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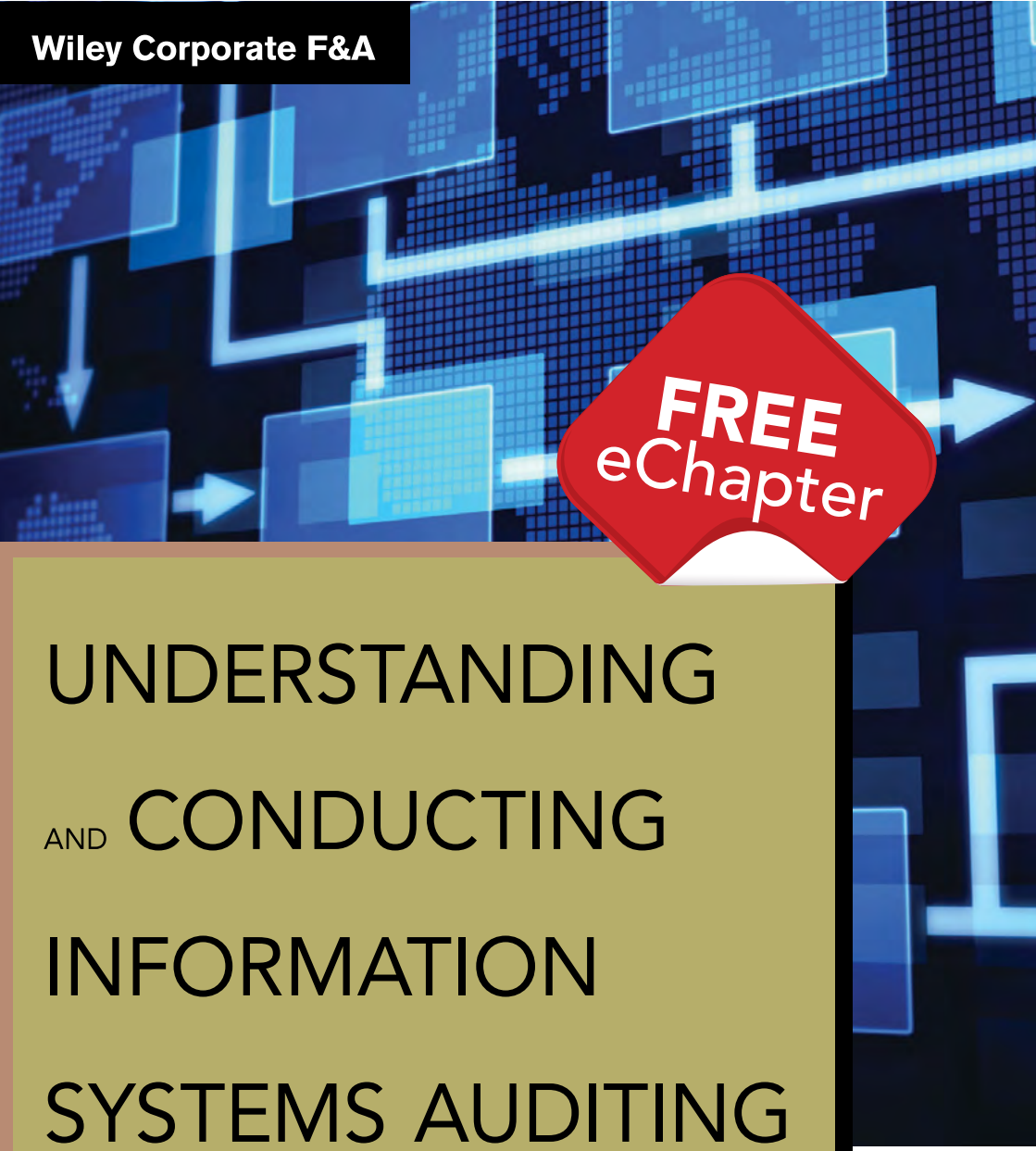

UNDERSTANDING AND CONDUCTING INFORMATION SYSTEMS AUDITING

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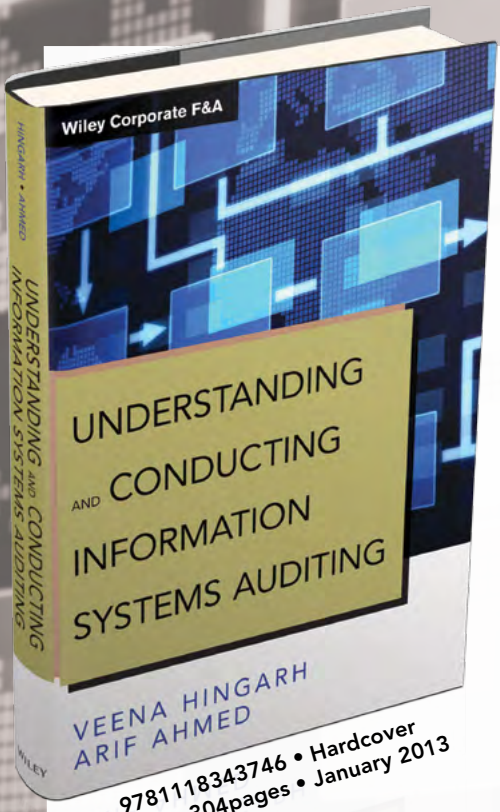

The increased dependence on information system assets for performing critical functions of an organization has enhanced the need for using an information systems audit as a control to ensure confidentiality, integrity, and availability of information systems resources. But in order to achieve these goals, auditors in this field face some difficult challenges, including the absence of an standardized audit approach and the lack of relevant checklists.

As experts in the information systems arena, authors Veena Hingarh and Arif Ahmed are quite familiar with these important issues. And now, with *Understanding and Conducting Information Systems Auditing*, they share their valuable insights with you.

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Preface

THIS BOOK FOCUSES ON an information systems audit as a management control and not a technology-driven subject. Complete with resources to understand the subject, definitions of technical terms, ready checklists to conduct an information systems audit, and multiple-choice questions to review the level of understanding, the book is designed to be an indispensable resource for the information systems practitioner and aspirant alike. Readers will find enough resources for their audit needs, examination needs, and even continuing professional education requirements.

