INTERNATIONAL EDUCATION PRACTICE STATEMENT

IEPS 2

INFORMATION TECHNOLOGY FOR PROFESSIONAL ACCOUNTANTS

CONTENTS

Introduction

1. International Education Practice Statements (IEPSs) assist IFAC member bodies in the implementation of generally accepted good practice in the education and development of professional accountants.

2. International Education Standard (IES) 2, *Content of Professional Accounting Education Programs*, prescribes the knowledge content of professional accounting education programs that candidates need to acquire to qualify as professional accountants. IEPS 2 provides guidance for IFAC member bodies and other educators in implementing IES 2 in relation to the IT knowledge component of pre-qualification professional accounting education programs.

3. This IEPS also provides guidance for IFAC member bodies in implementing IES 7, *Continuing Professional Development: A Program of Lifelong Learning and Continuing Development of Professional Competence*, and IES 8, *Competence Requirements for Audit Professionals*, in relation to the further development of IT knowledge and competences post-qualification.

4. The International Accounting Education Standards Board (IAESB) recognizes (a) the wide diversity of culture, development, language, and educational, legal, and social systems in the countries of IFAC member bodies, (b) the wide variety of functions accountants perform, and (c) that IFAC member bodies are at different stages in developing their pre- and post-qualification professional accounting education programs. The guidance provided in IEPS 2 is intended to assist all IFAC member bodies in implementing IES 2, but in doing so they will take into account the environmental factors outlined in this paragraph.

Definitions

5. The following terms used in this IEPS are defined in the *Framework for International Education Pronouncements*:

   Assessment—all forms of tests of professional competence, whether in writing or otherwise, including examinations, carried out at any time throughout the learning process.

   Candidate—any individual who is enrolled for assessment as part of a professional accountancy education program.

   Capabilities—the professional knowledge; professional skills; and professional values, ethics, and attitudes required to demonstrate competence.

   Competence—being able to perform a work role to a defined standard, with reference to real working environments.

Continuing Professional Development (CPD)—learning activities for developing and maintaining the capabilities of professional accountants to perform competently within their professional environments.

Education—a systematic process aimed at developing knowledge, skills and other capabilities within individuals. It includes training.
Formal education—the non-workplace based component of an accounting education program.

Learning—a broad range of processes whereby an individual acquires capabilities.

Mentor—professional accountants who are responsible for guiding and assisting trainees and for assisting in the development of the trainees' competence.

Post-qualification—the period after qualification as an individual member of an IFAC member body.

Practical Experience—work experience, undertaken by a trainee or a qualified professional accountant that is relevant to the work of professional accountants. The program of experience enables the individual's development of professional competence (including professional behavior) in the workplace and provides a means whereby individuals can demonstrate the achievement of professional competence in the workplace.

Pre-qualification—the period before qualification as an individual member of an IFAC member body.

Professional accountant—a person who is a member of an IFAC member body.

Qualification—qualification as a professional accountant means, at a given point in time, an individual is considered to have met, and continues to meet, the requirements for recognition as a professional accountant.

Student—an individual following a course of study, including a trainee. In the context of professional education, a student is an individual undertaking a course or a program of study deemed necessary for the education of professional accountants, whether general or professional in nature.

Trainee—an individual undertaking pre-qualification work experience and training within the workplace.

Training—pre- and post-qualification educational activities, within the context of the workplace, aimed at bringing a student or professional accountant to an agreed level of professional competence.

The following term used in this IEPS is defined in IES 8, *Competence Requirements for Audit Professionals*[1]:

Audit professional—a professional accountant who has responsibility, or has been delegated responsibility, for significant judgments in an audit of historical financial information.

Scope and Structure of IEPS 2

6. In implementing IESs, IFAC member bodies need to ensure that candidates possess the necessary general IT and IT control knowledge and competences required for qualification. Guidance on this is provided in Section 1 of IEPS 2, and is supported by Appendices 1, 2 and 3. These contain subject matter that IFAC member bodies can include in the IT knowledge component of pre-qualification professional accounting education programs, as appropriate.

7. In addition, all candidates are expected, for qualification as a professional accountant, to have a knowledge and understanding of at least one of the three roles set out in IES 2 (manager, evaluator and designer of information systems), or a combination of these roles. Section 1 of this IEPS provides good practice guidance on these roles, supported by Appendices 4, 5 and 6. These contain competency elements that IFAC member bodies can include in the IT knowledge component of pre-qualification professional accounting education programs.

8. Section 1 of IEPS 2 also provides good practice guidance for IFAC member bodies on teaching and assessing IT at the pre-qualification stage.

9. Section 2 of IEPS 2 provides guidance for IFAC member bodies on implementing IES 7, in relation to the post-qualification development of IT knowledge and competences.

10. The IAESB is not able to provide detailed guidance for every possible role undertaken by a professional accountant. IFAC member bodies may find some or all of the competency elements set out in Appendices 4, 5 and 6 helpful, however, in developing CPD requirements for professional accountants.

11. Section 3 of IEPS 2 provides guidance for IFAC member bodies on implementing IES 8, in relation to the education and assessment of audit professionals. IFAC member bodies may find some or all of the competency elements set out in Appendix 7 helpful in developing the IT component of an education program for audit professionals.

12. Professional accountants can, with more specialized training, work in more complex IT-related areas, such as information systems design, information systems management, and control and information systems evaluation. IEPS

[1] IES 8 *Competence Requirements for Audit Professionals*, paragraph 9.

2 does not prescribe the specific IT knowledge and competences that such specialists may require. It sets out the knowledge and skills professional accountants may require (a) to formulate the questions to be answered by specialists such as the IT auditor, and (b) to understand the outcome of the activities of such specialists.

Section 1: Pre-Qualification IT Knowledge and Competency Requirements

Overview

13. In implementing the requirements[2] of IES 2 IFAC member bodies should include the following subject areas and competences:

    (a) general knowledge of IT;

    (b) IT control knowledge;

    (c) IT control competences;

    (d) IT user competences; and

    (e) one of, or a mixture of, the competences of, the roles of manager, evaluator or designer of information systems.

14. IFAC member bodies will set detailed criteria for knowledge and understanding in these areas, as appropriate for their environment, but in doing so should consider the guidance contained in IEPS 2.

15. Subject areas and competences (a) to (d) above contain the common IT knowledge and competences required by all professional accountants, at point of qualification. Guidance on the content of a pre-qualification professional accounting education program in this area is given in paragraphs 17 to 24 below.

16. Competence area (e) above requires professional accountants, at point of qualification, to have a knowledge and understanding of at least one of the roles of manager, evaluator and/or designer of information systems, or a combination of these roles. Guidance on the content of a pre-qualification professional accounting education program relating to these roles is given in paragraphs 25 to 34 below.

[2] IES 2 *Content of Professional Accounting Education Programs*, paragraph 28.

IT Subject Areas and Competences

General Knowledge of IT

17. In order for candidates to demonstrate knowledge and understanding in this subject area, they need to demonstrate their ability to explain, describe or discuss a range of topics relating to the general knowledge of IT. IFAC member bodies should consider including, as part of the IT component of a pre-qualification professional accounting education, the topics set out in Table 1:

Table 1: General Knowledge of IT Topics

Competences	Topics
Information Technology Strategy (Topic 1 in Appendix 1)	
Candidates can explain, describe or discuss the importance of aligning IT strategy with business strategy.	Enterprise strategy and vision Current and future IT environment IT strategic planning Ongoing governance and outcomes of monitoring
Information Technology Architecture (Topic 2 in Appendix 1)	
Candidates can explain, describe or discuss how IT architecture relates to the entity's business model.	General systems concepts Transaction processing in business systems Hardware components Software Protocols, standards and enabling technologies Data organization and access methods IT Professionals
IT as a Business Process Enabler (Topic 3 in Appendix 1)	
Candidates can explain, describe or discuss how IT impacts on the business model and business processes, and associated risks.	Stakeholders and their requirements The entity's business models Risks and opportunities related to IT Impact of IT on the entity's business models, processes and solutions

Competences	Topics
Systems Acquisition and Development Process (Topic 4 in Appendix 1)	
Candidates can explain, describe or discuss the stages of the systems acquisition and development process and understand the role of the accountant within it.	Systems acquisition/development life cycle phases, tasks Investigation and feasibility studies Requirements analysis and initial design Systems design, selection, acquisition/development Systems implementation Systems maintenance and program changes Project management, project planning, project control methods and standards
Management of Information Technology (Topic 5 in Appendix 1)	
Candidates can explain, describe or discuss how IT is managed within an organization, with a focus on accounting systems, (b) performance monitoring, and (c) change management and procedures for updating hardware and software.	IT organization Management of IT operations, effectiveness, and efficiency IT asset management Change control, upgrades and problem management IT security management Performance monitoring and financial control over IT resources Software for professional use
Communication and IT (Topic 6 in Appendix 1)	
Candidates can explain, describe or discuss IT, and the benefits and risks of IT, in relation to communication.	General concepts of IT communication Networks and electronic data transfer Risks in communication supported by IT

18. Appendix 1, based on Table 1 above, sets out in more detail subject matter for each of the topics included in the table. This Appendix is not meant to be prescriptive; it is intended to be of further assistance to IFAC member bodies in developing the IT component of a pre-qualification professional accounting education program.

