies in accounting, auditing (internal or external), finance, or business (see **exhibit 7**). Only 1 out of 10 survey respondents studied computer science or information technology. Surprisingly, there is little change in this percentage since 2006 (12% in 2006 compared to 13% in 2015). One possible explanation for a lack of increase in technology degrees is that technology is being incorporated into other areas of study. For example, internal audit programs typically include an information systems course in their curriculum, and accounting programs often have accounting information systems (AIS) components.

Exhibit 7 Majors and Significant Fields of Study (Trends)

	2006	2015
Accounting	58%	57%
Auditing (internal)	13%	43%
Finance	25%	31%
Business management/general business	28%	35%
Auditing (external)	19%	23%
Economics	21%	22%
Computer science or information technology (IT)	12%	13%
Law	7%	10%
Mathematics/statistics	6%	7%
Engineering	4%	6%
Other	8%	5%
Arts or humanities	4%	4%
Other science or technical field	3%	2%

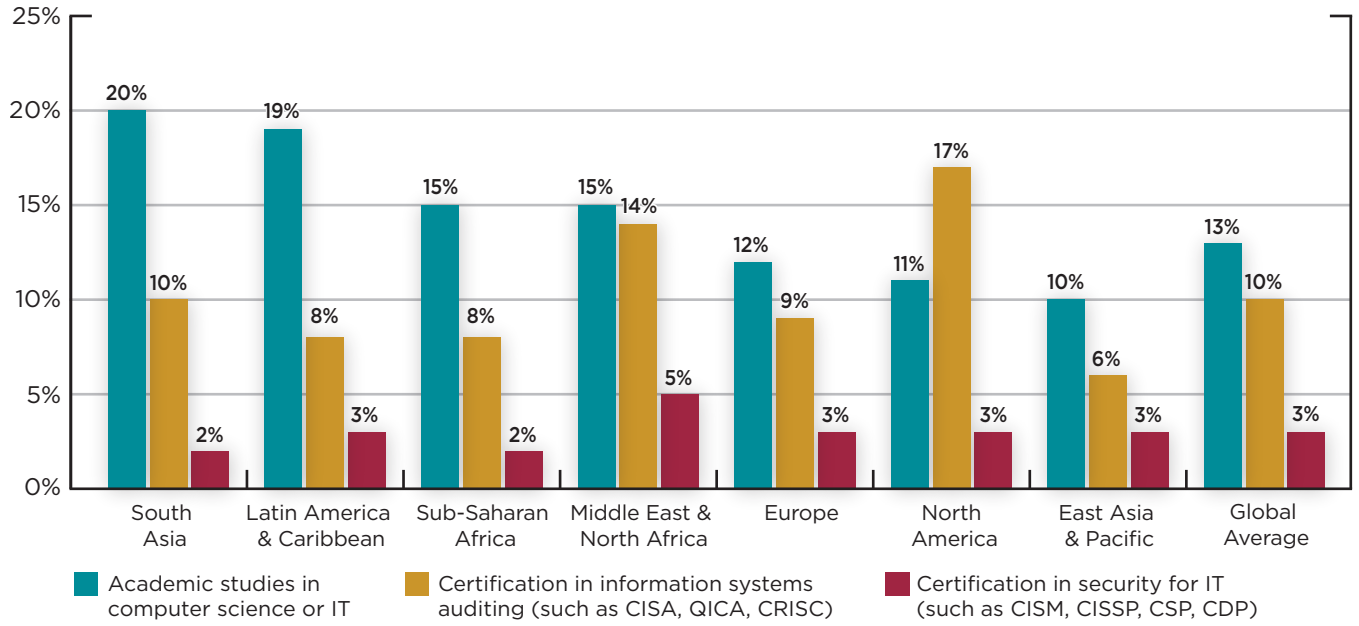
Note: Q5a: What were your academic major(s) or your most significant fields of study? (Choose all that apply.) The total will not equal 100% because respondents could choose more than one option. *n* = 7,819 for 2006. *n* = 12,288 for 2015.

Regional Differences in Technology Education and Certification

Internal auditors obtain their technology skills in very different ways, depending on where they live. In most parts of the world, technology skills are more likely to be gained from academic studies rather than earning information systems certifications as part of continuing education while on the job. However, in North America, certifications play a stronger role than academic studies (see **exhibit 8)**. In general, in regions where technology education is higher, certifications in information systems technology are lower (and vice versa). Ulrich Hahn, who has taught internal and IT auditing courses all over Europe, commented: "More colleges and universities should have IT audit programs, with specialized courses and actual training on computers in addition to their traditional financial audit educational tracks."