Increased dependence on information systems assets for performing critical functions of an organization has strengthened the need for using information systems audits as a control to ensure confidentiality, integrity, and availability of information systems resources. Major problems that an information systems auditor faces include apparent technology bias of the subject, lack of a standardized audit approach, and lack of availability of standardized checklists. In this book, we have attempted to address these problems by approaching the subject from the viewpoint of management control, providing readers with requisite knowledge resources, and making available an audit tool in the form of checklists.

Our approach to an information systems audit is essentially nontechnical in nature. We firmly believe that an information systems audit is a managerial control tool and use of technology is subordinate to it. We hold that attempts to consider an information systems audit as a technical control would make it an esoteric subject and be counterproductive in the long run. Technical tools are most useful for specific applications within the domains of an information systems audit, but may not be the primary focus. The primary focus should be to establish a framework of management control, and technology could be used wherever necessary to implement the control. An information systems auditor is free to seek the help of a technology specialist to examine specific controls, whenever such a need arises. The scope of the audit will determine the extent of use of technology-driven tools. For example, an audit of network security or website penetration testing definitely requires technical competence and appropriate tools. It must be clarified that we are not underestimating the importance and convenience of technology; we are merely assigning a specific role for it within the domain of an information systems audit.

Preface

The book is divided over two parts—Part One focuses on the knowledge that all information systems auditors must have to be able to effectively conduct an information systems audit. This part will act as reference material for the aspiring information systems auditors who are preparing for a certifying examination. There are 10 chapters in this part, progressively building up the competence of conducting a real-life information systems audit. The chapters in Part One are the following:

Chapter 1: "Overview of Systems Audit": This chapter will make readers aware of the challenges they are likely to face while conducting an information systems audit. The importance of such an audit is established in this chapter.

Chapter 2: "Hardware Security Issues": This chapter identifies the security aspects of hardware and network assets that should be taken care of.

Chapter 3: "Software Security Issues": This chapter sensitizes the reader about the critical aspect of software security.

Chapter 4: "Information Systems Audit Requirements": This chapter develops understanding about the general scope of information systems audit, types of evidences, and areas of focus of an information systems auditor.

Chapter 5: "Conducting an Information Systems Audit": This chapter discusses the process of conducting an information systems audit and provides an overview of an audit program, plan, and procedure, compliance and substantive testing, testing tools, and the process of reporting.

Chapter 6: "Risk-Based Systems Audit": This chapter deals with the approach that an information systems auditor needs to adopt in situations where the auditee is exposed to various risks of different magnitude and also under situations of resource constraints.

Chapter 7: "Business Continuity and Disaster Recovery Plan": This chapter provides the knowledge resource to understand and audit business continuity and disaster recovery systems of the auditee. A large number of useful forms have been provided in this chapter.

Chapter 8: "Auditing in the E-Commerce Environment": This chapter identifies areas for additional focus required for auditing an e-commerce environment. The knowledge resource provided is equally applicable for auditing an e-banking environment.

Chapter 9: "Security Testing": The aspect of security testing is often a technology-driven exercise. This chapter introduces the readers to the critical concept of cyberattacks and vulnerability testing.

Chapter 10: "Case Study: Conducting an Information Systems Audit": This chapter demonstrates how the knowledge acquired in previous chapters is put to use in real life. An example of conducting an information systems audit in a bank branch has been provided to take the readers on a step-by-step journey through the entire auditing process.

The second part contains checklists under ISecGrade methodology—a proprietary open source information systems audit methodology developed by the South Asian

Management Technologies Foundation. During development of this methodology and checklists, in addition to internal resources, resources from various public domains have been used. Various checklists, regulatory guidelines, best practice standards, and others have been consulted to develop these checklists. The authors have added their own personal experiences in conducting information systems audits while designing the methodology. The reader will find reference to the checklists during discussions in various chapters. These references allow the reader to refer to the relevant checklist and appreciate its implications. Part Two comprises the following two chapters:

Chapter 11: "ISecGrade Auditing Framework": This chapter explains the process involved in conducting an ISecGrade audit for awarding a security grade to an auditee. A detailed process of the audit, selecting checklists, and drafting the audit report are described.

Chapter 12: "ISecGrade Checklists": This chapter provides one of the most comprehensive information systems audit checklists for the use of the practitioner. There are 40 domain-specific checklists covering numerous control points that an information systems auditor must examine during an audit process.

Discussions in each chapter have generally avoided the temptation of becoming technical and verbose. Instead, we have provided action points against each body of knowledge. This will enable readers to remember the key issues introduced in the chapter. In order to bridge any prior technical requirement we have defined in each chapter technical terms whenever they are cited.

Chapter 13: "Session Quiz": Readers will find this chapter useful to verify the level of understanding they have achieved. Answers to session questions are provided in the companion website (www.wiley.com/go/understandingisauditing). The website also contains other useful learning material.

We sincerely hope that readers will find that the book addresses their need for a quality single-point reference for knowledge resources on information systems audits. We will be grateful for comments from our readers on what they liked and what they did not like. We will consider our efforts justified if this book contributes to making information technology installation across the world a little more secure.

07 UNDERSTANDING AND CONDUCTING INFORMATION SYSTEMS AUDITING

Contents

Contents

09 UNDERSTANDING AND CONDUCTING INFORMATION SYSTEMS AUDITING

Contents

Contents

PART ONE

Conducting an Information Systems Audit

CHAPTER ONE

1 Overview of Systems Audit

IN THIS CHAPTER WE discuss why an information systems audit would be conducted. The chapter also identifies the challenges that an auditor will face while auditing a computerized system. Critical differences between computerized and noncomputerized systems have also been identified. Upon completion of this chapter, the reader will have an understanding of the salient features of a computerized system that an information systems auditor must keep in mind.

INFORMATION SYSTEMS AUDIT

An information systems audit is an examination of various controls within an information systems infrastructure. It is the process involving collection and evaluation of evidence of the design and functions of controls designed and implemented in information systems, practices, and operations. The auditor, subsequent to evaluation of the evidence, forms an opinion on whether the information systems safeguard assets, maintain data integrity, and operate effectively and efficiently in order to achieve the agreed-upon goals and objectives of the entity. An information systems audit can

be performed independently of or along with an audit of financial statements. More often than not, it remains an independent function used during testing of controls.