IT Control Knowledge

19. In order for candidates to demonstrate knowledge and understanding in this subject area, they need to demonstrate their ability to explain, describe or discuss a range of IT control knowledge topics. IFAC member bodies should consider including, as part of the IT component of a pre-qualification professional accounting education, the following topics:

    - IT internal control environments;
    - IT objectives;
    - IT risk events;
    - IT risk assessments;
    - IT risk responses;
    - IT control activities;
    - Information and communication in relation to IT; and
    - Monitoring in relation to IT.

20. Appendix 2, based on paragraph 19 above, sets out in more detail subject matter for each of the topics above. This Appendix is not meant to be prescriptive; it is intended to be of further assistance to IFAC member bodies in developing the IT component of a pre-qualification professional accounting education program.

IT Control Competences

21. Candidates need to demonstrate a range of IT control competences. These are most likely to be developed through a period of practical experience. IFAC member bodies should consider including, as part of the IT component of a pre-qualification professional accounting education program, the following topics:

    - Suitable control criteria for analyzing and evaluating controls;
    - The IT internal control environment;
    - Selected IT objectives;
    - Identified IT events;
    - IT risk assessment;
    - Selected IT risk responses;
    - IT control activities;
    - Information and communication in relation to IT;
    - The monitoring process and actions taken in relation to IT;

- The application of appropriate IT systems and tools to business/accounting problems;
- Understanding of business and accounting systems; and
- The application of controls to personal systems.

22. Appendix 3, based on paragraph 21 above, sets out in more detail competency elements for each of the topics above. This Appendix is not meant to be prescriptive; it is intended to be of further assistance to IFAC member bodies in developing the IT component of a pre-qualification professional accounting education program.

IT User Competences

23. Candidates need to demonstrate a range of IT user competences. These are most likely to be developed through a period of practical experience. Three broad areas of competence relating to the user role[3] are set out in IES 2 (paragraph 32).

    (a) Apply appropriate IT systems and tools to business and accounting problems;

    (b) Demonstrate an understanding of business and accounting systems; and

    (c) Apply controls to personal IT systems.

24. These will be demonstrated by the candidates' ability to perform their work using appropriate IT systems and tools.

Manager of Information Systems Role

25. Candidates who concentrate on the manager of information systems role need to have a knowledge and understanding of (but not necessarily proficiency in) the following topics:

- Managing an entity's IT strategy;
- Managing an IT organization;
- Managing IT operations' effectiveness and efficiency;
- Maintaining financial control over IT;
- Managing IT controls;
- Managing systems acquisition, development and implementation; and
- Managing systems change and related problem management.

[3] IES 2, *Content of Professional Accounting Education Programs*, paragraph 32.

26. Knowledge and understanding are evidenced by the candidate's ability to (a) describe or explain some or all of the above topics and their significance in a relevant business setting, and (b) participate effectively in some or all of the above as part of a team or under supervision.

27. Appendix 4, based on paragraph 25 above, sets out in more detail competency elements for each of the topics above. This Appendix is not meant to be prescriptive; it is intended to be of further assistance to IFAC member bodies in developing the IT component of a pre-qualification professional accounting education program.

Evaluator of Information Systems Role

28. Candidates who concentrate on the role of evaluator of information systems need to have a knowledge and understanding of (but not necessarily proficiency in) the following topics:

- Planning systems evaluation;
- Evaluating systems; and
- Communicating results of evaluations and following-up.

29. Knowledge and understanding are evidenced by the candidate's ability to (a) describe or explain some or all of the above topics and their significance in a relevant business setting, and (b) participate effectively in some or all of the above as part of a team or under supervision.

30. Appendix 5, based on paragraph 28 above, sets out in more detail competency elements for each of the topics above. This Appendix is not meant to be prescriptive; it is intended to be of further assistance to IFAC member bodies in developing the IT component of a pre-qualification professional accounting education program.

Designer of Information Systems Role

31. Candidates who concentrate on the designer of information systems role need to have a knowledge and understanding of (but not necessarily proficiency in) the following topics:

- Analyzing and evaluating the role of information in an entity's business processes and organization;
- Applying project management methods;
- Applying systems investigation and project initiation methods;
- Applying user requirements determination and initial design methods;
- Applying detailed systems design and acquisition/development methods;

- Applying systems implementation methods; and
- Applying systems maintenance and change management methods.

32. Knowledge and understanding are evidenced by the candidate's ability to (a) describe or explain some or all of the above topics and their significance in a relevant business setting, and (b) participate effectively in some or all of the above as part of a team or under supervision.

33. Appendix 6, based on paragraph 31 above, sets out in more detail competency elements for each of the topics above. This Appendix is not meant to be prescriptive; it is intended to be of further assistance to IFAC member bodies in developing the IT component of a pre-qualification professional accounting education program.

Mixed Role

34. The IAESB recognizes that, in many environments, the tasks performed by students and professional accountants may not fall into just one of the three roles (manager, evaluator and/or designer of information systems) outlined above. IFAC member bodies may, therefore, choose to combine some of the topics, subject matter and competency elements listed in the appendices to this IEPS to reflect the role or occupation of some or all of its members at point of qualification. For example, a member body may combine some of these competences to create a set of competences relating to the role of an IT Project Manager, as illustrated in Table 2 below:

Table 2: Example of IT Project Management Competences
Candidates can (a) describe or explain some or all of the following, and their significance in a relevant business setting, and (b) participate effectively in some or all of these as part of a team or under supervision: • The role of information in the entity's business processes and organization; • Identification of business and user needs relating to IT; • Investigations and feasibility studies; • Project management methods and approaches; • Management of project budget(s), timeline(s) and personnel; • Systems acquisition, development and implementation; • Systems change, problem management and risk management; • Installation, deployment and testing of IT systems; and • Evaluation of the efficiency and effectiveness of IT systems and project outcomes.

Teaching and Assessment of IT

Teaching

35. IFAC member bodies should consider ways in which the IT component of a pre-qualification professional accounting education program can be integrated with the other components of such programs required by IES 2, i.e., accounting, finance and related knowledge, and organizational and business knowledge. For example:

    - Coverage of some aspects of computer-based business systems could be integrated within a financial accounting course;
    - Coverage of some aspects of management information systems could be integrated within a management accounting course; and
    - Coverage of some aspects of internal control in a computer environment could be integrated within an auditing course.

36. The development of IT knowledge and competence will typically involve a combination of formal education (classroom-based training, or similar), computer-based training, and on-the-job training.

37. In terms of formal education in IT, IFAC member bodies may consider using case studies, simulations, interactions with experienced professionals and similar techniques to enhance the presentation of subject matter and to help students develop an understanding of the practical implications of theoretical IT knowledge.

38. IFAC member bodies may consider their practical experience requirements with the aim of incorporating, as appropriate, some or all of the IT knowledge subject areas and competences outlined in this IEPS.