One area where all regions are equally low is certifications for IT security (see **exhibit 8**). On average, only 3% of respondents worldwide hold a certification in IT security. With cybersecurity risks increasing around the world, a much higher percentage of internal auditors will probably need to obtain certifications in IT security in order for internal audit to effectively provide assurance in this area.

Exhibit 8 Technology Education Compared to Technology Certifications



Note: Q5a: What were your academic major(s) or your most significant fields of study? (Choose all that apply.) Topic: Computer science or information technology (IT). *n* = 12,288. Q13: Which professional certifications do you have in areas other than internal auditing? (Choose all that apply.) *n* = 12,540.

7 Increasing Technology Skills in the Internal Audit Department

ACTION STEPS

1. Perform a separate risk assessment of the organization's technology risks.
2. Assess the technology skills required for internal audit to address the organization's technology risks.
3. Implement a plan to acquire the needed technology skills, including which skills can be developed within the internal audit staff and which skills you will need to acquire periodically from a third party.
4. Advise management and the audit committee about how you are addressing the organization's technology risks.

We often hear the analogy: you do not need to understand how an engine works to drive a car. This is also the case for users of computer systems. When an internal auditor uses a computer to accomplish an audit objective, such as using a spreadsheet program or word processor, that analogy may hold true. However, additional skills and understanding are required to audit a computer system. The line between the generalist and specialized IT auditor and the benefits of outsourcing IT audit projects are defined in each industry and department.

A continuing challenge to adding more technology to the internal audit process is that internal auditors' foundational skills lie in accounting and auditing. However, over the decades, universities have added (and are continuing to add) IT courses to their accounting and auditing curriculums, including IT auditing courses in some cases. In addition, university programs continue to add more general technology courses and require students to use generalized software tools. Consequently, new graduates are significantly more computer savvy than past generations.

While they continue to acquire IT technical knowledge and skills, many internal auditors do not have the time or interest in becoming programmers. In the most base case, internal auditors in the new millennium need to understand the basics of computerized systems, including the core hardware components of a computer system and the basic concept for every computer program (input-process-output). At the same time, there is a lot more to understanding technology, including the basics of systems development, systems lifecycles, process flowcharting, programming logic, and writing scripts for analytics. These skills should exist in some aspect of the staffing or be outsourced.

Even when IT knowledge and skills are available, there may also be less apparent impediments to expanding the use of technology by internal audit. These include the need to be creative (in particular, envisioning what can be automated in the design phase). In addition, because developing or acquiring a system requires an upfront investment, internal auditors need to step out of their comfort zone and take normal business risks to get approvals and be responsible for the effectiveness of the project and its return on investment.

Conclusion

Advancements in technology are creating continuous opportunities for internal auditors to innovate and improve functionality of current systems. To make sure your internal audit department is staying a step ahead, consider the following questions:

- What new technology-based applications are being used in your organization? Has the internal audit department deployed new technologies of its own to ensure that it can effectively audit the new systems?
- Does the internal audit department have the capital funds to acquire technologies that are needed to properly audit the organization's systems?
- Does the internal audit department have sufficient IT technical skills to address the level of technology used by the organization?
- What are the internal audit department's plans to address the "big data" that is important to the organization (both structured and unstructured)?
- Are there any organizational applications or processes that take place entirely in the "black box" (the computer) (for example, the computation of interest charges on loans)? If so, how are they audited?
- What types of software does the internal audit department use to make audits more efficient and effective? How extensively are they used, and how often?

Exploring questions like these will help you and your internal audit department to find creative solutions to new challenges and to keep up with the skills that are needed for effective performance. Ultimately, the goal for internal audit's use of technology is to evolve in step with the business, using technologies that will, at a minimum, allow you to effectively audit the disparate business infrastructures while also beginning to creatively innovate to stay a step ahead of the real-time pace of technology advancement.

About the Author

Michael P. Cangemi, coauthor of *Managing the Audit Function*, is a former Certified Public Accountant (CPA) and CAE who went on to be a chief financial officer (CFO), chief executive officer (CEO), director, and audit committee chair. He currently serves as senior advisor and director to various companies and as a Senior Fellow of the Rutgers Continuous Auditing & Reporting (CAR) Lab. He has served on the Committee of Sponsoring Organizations of the Treadway Commission's (COSO's) Board of Directors, the advisory boards for the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB), in numerous IIA, IIARF, and ISACA professional capacities, and as editor-in-chief of *ISACA Journal* for two decades.

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CBOK is administered through The IIA Research Foundation (IIARF), which has provided groundbreaking research for the internal audit profession for the past four decades. Through initiatives that explore current issues, emerging trends, and future needs, The IIARF has been a driving force behind the evolution and advancement of the profession.

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Contact Us

The Institute of Internal Auditors Global Headquarters
247 Maitland Avenue
Altamonte Springs, Florida 32701-4201, USA