INFORMATION SYSTEMS AUDITOR

Under the existing practices in various countries, any person having a recognized qualification in information systems audit can conduct an information systems audit. To be a recognized qualification, it must be awarded by an institution that is acknowledged by the laws of the country. These institutions can be academic or professional bodies. The qualification can also be designated by membership of an association or body of person on the basis of their internal norms of qualification for such membership. Usually such membership is renewable annually by paying a membership fee. Qualifications from academic institutions usually do not involve any recurring membership cost. It is important to note whether the regulatory authorities recognize the qualification of an information systems auditor for conducting an information systems audit in a specific country. Industries are free to recognize qualifications awarded by institutions other than those mentioned earlier.

It may be noted that, unless specified by the auditee or regulatory authorities, there is no requirement of any additional qualification other than that of an information systems auditor, in order to conduct an information systems audit.

LEGAL REQUIREMENTS OF AN INFORMATION SYSTEMS AUDIT

More often than not, an information systems audit is a best practice or an ethical exercise rather than a legal requirement. However, the audit may be legally required in some countries, such as under the Sarbanes-Oxley Act of 2002 in the United States.

Major requirements of the Sarbanes-Oxley Act with relation to information systems audit are provided in the following sections.

The Sarbanes-Oxley Act of 2002

The Sarbanes-Oxley Act came into force in 2002 to ensure better regulation of financial practices and corporate governance and requires a number of compliances. The act is named after Senator Paul Sarbanes and Representative Michael Oxley, who were its main architects.

Form 10-K

Form 10-K is the name of the form that every domestic issuer in the United States has to submit to the Securities and Exchange Commission. The form provides

a comprehensive overview of the business of the filer, along with the business's financial condition and audited statements.

Securities and Exchange Commission

Better known by its acronym, SEC, the Securities and Exchange Commission is the apex regulator responsible for enforcing all of the laws and regulations of the securities industry in the United States.

1. Section 302 assigns corporate responsibility for accuracy of financial statements and operational activities to the chief executive officer (CEO) and chief finance officer (CFO). The signing officers certify that they have reviewed the reports and that they are free of untrue statements, material omissions, or misleading statements. This can be assured only if an information systems audit has reviewed the operation of the software and systems involved in producing the financial statements.
2. Section 404(b) calls for certification from auditor on management assessment of internal control. The assessment seeks to ensure that adequate controls are established and maintained for financial reporting. Naturally an information systems audit is useful for such an assessment.
3. Section 409 requires immediate disclosure of changes in financial position and operations in real time. An information systems audit can assess the readiness of an organization in this regard.
4. Section 802 requires retention of electronic records that have an impact on assets or performance of a company. An information systems auditor reviews the preparedness of any organization to prevent willful or accidental destruction of such records.

Following is a sample certification from the 10-K filing of Kraft Foods Inc. with the Securities and Exchange Commission.

CERTIFICATION

I, Irene B. Rosenfeld, certify that:

1. I have reviewed this annual report on Form 10-K of Kraft Foods Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

(*Continued*)

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a–15(e) and 15d–15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a–15(f) and 15d–15(f)) for the registrant and have:

   Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2011
/s/ IRENE B. ROSENFELD
Irene B. Rosenfeld
Chairman and Chief Executive Officer

CHAPTER ONE 1

Overview of Systems Audit

The audit under Statement on Auditing Standards (SAS) No. 70, developed by the American Institute of Certified Public Accountants (AICPA), is another example of statutory and quasi-statutory needs to perform information systems audits.

Statement on Auditing Standards

Usually referred to as SAS, these standards narrate generally accepted auditing practices that an auditor should follow while conducting an audit and issuing the audit report. These are issued by the Auditing Standards Board of the American Institute of Certified Public Accountants in the United States. Most countries have their independent accounting and auditing body, which issues such standards.

The standard identifies the factors that an independent financial auditor of an organization should consider when auditing the financial statements of an entity that uses a service organization to process certain transactions. Since the evaluation is based essentially on examination of the controls employed by the service organization, an information systems audit will be found extremely useful.

Though there may not be any specific legal requirement of an information systems audit, more often than not a statutory financial audit requires testing of adequacy and efficiency of internal control before expressing an audit opinion. With most of the auditees having a computerized environment as one of their major logistics, and using integrated enterprise resources management software, it is imperative that an information systems audit is conducted to form an opinion on the adequacy of internal control.

SYSTEMS ENVIRONMENT AND INFORMATION SYSTEMS AUDIT

Computerization is a tool that gives organizations the capability to provide better customer service, to conduct better housekeeping, and so on, to enable optimization of the use of resources. To ensure that computerization takes care of existing and emerging needs of the organization, the following nine issues must be considered:

1. Standardization of hardware, operating systems, system software, and applications: Failure to ensure such standardization creates complex technology management issues, which often manifests through involvement of multiple systems in a single process instead of an integrated process ensuring nonduplication of functions.
2. Use of software to facilitate interconnectivity of systems intensifies the need for a systems audit to ensure that information flow is smooth and not compromised.
3. The need for high levels of security not only calls for technical competence but also requires continuous testing of efficiency and searching for new, emerging vulnerabilities as well.

4. Communication and networking involving the use of networks facilitate establishing a centralized database and distributed processing on one hand, but on the other hand expose the entity to the risk of security breach from multiple sources. Consequently the scope of a systems audit enlarges and involves more complex testing.
5. A technology infrastructure with periodic up grades often leads to migration from one system to another. The information systems audit is required to keep pace with not only the technology but also the maturity of the organization. A more matured organization entrusts more critical resources to the information system and at the same time becomes more susceptible to a systems breach.
6. The need for business process reengineering is a consequence of the evolution of business complexity, which necessarily calls for an enlarged role of the information systems. Such reengineering brings about serious challenges to smooth migration and maintenance of data integrity.
7. Issues of human relations in a computerized environment are perhaps one of the greatest challenges for an information systems audit. Unpredictable and indispensable as they are, human resources define the fine line differentiating the success or failure of an information technology project. The information systems auditor finds the task of assessing adequacy and efficiency of such controls extremely difficult and often subjective.
8. Sharing of technology experiences between organizations and between various levels of an organization enriches the quality of performance as it ensures that the same mistake is not repeated twice. The comfort level of an information systems auditor is greater in an organization that enables a system of internal learning.
9. An information systems audit assumes greater importance in the face of the increased use of credit and debit cards and e-commerce interface in the regular functioning of an entity. These are activities that require closer monitoring as well as the assurance that the access and security aspects of these systems are well laid out.