Assessment

39. IFAC member bodies should also consider how the information technology component of a pre-qualification accounting education program can be effectively assessed. A range of assessment techniques may be considered, including but not limited to:

    - Tests and examinations of IT knowledge, either stand-alone or integrated with tests and examinations of other components of the accounting education program, including objective testing (e.g. multiple-choice questions) and longer, essay-style questions or mini case studies;
    - Case studies and other simulations of the workplace; and
    - Mentor’s evaluation of trainees’ capability and competence.

40. Whichever form(s) of assessment are used to assess candidates' IT knowledge, IFAC member bodies should consider whether the assessment(s) include sufficient coverage of IT knowledge and practical application.

41. Where tests and examinations of IT knowledge are integrated with tests and examinations of other components of the pre-qualification accounting education program IFAC member bodies should consider whether the weight given to IT is sufficient.

Section 2: Post-Qualification IT Knowledge and Competency Requirements

Overview

42. This section of IEPS 2 provides guidance for IFAC member bodies in implementing IES 7 in relation to the further development of IT knowledge and competences post-qualification. IES 7 requires professional accountants to develop and maintain the skills and competences relevant to their work.

43. Given the great diversity of roles played by professional accountants, the IAESB (and IFAC member bodies) are not able to provide detailed guidance for every possible role. The following sections discuss post-qualification knowledge and competence requirements for each of the roles set out in Section 1 of this IEPS. In setting CPD requirements, IFAC member bodies may consider some or all of the guidance set out in this section of this IEPS.

Post-Qualification IT Knowledge and Competences

Manager of Information Systems Role – Post-Qualification

44. Professional accountants who concentrate on the manager of information systems role need to have a knowledge and understanding of some or all of the following topics:

- Managing an entity's IT strategy;
- Managing an IT organization;
- Managing IT operations' effectiveness and efficiency;
- Maintaining financial control over IT;
- Managing IT controls;
- Managing systems acquisition, development and implementation; and
- Managing systems change and problem management.

45. Knowledge and understanding are evidenced by the professional accountant's ability to undertake some or all of the above in a relevant business setting.

46. IFAC member bodies may find some or all of the competency elements set out in Appendix 4 helpful in developing CPD requirements for professional accountants.

Evaluator of Information Systems Role – Post-Qualification

47. Professional accountants who concentrate on role of evaluator of information systems need to have a knowledge and understanding of some or all of the following topics.

- Planning systems evaluation;

- Evaluating systems; and
- Communicating results of evaluations and following-up.

48. Knowledge and understanding are evidenced by the professional accountant's ability to undertake some or all of the above in a relevant business setting.

49. IFAC member bodies may find some or all of the competency elements set out in Appendix 5 helpful in developing CPD requirements for professional accountants.

Designer of Information Systems Role – Post-Qualification

50. Professional accountants who concentrate on the designer of information systems role need to have a knowledge and understanding of some or all of the following topics:

- Analyzing and evaluating the role of information in the entity's business processes and organization;
- Applying project management methods;
- Applying systems investigation and project initiation methods;
- Applying user requirements determination and initial design methods;
- Applying detailed systems design and acquisition/development methods;
- Applying systems implementation methods; and
- Applying systems maintenance and change management methods.

51. Knowledge and understanding are evidenced by the professional accountant's ability to undertake some or all of the above in a relevant business setting.

52. IFAC member bodies may find some or all of the competency elements set out in Appendix 6 helpful in developing CPD requirements for professional accountants.

Section 3: IT Knowledge and Competence Requirements for Audit Professionals

IT Knowledge and Competences for Audit Professionals

53. IES 8 prescribes that competence[4] should be assessed before an individual takes on the role of audit professional. IES 8 prescribes the knowledge[5] content of the IT subject area for the education of audit professionals. This should include:

    (a) information technology systems for financial accounting and reporting, including relevant current issues and developments; and

    (b) frameworks for evaluating controls and assessing risks in accounting and reporting systems as appropriate for the audit of historical financial information.

54. This section of IEPS 2 provides guidance for IFAC member bodies in implementing IES 8 in relation to the specific IT knowledge and competences required of an Audit Professional. The IT knowledge and competences in this section are drawn from the relevant pre-qualification knowledge and competences referred to earlier in this practice statement and adapts them to the specific context of the audit of historical financial information.

55. IFAC member bodies, in developing the IT subject area for the education of audit professionals, may consider including the following topics:

    - Evaluating an entity's overall IT control environment;
    - Planning financial accounting and reporting systems evaluation;
    - Evaluating financial accounting and reporting systems; and
    - Communicating results of evaluations and following-up.

56. Appendix 7 sets out a number of competency elements based on the topics above that IFAC member bodies may consider in developing the IT subject area for the education of audit professionals. This appendix is not intended to be prescriptive.

57. IFAC member bodies may also find some or all of the competency elements set out for Audit Professionals in Appendix 7 and for Evaluators of Information Systems Role Competences in Appendix 5 helpful in developing CPD requirements for the Audit Professional.

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4 IES 8, *Competence Requirements for Audit Professionals*, paragraphs 63-64.

5 IES 8, *Competence Requirements for Audit Professionals*, paragraph 40.

Appendix 1

General Knowledge of IT Topics

Appendix 1 is based on Table 1 in this IEPS. It sets out, in more detail, subject matter for the general knowledge of IT subject area that may be of assistance to IFAC member bodies developing the information technology component of accounting education programs. This appendix is not intended to be prescriptive.

Topic 1: Information Technology Strategy

Candidates can explain, describe or discuss enterprise strategy and vision	
Main topic coverage	**Subject matter**
Internal and external business issues	Business focus of the entity Position of the entity within its industry Relationship of IT strategy and business strategy Operational dynamics that influence the business Business processes as they relate to the strategic plan
Factors that impact IT	Flexibility of changes in technology or business Speed to market Legal, regulatory and assurance requirements Business units (customers, markets, industries) Budgets Service level and operational requirements: availability, scalability, security, integrity, extensibility, maintainability, manageability

Candidates can explain, describe or discuss the current and future IT environment	
Main topic coverage	**Subject matter**
Current status of entity's use of IT to support business processes	Infrastructure Software People Procedures and controls Knowledge Data
IT risks and opportunities	Trends, issues concerns in current environment

Candidates can explain, describe or discuss the current and future IT environment	
	Business and IT alignment **Compliance with service level agreements/targets** Capacity and performance capabilities Stakeholder attitudes Political and social concerns relating to IT

Candidates can explain, describe or discuss IT strategic planning	
Main topic coverage	**Subject matter**
Envision future status of the entity's systems	Communicating with stakeholders Sourcing strategy Critical success factors, appropriate measurements
Align future IT strategy with business strategy	IT management's goals and objectives Overall feasibility and scope Business constraints (quality, time, cost) Action plans, timelines, transition elements Sponsor and stakeholder approval

Candidates can explain, describe or discuss ongoing governance and outcomes of the monitoring process	
Main topic coverage	**Subject matter**
Framework for IT governance	Control environment/culture Risk assessment Policies and procedures Information and communication Monitoring of controls and risks Impact on IT of compliance with professional standards and codes
Outcome measurement	Cost-effectiveness of IT processes Utilization of IT infrastructure Satisfaction of stakeholders Staff productivity Sharing of knowledge and information Linkages between IT and enterprise governance

Topic 2: Information Technology Architecture

Candidates can explain, describe or discuss general systems concepts	
Main topic coverage	**Subject matter**
Nature and types of systems	General systems theory, systems objectives: • Open/closed systems • Well/ill-structured • Formal/informal Operational/tactical/strategic Transaction processing vs. operational vs. decision support
Information systems architectures (components and relationships)	Subsystems, networks, client server, remote systems, distributed systems, mobile facilities, hardware (mainframe, server, router, workstation, etc.) Networks, telecommunication systems, electronic data transfer Software: systems software, application software, utilities: • Application development environment • Data organization and access methods: • Files, tables, data bases, data base management systems Protocols, standards, enabling technologies IT professionals and career paths in IT organizations
Control and feedback in systems	Objectives, measures, monitoring, feedback and follow-up
Systems development life cycle	Systems acquisition/development phases, tasks: • Investigation and feasibility study • Requirements analysis and initial design • Detailed design specification/ documentation • Systems installation/ implementation • Maintenance • Project management
Nature and types of information	Routine, exception, ad hoc, predictive Quantitative, qualitative Transaction documents, screens, reports, messages, etc.