An information systems audit ensures that the computerization activity of an entity follows the best practices and abides by all statutory and quasi-statutory requirements in its quest to achieve the objective of computerization.

The scope of an information systems audit extends over all information systems assets and processes that are owned or used by an entity or its representatives. An information systems audit seeks to ensure that the confidentiality, integrity, and availability of all information systems assets and processes are not compromised. In order to achieve this, an information systems audit focuses on the existence, adequacy, and efficiency of relevant controls.

INFORMATION SYSTEMS ASSETS

Information systems assets may be segregated into various kinds, such as:

- **Information assets:** These include databases, data files, system documentation, operating manuals, training guides and materials, operational and support

guidelines, continuity plans, backup guidelines, archived information, and so on. More often than not, values of these assets are utilitarian and rules of physical valuation are not applicable on them.

- **Software assets:** These include operating systems, application software, system software, development tools, implementation and monitoring utilities, and so on. Essentially these are tools that enable data processing, information generation, and reporting.
- **Physical assets:** These include, among others, the following devices:
  - Computer equipment: processors, monitors, laptops
  - Communications equipment: routers, fax machines, answering machines, IP phones
  - Storage media: magnetic storages, pen drives
  - Other technical equipment: power supplies, including power backup, temperature and humidity control devices, furniture, accommodation, and so forth
- **Services:** These include computing services, interoffice and intraoffice communications services, and general utilities, for example, heating, lighting, power, and temperature control. The increased popularity of cloud computing is redefining various software and physical assets as cloud services wherein the software, processing power, and storage are all provided by a cloud computing service provider.

Cloud Computing

Cloud computing is a shared service that provides computing power inclusive of processor, software, storage space, and so on for hire. The user connects to the service through a network, usually based on the Internet. This converts computing from a product-based solution to a service and allows the user to save on procurement cost and have anywhere access.

CLASSIFICATION OF CONTROLS

Controls are central to the idea of an information systems audit. They define a point of action in a work process wherein a decision to select the subsequent action arises. Controls without an alternative are fictitious controls that exist only on paper without any impact potential.

Controls can be classified in different ways. Three basic categories are general controls, application controls, and objective-based control classification, which are discussed in the following sections.

General Controls

General controls are basic hygiene issues that any system should observe. These are applicable across all systems though the extent of application along with segmental

importance may vary. General control features in most systems can be classified into the following six categories:

1. **Organization and operation controls**, which include:
   a. Segregation of functions between the information technology department and users
   b. Provision for general authorization over the execution of transactions, for example, prohibiting a person from initiating and authorizing transactions
   c. Segregation of functions within the information technology department
2. **Systems development and documentation controls**, which include:
   a. Process of review, testing, and approval of new systems as well as modified systems
   b. Control over program and parameter changes
   c. Documentation procedures
3. **Hardware and system software controls**, which include:
   a. Automatic error detection features
   b. Periodic preventive maintenance
   c. Formal procedures to recover from hardware errors
   d. Adequate authorization and control over implementation of, and changes to, operating systems software
4. **Access controls**, which are designed:
   a. To prevent and alert unauthorized access to any information system asset
   b. To prevent deliberate or accidental errors that may be caused by improper alteration of data files or by unauthorized or incorrect use of computer resources, including software
   c. To establish a robust layered authentication scheme for third-party resources being hosted by the organization, more specifically, in cases of cloud computing
5. **Data and procedural controls**, which include:
   a. A control or balancing function
   b. Written manuals in support of systems and procedures
   c. Capability to restore or replace lost, damaged, or incorrect data files
6. **Business continuity controls**, which include:
   a. A control to detect, alert, and act on identification of threats to business continuity
   b. An established plan to ensure earliest resumption of most critical functions of information technology department

Application Controls

The detailed structure of application controls will depend on the nature of the application. Broadly there are three types of application controls appropriate to any application. These are:

1. **Input controls**, which include control over:
   a. Transaction entry
   b. File maintenance transactions

c. Inquiry transactions
d. Error correction transactions
e. System-induced transactions

2. **Processing controls**, which are usually included in application programs and designed to prevent or detect errors of the following nature:
   a. Failure to process all input transactions, or erroneous processing
   b. Duplicate processing or updating wrong file or files
   c. Processing inputs that are either illogical or unreasonable
   d. Loss, unintentional modification, or distortion of data during processing
3. **Output controls,** which are used to assure the accuracy of processing results, and to ensure that only authorized personnel receive the output. The basic output controls are:
   a. Balancing
   b. Visual scanning or verification
   c. Distribution
   d. Storage, retrieval, and distribution

Objective-Based Control Classification

The classification of controls on the basis of action or objectives would lead to the following five categories:

1. **Directive controls:** These controls comprise management actions, procedures, directives, or guidelines that facilitate the occurrence of a preferred event. Such controls influence the entire system or operation and address areas of usage, maintenance, audit, control, and security attributes of a system and software with the object of ensuring integrity, reliability, and availability of systems resources.
2. **Preventive controls:** These controls aim to establish a reliable system and are based on standards, methods, practices, tools, and techniques. These controls could be automated or manual depending on whether human intervention is required to trigger the same. Preventive controls also act as a deterrent that minimizes the possibility of the occurrence of undesirable events, including computer-related fraud, theft, embezzlement, possible errors, omissions, and irregularities. These controls address various issues, including maintenance, security, usage, and control features of the system.
3. **Detective controls:** These controls are designed to detect variation outside control limits. They assess whether various controls (for example, directive or preventive) have achieved their objectives. These controls primarily focus on detection of errors, omissions, and irregularities. In addition, they also highlight system quality, controls, and security issues that need management intervention.
4. **Corrective controls:** These controls continue from the detections made by detective controls by making available information, procedures, and instructions for correcting identified errors, omissions, and noncompliances. Corrective control tools and techniques can be manual and automated. These controls highlight the usability of the system along with the availability of audit trails to conduct subsequent audits.

5. **Recovery controls:** These controls assume criticality in face of exposure to events that threaten a disruption in services. These controls describe and provide tools, techniques, and procedures of backup, restoration, recovery, and restart of an information resource. These controls define a formal structure to ensure availability of all required resources necessary to ensure an early recovery from disaster. These controls may be designed for a specific activity, an entire operation, or an entire organization. Recovery controls include timely backup and rotation of data and program files, checkpoints, restart/rerun procedures, record and file retention, and so forth. Depending on the organization structure and technology implemented, the grouping of recovery controls with corrective controls may facilitate better implementation.

THE IMPACT OF COMPUTERS ON INFORMATION

Not all controls that are useful in a noncomputerized system may be as useful or even necessary in a computerized system. Arguably the functional attributes of all such controls will be necessary, but technology interface may allow a combination of different functions within one control. In order to make a better assessment of controls that need to be replicated in a computerized system, it is important to understand the impact of computers on information as well as on information systems. The fact that changes in a processing system often obscure the need for implementing a control underscores the need to review the following subprocesses to recognize the transformation of a process. The following checklist of 13 items will also serve for reviewing a system that has migrated from one platform to another.

1. **Transaction initiation:** In a computerized system, many transactions may be initiated by the system itself. Thus all transactions may not have a supporting initiation document. A common example is execution of a standing instruction in banking software.
2. **Inputs:** Information may be committed directly into the system, without any hard-copy evidence. This is common in enterprise-wide integrated software wherein one input creates a chain of inputs in various subsystems, often after partial processing by a subsystem before onward processing. For example, computation of the cost of a product is influenced by a material receipt, as it changes the average issue price, which is a component of the standard cost of a product. Though no entry is directly being made in the costing module, entry in the inventory module has an impact on the costing module.
3. **Authorization:** Unlike a manual system, in which a supervisor reviews a transaction and then authorizes it, in a computerized system the authorization limits may be set within the system itself. Thus manual supervision may not be required. A common example is found in the operation of credit cards, where predetermined limits are set.

4. **Movement of documents:** In computerized systems, documents move electronically, including on e-mail or group documentation management systems. Cloud computing even takes physical custody of the documents out of the physical perimeter of the organization. Collaborative applications allow multiple users to access the same file and work on documents simultaneously. Exclusive custody of the document is no longer necessary, which creates a need to design specific controls to manage access and usage.
5. **Transaction processing:** In computerized application systems, processing is done electronically within the computer by programs that follow predetermined rules and consequently do not leave behind any physical audit trail. Thus there must be controls to test the processing, preferably before implementation of the software. Such controls need to be redesigned to assess processing efficiency post-implementation.
6. **Complexity of processing:** By using the high processing capabilities of computers, complex processing functions can be performed that are not possible in a manual system. Consequently, no controls were designed for such processes. In fact, the entire process has to be initiated specifically for the computerized system.
7. **Information storage:** Information may be categorized into two forms—permanent and temporary. Permanent information needs to be maintained for longer periods of time. Various backup facilities and storage media are available in computer systems, which raises a question of careful selection in light of the rapid progress in technology. Third-party storage services add to the list of alternatives available for storage. One of the critical issues involving choice of storage is the ability of future hardware to access the same. Often the storage media may remain uncompromised but the hardware required to retrieve data becomes obsolete. Floppy drives and cartridges are examples of such developments.
8. **Outputs:** Unless required legally or warranted by the workflow, printed output from system is actively discouraged. In many cases the output is in the form of visual displays, including e-mail and screen displays, which make evidence collection a specialized activity. The increased use of personal handheld devices has promoted ideas about generating output as text messages or e-mailing them as an attached document. These have since emerged as common output options.
9. **Filing of documents:** In a manual system, data and information stored in files can be manually retrieved whenever required. In a computerized system, data retrieval from the database requires either running the report generation again or using alternative techniques available for storage of reports. Use of data warehousing makes preprocessed or semiprocessed data available for faster retrieval. This effectively promotes the concept of separation of data and reports, enabling organizations to prevent data access whenever reports are required.
10. **Audit trails:** When the auditor traces a transaction from initiation to the final output, the flow of events is reconstructed. This function is aided by an audit trail. In a computerized system, the auditor needs to be familiarized with the processing rules because the processing path may not be externally observable, especially when processing is complex.

11. **Procedure manual:** Procedure manuals in a manual system help an auditor to know the steps required to process any transaction. In computerized systems, help menus and program documentation have to be looked into. The major problem faced in this regard is in updating the documentation, whenever the system is modified. Often there is a gap in this area, leading to a modified feature of the software being undocumented. This is a common weakness for customized solutions.
12. **Monitoring and supervision:** In a computerized system, a large part of the monitoring and supervision is done automatically and online by the system. Controls involving data editing, validation routines, and checks and balancing are often performed by the system itself. Consequently these checks need to be analyzed at the program level rather than at the operational level, where there may not be adequate evidence available. This becomes imperative when the processing is outsourced to locations that are not under the direct supervision of the information owner.
13. **Segregation of duties:** Segregation of duties tends to be compromised in a computerized system. Unless specifically designed, it is often possible for an individual to enter, change, and delete a transaction. This requires the introduction of compensating controls, including a supervisory review to ensure that concerned individuals discharge their responsibilities within the defined scope.

THE IMPACT OF COMPUTERS ON AUDITING

Much as computers have changed the way information is handled and stored, their use has also affected the process of auditing a company. Entities produce standardized information on a real-time, online basis. The scope of a financial audit has also migrated from essentially a "backward-looking" activity to an assurance service by which the subscribers seek to form an opinion about the sustainability of an entity.

Thus, in order to ensure the accuracy and relevance of financial figures being commented upon, one needs to understand the process of generation of the same. This involves the function of an information systems auditor. The areas where the financial auditor would concentrate depend greatly on the work of the information systems auditor, and may even require continued assistance, such as in the following activities:

1. **Computerized audit trail:** Paper-based trails as a mode of evidence collection is giving place to screen-based outputs and inputs. Audit trails are now design-dependent and not function-dependent.
2. **Interwoven complex systems:** In an integrated system consisting of a number of interacting subsystems, errors or irregularity in a subsystem can quickly propagate to another subsystem and cause material losses. The auditor needs to understand the referred loss potential of a control failure.

3. **Transaction walkthroughs:** An auditor would need to follow a transaction from its initiation to its end to get an understanding of the process flow. This will be useful to identify the system's strengths and weakness and plan subsequent audit tests.
4. **Entropy in complex systems:** Entropy is the tendency of systems toward internal disorder and eventual collapse. A computerized system is exposed to this threat because of various reasons, including changed business conditions, which can make existing information redundant, or multiply the volume of computations, or increase the difficulties in maintenance.
5. **Outsourced and distributed information systems:** A large number of activities are either outsourced or take place in geographically distributed facilities. Since physical presence at all facilities may not be possible to gather audit evidence, the auditor needs to understand the process flow and may be required to design audit routines to collect evidence and identify areas where errors and irregularities are likely to happen.