Candidates can explain, describe or discuss general systems concepts	
Main topic coverage	**Subject matter**
	Data vs. information vs. knowledge
Attributes of information	Quality, relevance, reliability, cost Completeness, accuracy, level of aggregation, timeliness, currency, frequency, accessibility, availability, authorization, authenticity, privacy, confidentiality, etc. Decision value, competitive advantage
Role of information within business	Users: internal, external Monitoring, problem finding, action, decision support, etc. Decision theory Human information processing strengths, limitations Communication of information Reporting concepts and systems
Types of business systems	Transaction Processing Systems (TPS) Production support systems Management Information Systems (MIS) Knowledge Management Systems (KMS) Executive Information Systems (EIS) Decision Support Systems (DSS) Expert Systems (ES), Neural Networks (NN)

Candidates can explain, describe or discuss transaction processing in business systems	
Main topic coverage	**Subject matter**
Transaction processing phases	Data entry Edit/validation Transmission File look-ups, calculations, logical comparisons Master file update Storage, record retention, back-up Accounting, control, management and reporting

Candidates can explain, describe or discuss transaction processing in business systems	
	Query, audit trail, ad hoc reports Error prevention, detection, correction
Processing modes	Batch processing Transaction processing On-line processing Real-time processing Distributed processing Multi-programming, multi-tasking and multi-processing
Business documents, accounting records, data bases, control/ management reports	Revenue/receivables/receipts Purchases/payables/payments Inventories/cost of sales Fixed assets Production planning, scheduling and control Distribution management, logistics Project management Human resources and payroll Delivery of services Logistics Treasury Administration

Candidates can explain, describe or discuss physical and hardware components of a system	
Main topic coverage	**Subject matter**
Processing units	Personal/workstation/mini/mainframe/ supercomputer Standalone or multi-user/network Multi-processor vs. single processor Server, server farm Central processing unit (CPU), main memory, etc. Bus-lines, cables, integrated circuit cards, micro-code, registers, instruction sets, etc.
Input/output devices	Keyboard, mouse, scanner, Radio Frequency Identification (RFID), text recognition, voice

Candidates can explain, describe or discuss physical and hardware components of a system	
Main topic coverage	**Subject matter**
	recognition, web cam, smart card, pen display, tape, disk, printer, barcode scanning, biometrics, etc. Control units, buffers, channels, etc.
Data communication devices	Modem, switch, router, concentrator, bridge, monitor, etc. Wireless transmitter, receiver, Bluetooth, infrared devices etc.
Physical storage devices	Data representation by computer, data compression Tape, disk, Compact Disk Read Only Memory (CD-ROM), Digital Video Discs (DVD), Storage Area Network (SAN), Network Attached Storage (NAS).

Candidates can explain, describe or discuss software	
Main topic coverage	**Subject matter**
Components of a software configuration	Distinction between systems and application software Workflow managers, middleware and other utilities Software designs for various processors Open vs. proprietary systems
Operating systems	Graphical user interfaces Network, client/server, etc. Single user vs. multi-user Process management Memory and file systems management
Communications systems	Terminal monitors, network directories, etc. Communication protocols
Security software	Authentication and access control software Anti-virus software Firewall Intrusion detection Security assessment tools
Utility software	Text editor, directory manager, file back-up/recovery, file compression, etc. Performance monitoring software, scheduling

Candidates can explain, describe or discuss software	
Main topic coverage	**Subject matter**
	software, etc.
Programming languages/ compilers	Program control structures Open source, testing during application development, application development techniques such as RAPID Program specification, verification and validation Machine code/assembly languages Procedural vs. non-procedural languages Language evaluation and selection approaches Object-oriented languages, multimedia authoring systems, etc.
Programming aids, interactive programming software	Application development environment CASE tools and programming environment UML (Unified Modeling Language) Methods of program design and development Testing and documentation
Library management systems	Version control, migration, etc.
Data management systems	Tape/disk management systems Hardcopy/microfiche/optical imaging On-line, archival Report generators and data retrieval software Data base management systems
General application software	Distinction from systems software Competitive advantage Piecemeal vs. organization-wide development/ integration Package vs. custom software Distributed vs. centralized processing End-user computing Internet/intranet/extranet applications
E-business enabling software	Supply Chain Management (SCM) Customer Relationship Management (CRM) Sales Force Automation (SFA) Human resources management

Candidates can explain, describe or discuss software	
Main topic coverage	**Subject matter**
	Asset management Enterprise Resource Planning (ERP) Manufacturing (CAD/CAM, CIM) Distribution, logistics Enterprise Application Integration (EAI): • Electronic commerce systems • Brochure, catalog, exchange • Order entry (shopping cart), payment processing, fulfillment Knowledge management systems: • Knowledge creation, capture, sharing, maintenance Financial Reporting, XBRL

Candidates can explain, describe or discuss protocols, standards and enabling technologies	
Main topic coverage	**Subject matter**
Common standards	Seven-layer OSI Reference Model: • Physical, Data Link, Network, Transport, Session, Presentation, Application Common Object Request Broker Architecture (CORBA) Electronic data interchange (EDI) Transmission control protocol / Internet protocol (TCP/IP) Wireless application protocol (WAP)
Internet protocols	Packet switching Uniform Resource Locator (URL) Domain Name Server (DNS) File Transfer Protocol (FTP) Hypertext Transfer Protocol (HTTP) Hypertext Markup Language (HTML) Extensible Markup Language (XML) Extensible Business Reporting Language (XBRL) Internet Relay Chat Protocol (IRC)

Candidates can explain, describe or discuss protocols, standards and enabling technologies	
Main topic coverage	**Subject matter**
Standard-setting organizations	Institute of Electrical and Electronic Engineers (IEEE) International Organization for Standardization (ISO) Open Systems Interconnections (OSI) American National Standards Institute (ANSI) World Wide Web Consortium (W3C) Project Management Institute (PMI) Software Engineering Institute (SEI) International Federation of Accountants (IFAC) XBRL International

Candidates can explain, describe or discuss data organization and access methods	
Main topic coverage	**Subject matter**
Data structures and file organization	Data coding: characters, records, files, multi-media Precision of data Data relationships: one-to-one, one-to-many, many-to-many Conceptual data modeling Normalization of data Logical vs. physical Entity-relationship diagramming Referential integrity Table structure vs. user interface Distributed structures
Access methods	Sequential access Direct (random) access Indexed sequential access
Types of data files	Master/transactions/tables Array, list, stack, queue, tree, index Database: Relational, Network, Hierarchical, Object-oriented Benefits of using a database

Candidates can explain, describe or discuss data organization and access methods	
Main topic coverage	**Subject matter**
Data base management systems features, functions, architectures	Data storage, access, and sharing Roll back / journaling Performance tuning and metrics Stored procedures
Data base administration	Defining/ documenting data base requirements File layout/ schema/ data dictionary Model data bases, distributed systems
Document management	Capture, index, store, retrieve, display/print Optical imaging systems

Candidates can explain, describe or discuss IT professionals	
Main topic coverage	**Subject matter**
Job functions	Chief Information Officer (CIO) and similar Chief Information Security Office (CISO) and similar Business Analyst Systems Analyst Programmer Operations Manager Database Administrator / Data Administrator Knowledge Base Administrator / Knowledge Administrator / Knowledge Engineer Security Officer Network Controller Librarian Webmaster, Web Designer Quality Assuror
Recruiting/developing IT human resources	Training and development Sourcing Career paths
Organization	Organization structure IT governance

Topic 3: IT as a Business Process Enabler

Candidates can explain, describe or discuss stakeholders and their requirements	
Main topic coverage	**Subject matter**
Monitoring service level performance against service level agreements	Quality of service Availability Response time Security and controls Processing integrity Privacy Remedies Amending service level agreements