INFORMATION SYSTEMS AUDIT COVERAGE

As described earlier, an information systems audit would cover all information system assets and processes. In order to develop a comprehensive opinion about the occurrence or possibility of compromise of confidentiality, integrity, and availability of information system assets and processes, the auditor should be knowledgeable about the following nine aspects:

1. Hardware security issues
2. Software security issues
3. Information systems audit requirements
4. Conducting an information systems audit
5. Risk-based information systems audit
6. Auditing disaster recovery plans
7. Auditing in the e-commerce environment
8. Security testing
9. Information security grading, such as ISecGrade framework

These topics are discussed in detail in the chapters of this book. We have also included a case study on conducting an information systems audit at a bank branch. ISecGrade checklists have been provided.

PART TWO

Information Systems Auditing Checklists

CHAPTER ELEVEN

11

ISecGrade Auditing Framework

IN THIS CHAPTER, WE learn about the ISecGrade framework for conducting an information systems audit and according a risk score to the audit object. At the end of this chapter we will be in a position to use the ISecGrade framework while conducting an information systems audit.

INTRODUCTION

The ISecGrade framework is an open source project undertaken by South Asian Management Technologies Foundation. The design process involved consulting various open source and proprietary tools and processes. The designed draft framework was implemented in various organizations with the help of a practicing information systems audit firm. The project has been enriched by practical experience gained from putting the framework to use.

The framework has two components:

1. Checklists to ascertain adherence to the information systems management best practices.
2. Grading methodology to award ISecGrade certification to the auditee.

CHAPTER ELEVEN 11

ISecGrade Auditing Framework

The information systems audit community is free to use the checklists and conduct information systems audits under the ISecGrade framework.

LICENSING AND LIMITATIONS

The approach and sample checklists compiled and designed under the ISecGrade framework are available for use by the purchasers of this book. The grading methodology and compilation is made by South Asian Management Technologies Foundation. Information systems auditors or other auditing entities may award the ISecGrade certificate according a risk grading to their clients.

METHODOLOGY

ISecGrade methodology is based around checklists. The information systems auditor is required to use the checklist provided in Chapter 12 of this book to conduct an information systems audit and verify the auditee responses by conducting substantive testing.

The methodology is built around identification of the controls necessary to manage a majority of risks faced by information system assets and processes. The objective of the auditee entity is to protect itself from the risks by building controls. The checklists are designed to identify the existence of such controls and to test the performance of such controls. Upon being satisfied of the existence and performance of each control, the information systems auditor may consider the control to be effective and respond accordingly to the question in the checklist.

Questions in the checklists are designed to obtain an objective answer: Yes or No. Existence of a control merits a "Yes" response and awards a 0 (zero) risk score to the auditee, while a "No" response awards a minimum of 1 (one) risk score to the auditee. Higher risk scores are awarded in specific cases. The higher the score, the riskier are the information systems of the auditee.

DOMAINS

Presently, the following domains and special application areas are covered under the ISecGrade methodology. These checklists are based on various best practice controls relevant to the domains or applications. ISecGrade audit checklists primarily focus on six critical aspects of information systems and help the auditor to form an opinion on the risk classification—which is the seventh step. These seven steps are as follows:

1. **Planning:** This covers the top-level controls that the auditee should put in place to ensure a proper governance framework for the information systems assets.

2. **General control testing:** These are the "hygiene" factors. These controls are applicable on information systems of the auditee, irrespective of the nature and type of hardware and application controls used by them.
3. **Hardware audit:** These controls focus on management, effectiveness, and efficiency of hardware.
4. **Software audit:** These are essentially application controls that should generally be present in any software.
5. **Network and communication audit:** This comprises checklists for the connectivity backbone of the auditee.
6. **Legal compliance review:** These controls ensure that the auditee is observing relevant legal provisions.
7. **IT risk assessment:** In this section we arrive at a composite risk score through a test of controls identified in the checklists. It may be noted that not all controls may be applicable to every entity. The auditor needs to use only those control questions that are relevant for the auditee.

The domains that are covered by ISecGrade include the following:

- Access control
- Antivirus
- Application development
- Asset classification and control
- Audit plan
- Authentication devices
- Business strategy
- Change management
- Client-server
- Communication software/devices
- Data communication
- Disaster recovery plan
- Electronic funds transfer
- File and directory protection
- Human resources, job definition, resourcing and training
- Implementation of information systems security policy
- Internet security
- Information systems security policy
- Legal compliance
- Local area network
- Long-term IT strategy
- Maintenance
- Management control system
- Operating system
- Packaged software implementation

- Parameter settings
- Peripheral devices and storage media
- Physical access control audit
- Physical environment
- Problem management
- Security management
- Segregation of duties
- Short-range IT plans
- Software license
- System conversion and reconciliation
- System software controls
- Third-party and vendor services review
- Transaction processing
- Utility program
- Wireless network

The information systems audit must commence with completion of the audit plan checklist. The audit plan checklist is an important document that will be necessary for substantiating the quality of work and for awarding an ISecGrade certificate.

ISecGrade recommends reporting in a prescribed format, which is discussed later in this chapter.

GRADING STRUCTURE

Every checklist under ISecGrade has three possible answers—Not Applicable, Yes, or No. As described earlier, in the case of the control being "Not Applicable," the ISecGrade auditor will exclude the question from the scope of the audit. "Yes" answers are recognized by awarding a 0 risk score, while "No" answers cause awarding of at least a risk score of 1.

The ISecGrade adoptee may assign different higher risk scores reflecting the relative importance of the control in the auditee entity. As recognized earlier, all controls listed in a checklist as well as all checklists may not be applicable to all auditees.

Once the ISecGrade audit is complete, the ISecGrade compliance auditor will compute the total risk score obtained by the auditee against each checklist and compare the total risk score obtained against the possible maximum score, which excludes the "Not Applicable" controls. The auditor will express the total risk score obtained as a percentage of total possible maximum score. This step will be repeated for all checklists. The auditor should note that nonapplicability of a control is to be ascertained, keeping in view the application being used and the processes adopted by the auditee. Proper justification must be documented before classifying a control as "Not Applicable."

Finally, the auditor will make a summary of all checklists and arrive at the grand total of risk scores awarded to the auditee against the grand total of possible maximum score. The total score will be expressed as a percentage of the total maximum possible score. This final percentage is the ISecGrade score obtained by the auditee.

CHAPTER ELEVEN 11

ISecGrade Auditing Framework

TABLE 11.1 ISecGrade Score Summary

ISecGrade Summary	Maximum Possible Score	Auditee Score	Percentage Score	Risk Grade
Audit Areas				
Access Control—Logical				
Antivirus Audit				
Application Development				
Asset Classification and Control				
Authentication Devices				
…... checklist				
…... checklist				
Utility Programs				
Wireless Network				
Combined ISecGrade Score				

The standard risk grading of the auditee may be done using a differential of 20 percent in the following manner:

- Risk score up to 20 percent: Highly secured
- Risk score above 20 percent and up to 40 percent: Secured
- Risk score above 40 percent and up to 60 percent: Safe
- Risk score above 60 percent and up to 80 percent: Risky
- Risk score above 80 percent: Highly risky

During the formal awarding of the ISecGrade, the grade classification slabs may be altered and differential weights may be provided on each control to reflect the risk tolerance of the auditee. Risk tolerance refers to the extent of risk that the auditee is willing to be exposed to. This in turn is primarily defined by the ability of the auditee to withstand any losses that the risk exposure may present. For example, if the auditee observes a zero-tolerance policy for computer viruses, the scores obtained against the checklist may be multiplied by a factor to increase their impact on the overall risk grade.

The ISecGrade auditors should provide a summary sheet in their report. This summary would contain the risk score obtained by the auditee against each checklist and may be presented in the manner shown in Table 11.1.

SELECTION OF CHECKLIST

The checklists that are used under the ISecGrade framework can be classified according to the audit domain that the checklist relates to. In case the information systems auditor performs a review with a limited scope, the referencer shown in the Table 11.2 can be used to select appropriate checklists that will be relevant for forming an audit opinion.

TABLE 11.2 ISecGrade Checklist Master Referencer

Audit Program Selection Referencer

	Audit Object						
Checklists to Be Used	**Planning**	**Evaluation and Testing of General Controls**	**Hardware Audit**	**Software Audit**	**Network and Communications Audit**	**IT Risk Assessment**	**Legal Compliance Review**
Access Control—Logical Access		√					
Antivirus Audit Program				√			
Application Development		√					
Asset Classification and Control			√	√			
Authentication Device			√				
Business Strategy	√						
Change Management			√	√	√		
Client-Server			√				
Communication Software				√	√		
Data Communication					√		
Disaster Recovery Plan		√					
Electronic Funds Transfer					√		
File and Directory Protection				√			
Human Resources, Job Definition, Resourcing and Training	√					√	√
Implementation of IS Security Policy	√						
Internet Security					√		
IS Security Policy	√						
Local Area Network					√		

TABLE 11.2 ISecGrade Checklist Master Referencer

Audit Program Selection Referencer	Audit Object						
Checklists to Be Used	**Planning**	**Evaluation and Testing of General Controls**	**Hardware Audit**	**Software Audit**	**Network and Communications Audit**	**IT Risk Assessment**	**Legal Compliance Review**
Legal Compliance							√
Long-Term IT Strategy	√						
Maintenance			√	√	√		
Management Control System	√						
Operating System				√			
Packaged Software Implementation				√			
Parameter Settings		√		√			
Peripheral Devices and Storage Media			√				
Physical Access Control		√					
Physical Environment		√	√				
Problem Management			√	√	√		
Security Management			√	√	√		
Segregation of Duties		√					
Short-Range IT Plans	√						
Software Licence				√			
System Conversion and Reconciliation				√			
System Software Controls		√		√			
Transaction Processing				√			
Third-Party and Vendor Services Review		√					
Utility Program		√		√			
Wireless Network		√			√		

It may be noted that some checklists feature in more than one domain. These checklists need not be used more than once during a full-scope ISecGrade audit, but are an integral component for domain-specific, limited-scope ISecGrade audits.

FORMAT OF AUDIT REPORT

The recommended structure of an ISecGrade audit report is provided in this section. This format can be freely used by ISecGrade auditors and suitably modified to reflect the audit scope.

SAMPLE AUDIT REPORT

Letterhead of the Information Systems Auditor

Date

Client Contact Person
Client Name
Client Address

Dear Mr./Ms.,

Sub: ISecGrade Information Systems Audit Report

1. We have conducted an Information Systems Audit of *[Audit object]* of *[Client]* following the ISecGrade methodology.
2. We have obtained all information and explanations that to the best of our knowledge and belief were necessary for the purposes of our audit.
3. Our observations during the ISecGrade audit have been detailed in the appendix to the report and form a part of the audit report.
4. In our opinion, based on the information provided, explanation given, and evidence found and evaluated by us, the information system and its related environment adequately safeguards assets, maintains data and system integrity, provides relevant and reliable information, consumes resources efficiently, achieves information system goals effectively, and provides a reasonable assurance that its operational and control objectives will be met.

   OR

5. In our opinion, based on the information provided, explanation given, and evidence found and evaluated by us and subject to paragraph number 3 of our audit report, the information system and its related environment adequately safeguards assets, maintains data and system integrity, provides relevant and reliable information, consumes resources efficiently, achieves information

systems goals effectively, and provides a reasonable assurance that its operational and control objectives will be met.

OR

6. In our opinion, based on the information provided, explanation given, and evidence found and evaluated by us and reported in paragraph 3 of our audit report, the information system and its related environment does not adequately safeguard assets, maintain data and system integrity, provide relevant and reliable information, consume resources efficiently, or achieve information system goals effectively, and does not provide a reasonable assurance that its operational and control objectives will be met.

OR

7. Based on the information provided, explanation given, and evidence found and evaluated by us, we are not in a position to opine whether the information system and its related environment adequately safeguards assets, maintains data and system integrity, provides relevant and reliable information, consumes resources efficiently, achieves information system goals effectively, and provides a reasonable assurance that its operational and control objectives will be met.

The ISecGrade score awarded to the auditee is ____, signifying that the auditee is highly secured/secured/safe/risky/highly risky.