Candidates can explain, describe or discuss the entity's business models	
Main topic coverage	**Subject matter**
Business models	Revenue Distribution Supply Market Organization Legal and regulatory issues
Effectiveness of the entity's individual business processes	Revenue/receivables/receipts Purchases/payables/payments Inventories/cost of sales Fixed assets Production planning, scheduling and control Distribution management, logistics Human resources and payroll Delivery of services Logistics Treasury Administration
Framework of controls	Relation between user controls, application controls and IT general controls

Candidates can explain, describe or discuss risks and opportunities	
Main topic coverage	**Subject matter**
Barriers and enablers	Technology Alignment of business processes and IT with business strategy Business Process Re-engineering (BPR) Organizational structure and culture Leadership Human resources Capital Legal and Regulatory

Candidates can explain, describe or discuss the impact of IT on the entity's business models, processes and solutions	
Main topic coverage	**Subject matter**
Applications of internet-commerce	Internet-commerce issues and trends Business to Business (B2B) • Exchange, Portal, Public/private exchange, EDI, • Credit authorization, Wire lines (ACH, EFT) Business to Consumer (B2C) Consumer to Consumer (C2C) Business to Employee (B2E) Distance learning; distributed learning Electronic government
Enterprise systems	Supply Chain Management (SCM) Customer Relationship Management (CRM) Sales Force Automation (SFA) Human resources management Asset management Enterprise Resource Planning (ERP) Manufacturing (CAD/CAM, CIM) Distribution, logistics Enterprise Application Integration (EAI): • Electronic commerce systems • Brochure, catalog, exchange

Candidates can explain, describe or discuss the impact of IT on the entity's business models, processes and solutions	
	• Order entry (shopping cart), payment processing, fulfillment Knowledge management systems: • Knowledge creation, capture, sharing, maintenance Financial Reporting, XBRL

Topic 4: Systems Acquisition and Development Process

Candidates can explain, describe or discuss systems acquisition and development life-cycle phases and tasks	
Main topic coverage	**Subject matter**
Approaches	Waterfall, spiral, interactive, prototyping Effect of new development techniques and management theories on formal systems development life-cycle
Acquisition/development phases	Investigation and feasibility study Requirements analysis and initial design Detailed design specification/ documentation Systems installation/ implementation Maintenance
Standards, methods and controls	Documentation requirements Main risks and reasons for failure of systems projects: e.g., economic, technical, operational, behavioral

Candidates can explain, describe or discuss investigation and feasibility studies	
Main topic coverage	**Subject matter**
Investigation	Analysis of existing systems; business process integration; business process re-engineering Scope of proposed systems and information needs, technology options Nature and size of business
Feasibility study	Cost/benefit analysis Statement of application requirements Feasibility analysis

Candidates can explain, describe or discuss requirements analysis and initial design	
Main topic coverage	**Subject matter**
User requirements elicitation	Processing modes User interface: screen, report, form layouts Data bases/files/records Integration with existing applications and systems Volume, scalability, extensibility requirements
Systems analysis/design	Structured analysis and design methodologies

Candidates can explain, describe or discuss requirements analysis and initial design	
tools and techniques	Questionnaires, interviews, document analysis, observation Data flow diagrams; entity-relationship modeling, etc. Decision tables and decision trees Computer Aided Software Engineering (CASE) tools Unified Modeling Language (UML) Object methods
Process design, data organization, software requirements	Application architecture Technical architecture Infrastructure requirements: facilities, hardware, network
Control requirements	Availability, security/privacy, integrity, maintainability

Candidates can explain, describe or discuss systems design, selection, acquisition and development	
Main topic coverage	**Subject matter**
Infrastructure and software services	Selection of hardware, facilities, networks Selection of software packages Selection of vendor/supplier/service providers Service level agreements Escrow agreements Contracting/leasing/licensing considerations
Software development	Application development environment (programming languages/compilers, etc.) Programming aids: Structured, event driven, object-oriented approaches
Systems design	User interface: screen and report design Data base/file design; systems and data base integration Audit trail; transaction flows Interfaces Systems and network transaction load requirements Computerized and user controls Acceptance testing approach
Documentation	Statement of technical requirements User and operations manuals

Candidates can explain, describe or discuss systems implementation	
Main topic coverage	**Subject matter**
Systems implementation plan	Change management requirements User training User acceptance Systems roll-out Data conversion Risk management Operation and recovery procedures Documentation
Install/deploy systems	Install/deploy components: infrastructure, software User/operator procedures and controls Recruit/train personnel
Acceptance testing	Acceptance testing approach: • Identify resources required • Develop high level testing scenarios • Relate to functional and technical/architectural requirements Tools and support: • Automated test tools • Test environment • Support Test scripts and related data Quality assurance/pre-implementation review
Systems conversion/changeover	Data transformation requirements Automated/manual Operational considerations (pilot, parallel running and going live) Timing consideration Tests Risk management Resources required: • Data transformation tools • Conversion environment • Support

Candidates can explain, describe or discuss systems implementation	
Main topic coverage	**Subject matter**
	Tests to ensure data is complete, accurate and authorized
Post-implementation review	Meets business requirements Impact on users, management and staff Project schedule and resources (financial and people) consumed Benefits realized Opportunities for improvement

Candidates can explain, describe or discuss systems maintenance and program changes	
Main topic coverage	**Subject matter**
Maintenance standards	Infrastructure Software Personnel competences Information architecture Business processes Version management Implementation controls Authorization controls Documentation standards and controls Migration planning
Change controls	Custody; change authorization Emergency change controls Testing and quality assurance

Candidates can explain, describe or discuss project management, project planning, project control methods and standards	
Main topic coverage	**Subject matter**
Initiate the project	Project sponsorship and funding Stakeholders Terms of reference Apply project management tools and techniques

Candidates can explain, describe or discuss project management, project planning, project control methods and standards	
Main topic coverage	**Subject matter**
Plan the project	Scope, objectives and deliverables Strategy to achieve objectives and deliverables Project schedule, including sequence of tasks and milestones Resources and budgets Quality standards that will be used to evaluate the project Communication needs of all project stakeholders Goods and/or services that will be required to complete the project
Risk management approach on the project	Project management risk Business risk
Execute the project plan	Ensure: • Goods and services are selected and contracted, as required • Quality standards are understood • Staff are properly trained and managed • Defined communication strategy
Control the project	Control and coordinate changes across the project Manage the project budget Ensure results meet quality standards and identify methods to rectify any problems noted Report project performance and revised schedule, as necessary Ensure effective risk management Monitor risk mitigation Identify new risks and change plan accordingly Issue identification, escalation and resolution process
Complete the project	Stakeholder communication and sign-off Open items Post-implementation review

Topic 5: Management of Information Technology

Candidates can explain, describe or discuss IT organization	
Main topic coverage	**Subject matter**
IT policies, procedures and methodologies	Process to create and amend IT organization Process to maintain documentation Alignment with entity's strategic plan IT organization to address infrastructure, software, people, procedures and data
IT human resource policies	Skills assessment Performance evaluation Job descriptions Training and certifications Recruitment and retention

Candidates can explain, describe or discuss the management of IT operations and their effectiveness and efficiency	
Main topic coverage	**Subject matter**
Resources management processes used to maintain organizational efficiencies	Resource procurement Ongoing support procedures Maintenance of updates and upgrades
Relationship of infrastructure to applications and user requirements	Developing operational priorities Compatibility of components Planning IT capacity Impact of IT on procedures Data/information architecture IT infrastructure (hardware, facilities, networks) software (systems, applications, utilities)
Monitoring service provider activities	Performance measurement (productivity, service quality) Service level agreement monitoring Collaborative computing Distributed systems EDI and electronic commerce Outsourced services (ISPs, ASPs, etc.)