Signed in terms of our audit report and appendix on this date,

Signature of Auditor

Date:
Name of Signatory:
Place:
Designation:

USING THE AUDIT REPORT FORMAT

The auditor should draft the audit report using the format provided earlier and following these three guidelines:

1. In the first paragraph, the auditor should mention the object of the audit. For example, if the audit is of a bank branch, the auditor should write the branch name as *Audit object* and the bank name as *Client*. If the audit is of the data center of a manufacturing company, the auditor should write "data center" as *Audit object* and name of the manufacturing company as *Client*.
2. The auditor then asserts his or her satisfaction on the adequacy of information and explanation received from the auditee to form the audit opinion.

3. The standard format may be maintained by the auditors when they provide their observations. In most cases, there will be one or more observations. In rare cases where such observations have not been made, this paragraph will have to be deleted.
4. The auditors will express their opinion in one of the suggested four formats:
   a. If the auditor is fully satisfied and the referred paragraph 3 is deleted, the first option is applicable.
   b. The second option will be used when the auditors have enclosed their observations but the ISecGrade score is not greater than 60 percent, that is, below the "Risky" category. The auditors are free to adjust the 60 percent level depending on how strongly they wish to calibrate their opinion or how risk averse the auditee is.
   c. The third option will be used when the ISecGrade score is more than 60 percent, that is, in or above the "Risky" category.
   d. The fourth option should be used if the auditor is unable to form any opinion. Paragraph 3 may not be enclosed in such cases.
5. The ISecGrade score and corresponding grade should be mentioned in the final paragraph.

About the Authors

VEENA HINGARH is Joint Director of the South Asian Management Technologies Foundation, a center for research, training, and application in the areas of finance and risk management, which provides training in areas including IS auditing, enterprise risk management, and risk modeling. Winner of numerous merit-based awards during her career, Hingarh's major areas of focus are IFRS and IS. She speaks frequently at conferences and platforms throughout Asia and the Middle East. Hingarh is a Chartered Accountant from the Institute of Chartered Accountants of India (ICAI), Certified Company Secretary of the Institute of Company Secretaries of India (ICSI), and Certified Information System Auditor (CISA) from ISACA (USA).

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UNDERSTANDING AND CONDUCTING INFORMATION SYSTEMS AUDITING

"This comprehensive book forms a basis for new auditors as well as experienced auditors working within an IT environment. Covering, as it does, such aspects as hardware and software security, the conducting of an information systems risk-based audit, as well as business continuity and disaster recovery planning, it acts as a reference manual as well as an instruction manual. Some of the focal areas such as security testing and vulnerability analysis are of particular benefit to the auditor, and the inclusion of ISecGrade Checklists makes this a must-have addition to any IT auditor's library."

—**Richard Cascarino,** MBA, CIA, CRMA, CFE, CISM

"Network security among organizations remains a major challenge in the evolution of the digital economy. If it were simply a technology issue the organizations could rely on IT engineers to deploy marvels of technological excellence. But ensuring continuous security is more than a mere technical matter. The authors, who are an extraordinary blend of accounting professionals with rich international experience and network security experts (CISA certified), have superbly deployed their own professional expertise to bring out a practical guide to organizational security in the digital economy. Like a master blender they have provided a rich interdisciplinary perspective with centrality of managerial responsibility. The central theme is that both technological design and managerial systems must continuously evolve in tandem. The book will be an invaluable guide for such organizations that are looking to enhance their management control systems and dynamically evolve along with technological change."

—**Anil Rawat**, PhD, Director, Institute of Business Management & Technology; Director, International Academy for Knowledge, Innovation & Technology Management, Bangalore

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"The authors provide an excellent overview of the information systems audit process, with an emphasis on today's evolving newer technologies and issues, such as performing audits in an e-commerce environment and systems security testing. The book is particularly strong in providing good, precise definitions and the audit implications for many of the technology concepts—such as routers, thin clients, or cloud computing—that are frequently used by information system auditors but where accurate definitions are often difficult. This kind of information helps both information system auditing newcomers and experienced professionals.

In addition to a wide range of information systems auditing and risk-based materials, the book has a large section of detailed information systems audit checklists that can be tailored to many environments. The book is an excellent resource for the information systems audit professional."

—**Robert R. Moeller,** CPA, CISA, CISSP, author of multiple books on internal auditing, risk management, and IT governance

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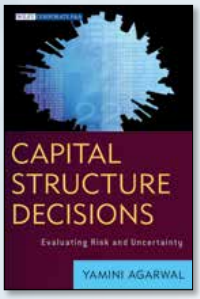

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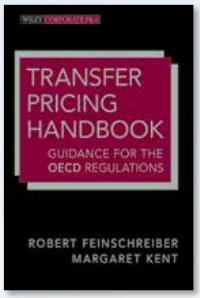

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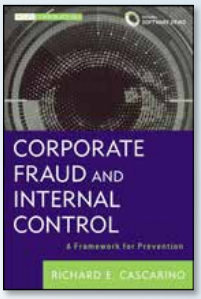

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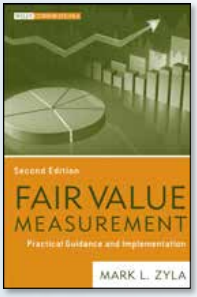

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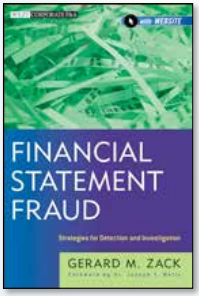

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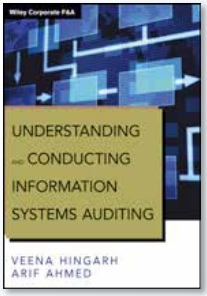

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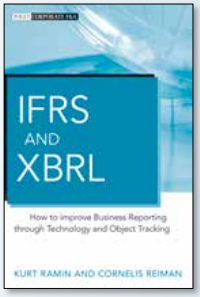

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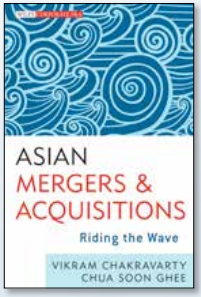

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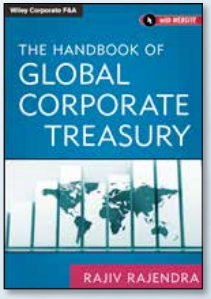

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