Candidates can explain, describe or discuss asset management	
Main topic coverage	**Subject matter**
Asset life cycle	Acquisition Change Retirement
Asset management and control	IT inventory Contracts and licenses and intellectual property issues Data ownership, reliability and privacy issues Cross-border transportation and storage of data Service provider documentation Privacy User documentation, on-going training and end-user support

Candidates can explain, describe or discuss change control and problem management	
Main topic coverage	**Subject matter**
Segregation of environments	Three environments: • Development • Test • Production Transport mechanisms Acceptation processes Authorization procedures Monitoring and logging
Change control techniques	Impact analysis Authorization Internal control Testing/Feedback Documentation Human resources, including training Approval Migration plans

Candidates can explain, describe or discuss change control and problem management	
	Release management
Problem management	Integration with change control management Help/Service desk support systems Problem resolution/escalation procedures Routing and assignment of problems Problem analysis and trend analysis
Management of end-user computing	Technology diffusion Information centre, help desk End-user systems security Support for end-user applications

Candidates can explain, describe or discuss security management	
Main topic coverage	**Subject matter**
Facilities	Data centers, outsourced facilities Storage, media libraries, back-up vaults Uninterruptible power source (UPS) Disaster recovery sites
Physical security	Threats Impact analysis Contingency planning Physical access Continuity
Logical security	User identification/passwords Authentication/authorization Logical access path Security packages Password management/password change procedures Firewalls

Candidates can explain, describe or discuss performance monitoring and financial control over IT resources	
Main topic coverage	**Subject matter**
Performance metrics	Defined Monitored Measured and compared to standards and reported
IT cost controls	Capital budget Time/expense tracking Accounting for systems costs Costs identifiable and measurable Costing procedures defined and implemented Billing and chargeback procedures to user departments
IT control objectives	Effectiveness, efficiency, economy of operations Reliability of financial reporting Effectiveness of controls (design, operation) IT asset safeguarding Compliance with applicable laws and regulations Systems reliability: • Availability and continuity (back-up, recovery) • Access controls (physical, logical) • Privacy, confidentiality • Processing integrity (completeness, accuracy, timeliness, authorization) Data integrity

Candidates can explain, describe or discuss software for professional use	
Main topic coverage	**Subject matter**
Office software	Presentation software Internet tools: e-mail, web browser Word processor Spreadsheets Data base management systems
Computer-assisted audit	Accounting packages and CAATs

Candidates can explain, describe or discuss software for professional use	
techniques (CAATs)	Professional research tools Analytical tools Pattern matching/recognition

Topic 6: Communication and IT

Candidates can explain, describe or discuss the benefits and risks of IT in relation to communication	
Main topic coverage	**Subject matter**
General means of communication supported by IT	Web communication E-mail SMS/MMS Digital signatures Electronic files
Risks in communication supported by IT	Privacy – appropriate use of information and relevant data protection legislation Secrecy Copying data from one client and using it for the benefit of another Use of USB sticks Forwarding data that is not checked for reliability
Benefits of IT to communication	Web searching Use of certificates with digital signatures Internet tools: e-mail, web browser, FTP

Candidates can explain, describe or discuss networks, and electronic data transfer	
Main topic coverage	**Subject matter**
Network components, configurations and designs	Local area networks/wide area networks Wireless/mobile systems Distributed processing networks Data transmission options, public and private carrier services, etc. Data communication and transmission devices/software

Appendix 2

IT Control Knowledge Topics

Appendix 2, based on the topics set out in paragraph 19 in this IEPS, sets out in more detail subject matter for the IT control knowledge subject area. This is intended to be of assistance to IFAC member bodies in developing the information technology component of accounting education programs. This appendix is not intended to be prescriptive.

Candidates can explain, describe or discuss the internal IT control environment	
Main topic coverage	**Subject matter**
IT risk management approach	Beliefs and attitudes IT risk strategy Policy statements, oral and written communications and decision making reflecting the approach Error, fraud, vandalism/abuse, business interruption, competitive disadvantage, excessive cost, deficient revenues, statutory sanctions, social costs Regulatory environment
IT risk tolerance	Acceptability of IT risk level Relation IT risk/entity risk/corporate risk/social risk Qualitative/quantitative risk approach strategies
IT oversight	IT governance Level of IT oversight in the organization Knowledge of IT in the oversight board Pro-active IT risk detection systems
Integrity, ethical values, and competence of the IT personnel	Corporate IT social responsibility systems and reports Corporate IT data integrity policy statements Organization structure of IT functions IT corporate governance processes and reports
Authority and responsibility, organization and development	Segregation of IT functions Authority structure Responsibility IT control structure: • Board, top management

Candidates can explain, describe or discuss the internal IT control environment	
	• IT management and IT personnel • User departments, individuals • Auditors

Candidates can explain, describe or discuss setting IT objectives	
Main topic coverage	**Subject matter**
IT strategic objectives	Mission/Vision/Purpose Relation entity strategy objectives/IT strategy objectives IT goals/measurements
IT objectives	IT operations objectives: effectiveness and efficiency of the IT operations IT reporting objectives: accurate and complete management information for IT purpose IT compliance objectives: conduct IT activities in accordance with relevant laws and regulations
Overlap of IT objectives	Integrated framework of entities objectives
Selection of IT objectives	Relation with IT risk management approach Relation with IT risk appetite IT risk tolerance, acceptability of different levels

Candidates can explain, describe or discuss identifying IT risk events	
Main topic coverage	**Subject matter**
IT risk factors	External factors: • Economic • Natural environment • Political • Social • Technological Internal factors: • Infrastructure

Candidates can explain, describe or discuss identifying IT risk events	
	• Personnel • Process • Technology
IT event identification techniques	IT event inventories IT internal analysis Escalation or threshold triggers Facilitated workshops and interviews Process flow analysis Leading event indicators Loss event data methodologies

Candidates can explain, describe or discuss conducting IT risk assessments	
Main topic coverage	**Subject matter**
IT risk categories	Inherent IT risk Residual IT risk Likelihood and impact Data sources Economic, technical, operational, behavioral Main reasons for failure of computer projects Error, fraud, vandalism/abuse, business interruption, competitive disadvantage, excessive cost, deficient revenues, statutory sanctions, social costs
Assessment techniques	Benchmarking Probabilistic models Non-probabilistic models Relations between events

Candidates can explain, describe or discuss establishing an IT risk response	
Main topic coverage	**Subject matter**
Response categories	Avoidance Reduction

Candidates can explain, describe or discuss establishing an IT risk response	
	Sharing Acceptance
Possible responses	Effect on IT risk likelihood and Impact Assessing cost versus benefit Opportunities in IT response options

Candidates can explain, describe or discuss conducting IT control activities	
Main topic coverage	**Subject matter**
IT control frameworks	COBIT, SysTrust, WebTrust (Trust Services Principles and Criteria), OECD, ISO27001, etc
IT control objectives	Effectiveness, efficiency, economy of operations: • Cost effectiveness of control procedures Reliability of financial reporting: • Relevance • Reliability • Comparability/consistency Effectiveness of controls (designing, implementing and operating): • At a point in time • During a period of time IT asset safeguarding: • Evaluation of facilities management • IT asset safeguarding Compliance with applicable laws and regulations: • Prevention/detection of fraud, error and illegal acts • Privacy • Confidentiality • Copyright issues Systems reliability: • Availability and continuity (back-up, recovery) • Access controls (physical, logical) • Processing integrity (completeness, accuracy, timeliness, authorization)

Candidates can explain, describe or discuss conducting IT control activities	
Main topic coverage	**Subject matter**
	• Maintainability Data integrity: • Comparability • Authorization • Auditability • Input/output • Reception/distribution controls
Types of control activities	IT top-level reviews Direct IT functional or IT activity management Information processing Manual controls IT performance indicators Segregation of IT duties and functions
Controls over information systems	Control design : • Objectives, framework, environment, activities, monitoring • Legal, ethical, professional standards/requirements • Preventive/detective/corrective strategies • Effect of control environment (personnel management methods) • Preventive application controls • Detective application controls • Contingency plans, insurance Control procedures: • Authorization • Separation of incompatible functions (organizational design, user identification, data classification, user/function/data authorization matrix, user authentication) • Adequate documents and records • Asset safeguards • Limitation of access to assets • Independent checks on performance

Candidates can explain, describe or discuss conducting IT control activities	
Main topic coverage	**Subject matter**
	• Verification of accounting records • Comparison of accounting records with assets • Computer-dependent controls (edit, validation, etc.) • User controls (control balancing, manual follow-up, etc.) • Audit trails • Error identification/investigation/correction/tracking Control over data integrity, privacy and security: • Understanding of data protection legislation • Consideration of personnel issues and confidentiality • Classification of information • Access management controls • Physical design and access controls • Logical access controls (user authorization matrix) • Network security (encryption, firewalls) • Program security techniques • Data security techniques • Monitoring and surveillance techniques Availability/continuity of processing, disaster recovery planning and control: • Threat and risk management • Software and data back-up techniques (problems of on-line systems, etc.) • Alternate processing facility arrangements • Disaster recovery procedural plan, documentation • Integration with business continuity plans • Periodic tests of recovery procedures • Insurance/Escrow IS processing/operations: • Planning and scheduling; service levels; risks

Candidates can explain, describe or discuss conducting IT control activities	
Main topic coverage	**Subject matter**
	Standards: • Infrastructure (hardware, facilities, networks) • Software • Human resources (skill sets and staffing levels) • Business processes • Performance monitoring • Costs/benefits (quantitative and qualitative impact on management, jobs and office procedures) • Business drivers that impact IT (e.g., scalability, right-sizing flexibility of changes in technology or business, speed to market, cross-platform capability) • Control over productivity and service quality • Software/data library management • Input/output distribution and control • Security and back up and recovery
Systems acquisition/development process	Investigation and feasibility study: • Steering Committee • Cost/benefit analysis • Risk assessment Requirements analysis and initial design: • Control requirements Detailed design specification/documentation: • Controls Implementation: • System installation/implementation • Acceptance testing • Conversion/changeover • Quality assurance • Post-implementation review Systems maintenance and change: • Maintenance of hardware and software • Change authorization, logging and testing

Candidates can explain, describe or discuss conducting IT control activities	
Main topic coverage	**Subject matter**
	• Systems documentation and operations manuals • Personnel training and development Project management/planning/control methods and standards: • Project phases, tasks and controls • Project characteristics and risks • Project staffing • Project scheduling • Expense budget • Documentation requirements

Candidates can explain, describe or discuss information and communication in relation to IT	
Main topic coverage	**Subject matter**
Information	IT strategic and integrated systems Integration with IT operations Depth and timeliness of IT information IT information quality People, procedures, data, software, infrastructure Key processes: • Identification and recording of all valid transactions • Proper/timely classification of transactions • Appropriate measurement/valuation • Appropriate timing/cut-off • Appropriate presentation
Communication	Business practices, codes of conduct, policy manuals, memos, etc. Documentation of systems, operations, user responsibilities, Reporting relationships Training, supervision

Candidates can explain, describe or discuss monitoring in relation to IT	
Main topic coverage	**Subject matter**
Ongoing monitoring activities	Management Regulators
Separate evaluation	Systems analysis and documentation (e.g., flowcharting packages, review of program logic, etc.) Systems/program testing (e.g., test data, integrated test facility, parallel simulation, etc.) Data integrity testing (e.g., generalized audit software, utilities, custom programs, sampling routines, etc.) Problem solving aids (e.g., spreadsheet, database, on-line data bases, etc.) Administrative aids (e.g., word processing, audit program generations, work paper generators, etc.)

Appendix 3

IT Control Competences

Appendix 3, based on the topics set out in paragraph 21 in this IEPS, sets out in more detail competency elements (or tasks) for the IT control subject area that may be used to demonstrate competence. This is intended to be of assistance to IFAC member bodies in developing the information technology component of accounting education programs. This appendix is not intended to be prescriptive.

Candidates can apply, demonstrate or evaluate	**Competency elements**
Suitable control criteria to analyze and evaluate controls	Identify relevant: • IT control framework to apply to the analysis and evaluation of internal control Acceptance testing • IT control objectives to apply to the analysis and evaluation of internal control • Layers of control to be included in the analysis and evaluation Identify areas of responsibility for identified control objectives
The IT internal control environment	Understand external regulatory controls Analyze and evaluate effectiveness of: • Board of directors or audit committee participation • Management philosophy and operating style • Organizational structures • Assignment of authority and responsibility • Management control methods • Human resource policies and practices • Financial policies and practices
The selected IT objectives	Analyze and evaluate: • IT strategic objectives • IT objectives • Overlap of IT objectives • Selection of IT objectives

Candidates can apply, demonstrate or evaluate	Competency elements
The identified IT events	Analyze and evaluate: • IT driving events factors • IT event identification techniques
IT risk assessment	Analyze and evaluate process for: • Identifying the entity's exposures to risks • Estimating probability of loss • Estimating monetary and non-monetary consequences • Developing cost-effective preventive/detective/corrective strategies to address risks
The selected IT risk responses	Analyze and evaluate effectiveness of: • Response categories • Possible responses
The IT control activities	Analyze and evaluate IT control frameworks Analyze and evaluate effectiveness of: • Design and operation of entity's information processing and communication activities in support of organizational objectives • Controls over data integrity, privacy and security • Controls over completeness, accuracy, timeliness and authorization of systems processing • Controls over systems availability, continuity of business processing and disaster recovery planning • Systems acquisition/development methodology, including make/buy criteria • Standards for systems development project management and control Analyze and evaluate compliance with: • Standards for systems investigation and feasibility study • Standards for determination of user requirements and initial systems design • Standards for systems design, selection,

Candidates can apply, demonstrate or evaluate	Competency elements
	acquisition/development • Standards for systems implementation, including systems testing, training, data conversion and quality assurance • Standards for systems maintenance and change management
Information and communication in relation to IT	Analyze and evaluate: • Information processes • Communication processes
The monitoring process and actions taken in relation to IT	Analyze and evaluate: • Internal monitoring processes, including their effectiveness in leading to changes in controls or control environment • Performance review process • Process for addressing non-compliance or deterioration in compliance identified by monitoring activities of management, users, internal auditors, external auditors Apply appropriate computer-assisted audit techniques to analyze and evaluate monitoring processes and activities.

Candidates can apply, demonstrate or evaluate	**Competency elements**
Appropriate IT systems and tools to business/accounting problems	Apply: • Operating systems • Word processing software in a relevant accounting/business context • Spreadsheet software in a relevant accounting/business context • Database software in a relevant accounting/business context • Internet tools (E-mail, Web Browser, FTP, Other) software in a relevant accounting/business context • Professional research tools in a relevant accounting/business context • Business presentation software in a relevant accounting/business context • Anti-virus and other security software in a relevant accounting/business context • Utility software and other relevant software in a relevant accounting/business context
Understanding of business and accounting systems	Demonstrate understanding of: • Accounting packages • E-business systems (ERP, CRM, and other business automation systems) • Networks (LAN) • Electronic commerce features (B2C and B2B models, encryption tools, digital signatures/certificates, key management)
The application of controls to personal systems	Ensure: • Processing integrity of IT resources • Security and safeguarding of IT resources • Availability/continuity provisions (back-up and recovery) for IT resources

Appendix 4

Manager of Information Systems Role Competences

This appendix lists competency elements (or tasks) that could be used to demonstrate each competence relating to the manager of information systems role at pre-qualification level. They are provided for illustrative purposes only and are not prescriptive. IFAC member bodies may find some or all of the competency elements set out in below helpful in developing CPD requirements for professional accountants.

Competence	Competency elements
Managing an entity's IT strategy	Understand enterprise strategy and business issues and related IT risks and opportunities
	Develop an IT strategic plan to support the entity's business plan
	Align/integrate IT strategic plan with entity's business/program objectives and success factors
	Translate strategic business/program objectives into operating principles for IT planning
	Facilitate business process enablement through the use of IT
Managing an IT organization	Define job functions and responsibilities of the IT department
	Define organization chart/reporting relationships of the IT department
	Define and implement processes for recruiting, staffing, personnel development and performance evaluation
Managing IT operations' effectiveness and efficiency	Measure, analyze and evaluate the consistency and compatibility of systems components
	Analyze, evaluate and plan IT capacity
	Analyze and evaluate impact of IT on management, jobs and office procedures
	Define/maintain data/information architecture
	Acquire/develop/maintain responsive IT infrastructure (hardware, facilities, communication networks)
	Acquire/develop/maintain software (systems,

Competence	Competency elements
	applications, utilities)
	Plan and schedule systems operations priorities and allocate resources
	Measure, analyze and evaluate: • IS effectiveness and productivity enhancement • IT function performance, productivity and service quality, quality assurance processes, continuous improvement
	Monitor outsourced services (ISPs, ASPs, etc.) and inter-organizational computing such as EDI and e-commerce services
Maintaining financial control over IT	Develop capital budget
	Account for systems costs
	Implement systems for tracking costs
	Monitor expenses
Managing IT controls	Implement physical and logical safeguards for hardware, facilities, software and information
	Implement systems and data security (i.e., physical, logical/electronic access controls)
	Implement systems availability and business continuity controls (back-up/recovery, disaster planning)
	Implement systems processing integrity (i.e., completeness, accuracy, timeliness and authorization) controls
	Implement data integrity, privacy and confidentiality controls
Managing systems acquisition, development and implementation	Identify and evaluate appropriate development/acquisition alternatives such as in-house/outsourcing
	Implement and monitor systems acquisition/development and implementation standards
	Determine and provide systems project staffing requirements and budgets

Competence	Competency elements
	Implement project management processes to manage and monitor systems projects
	Use appropriate methodologies to identify, analyze, evaluate and select appropriate supplier(s) and system(s)
	Manage expectations by communicating systems acquisition/development plans and status to users, top management/steering committee
Managing systems change and problem management	Manage technology diffusion
	Implement and manage: • Information centre, help desk • Standards and controls applicable to IS maintenance activities • Version management • Process for migrating systems from legacy to state of the art • Emergency change controls • Testing and quality assurance for all systems changes
	Manage custody of systems, change authorization

Appendix 5

Evaluator of Information Systems Role Competences

This appendix lists competency elements (or tasks) that could be used to demonstrate each competence relating to the evaluator of information systems role at pre-qualification level. They are provided for illustrative purposes only and are not prescriptive. IFAC member bodies may find some or all of the competency elements set out in below helpful in developing CPD requirements for professional accountants.

Competences	Competency elements
Planning systems evaluation	Identify IT assurance service requirements and/or opportunities
	Analyze/evaluate and advise on entity's IT assurance needs based on legal, ethical, professional standards and other requirements and best practices
	Identify nature of particular IT assurance engagement or project and standards and other requirements governing the engagement
	Analyze and decide whether to accept the IT assurance engagement or project
	Define the scope of the IT assurance engagement or project
	Identify, analyze and evaluate risk factors and business issues affecting the IT assurance engagement or project and their implications
	Define level/frequency of systems errors, flaws and failures that are deemed significant/material
	Design effective and efficient verification procedures to meet evaluation objectives while complying with professional standards
	Assign and schedule staff with appropriate IT skills, including IT specialist personnel, to perform the IT assurance engagement or project
	Conclude on evaluation strategy Develop an evaluation plan
Evaluating systems	Collaborate with colleagues, client and others, including IT specialist personnel

Competences	Competency elements
	Perform planned procedures, exercising required controls over their execution
	Evaluate general IT controls, application controls
	Evaluate relationship between user controls/application controls and IT general controls
	Adjust planned procedures for changes in circumstances
	Document procedures and findings
	Analyze and evaluate evidence/results of procedures
	Perform supervision, review and quality assurance procedures
Communicating results of evaluations and following-up	Prepare appropriate types of communication, including verbal communication, "seal" or printed report
	Present communication verbally, electronically or in printed format to client or other intended recipients
	Update communication as frequently as required (e.g., refresh the "seal" or report posted on a website)
	Follow up as required

Appendix 6

Designer of Information Systems Role Competences

This appendix lists competency elements (or tasks) that could be used to demonstrate each competence relating to the designer of information systems role at pre-qualification level. They are provided for illustrative purposes only and are not prescriptive. IFAC member bodies may find some or all of the competency elements set out in below helpful in developing CPD requirements for professional accountants.

Competences	Competency elements
Analyzing and evaluating the role of information in an entity's business processes and organization	Facilitate the development of the entity's strategic vision for IT
	Identify stakeholders and their requirements
	Assess the business impact of entity's strategic vision for IT on the entity, its customers, suppliers and employees
	Facilitate communication between users, technologists and management
	Analyze, evaluate and design information architecture (i.e., role of data bases and data base management systems including knowledge management systems, data warehouses)
	Analyze, evaluate and design entity's business processes
	Analyze framework of controls Analyze relations between user controls/application controls/general IT controls
	Analyze, evaluate and design entity's systems development life cycle (SDLC) phases, tasks
	Analyze and evaluate systems risks and opportunities
	Analyze, evaluate and design controls
Applying project management methods	Analyze and evaluate project characteristics and risks
	Organize project into phases and tasks corresponding to relevant stages of the systems development life cycle
	Identify appropriate staff and other resources and assign to project phases and tasks

Competences	Competency elements
	Assign time, expense and other resource budgets to project phases and tasks
	Apply appropriate standards and controls to the project phases and tasks
	Identify required project documentation and assign responsibility for its preparation
	Monitor project activities for compliance with budgets, standards, controls and documentation requirements and take corrective action when required
Applying systems investigation and project initiation methods	Perform systems investigation
	Identify business process integration/re-engineering opportunities
	Research relevant technology options
	Prepare feasibility study and evaluate project risks
Applying user requirements determination and initial design methods	Apply information requirements elicitation methods
	Document information requirements (including control requirements)
	Facilitate communication of information requirements between team members, users, management
	Analyze requirements and perform initial design (including controls)
Applying detailed systems design and acquisition/ development methods	Prepare and document detailed design specifications
	Evaluate and acquire infrastructure
	Evaluate and acquire/develop required systems, application and utility software
	Select suppliers and service providers
	Prepare hardware contracts, facilities leases, software licenses, network service level agreements in consultation with legal advisors
	Prepare documentation and operations manuals
Applying systems implementation methods	Prepare implementation plan
	Supervise installation/deployment of systems components

Competences	Competency elements
	Develop user/operator procedures and controls and recruit, train personnel
	Test (verify and validate) systems against specifications and requirements
	Convert systems, balance pre-post data, and start-up
	Perform post-implementation review
Applying systems maintenance and change management methods	Maintain: • IT infrastructure • Software; control versions • Personnel competences through hiring, training • IT standards and controls • Information architecture • Business processes
	Test all systems changes

Appendix 7

Audit Professional IT Competences

This appendix lists competency elements (or tasks) for audit professionals. They are provided for illustrative purposes only and are not prescriptive. IFAC member bodies may find some or all of the competency elements set out in below helpful in developing educational requirements for audit professionals including CPD.

Competences	Competency elements
Evaluating an entity's overall IT control environment	Identify, analyze and evaluate the effects of IT on an entity's business, considering relevant current issues and (technological) developments
	Understand the complexity of the IT environments
	Assign and schedule staff with appropriate IT skills, including IT specialist personnel, to analyze IT controls at entity level
	Analyze risks and controls at entity level to: • Align IT with entity's business strategy • Manage the IT organization • Manage IT operations • Manage IT controls • Manage systems acquisition, development and implementation • Manage systems change and problem management
	Conclude on preliminary audit strategy
Planning financial accounting and reporting systems evaluation	Identify business processes, significant flows of transactions, significant risks and relevant user controls/application controls
	Identify the supporting IT infrastructure and general IT controls
	Design test procedures on user controls/application controls/IT general controls
	Assign and schedule staff with appropriate IT skills, including IT specialist personnel, to test general IT controls and application controls

Competences	Competency elements
Evaluating financial accounting and reporting systems	Perform planned procedures, exercising required controls over their execution
	Evaluate general IT controls and application controls
	Evaluate relations between user controls/application controls and IT general controls
	Adjust planned procedures for changes in circumstances
	Document procedures and their findings
	Analyze and evaluate evidence/results of procedures
	Perform supervision, review and quality assurance procedures
Communicating results of evaluations and following-up	Prepare appropriate types of communication, including verbal communication and/or printed report
	Conclude on final audit strategy
	Follow up as required