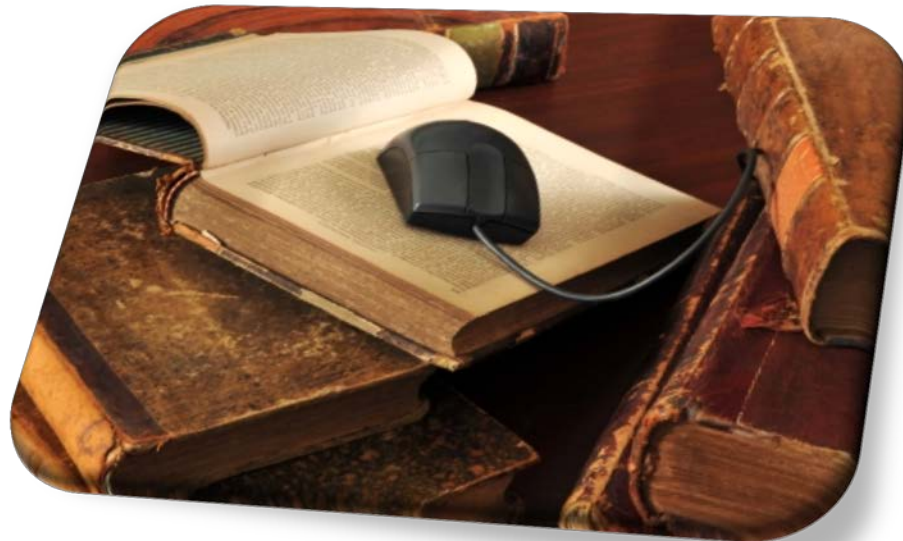




Canada's Association of Information  
Technology (IT) Professionals  
**[www.cips.ca](http://www.cips.ca)**

**A Guide to the Common Body of  
Knowledge for Computing and IT  
(CBOK)**



**2012 Version**

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## Foreword

With the development of the the *CIPS Guide to the Common Body of Knowledge for Computing and IT (CBOK)* has established a baseline for the body of knowledge for IT and the work partially fulfills the Society's mission and the vision as outlined in the vision document: "*CIPS in the 21st Century*." A core component of this vision was the formalization of a relevant Information Technology (IT) BOK for CIPS. The vision for the BOK was to develop a comprehensive description of the sum of knowledge and professional practices that are generally accepted within the IT profession in Canada and that characterize the content, ethical standards and codes of conduct that define the profession.

It should be noted that the Guide does not purport to define the body of knowledge but rather to serve as a compendium and guide to the body of knowledge that has been developing and evolving over the past four decades. Furthermore, this body of knowledge is not static. The Guide must, necessarily, develop and evolve as the field of IT matures. Furthermore, the Guide is necessarily incomplete. The Guide covers IT knowledge that is necessary but not sufficient for an IT Professional. Practicing IT professionals will need to know many things that fall outside the Common Body of Knowledge characterized by this Guide.

Many aspects of information technology that may be deemed important knowledge are not covered in the Guide. In all fields - not only computing - the designers of common bodies knowledge have realized that specific technologies are replaced much more rapidly than work force. An IT professional must be equipped with the essential knowledge that supports the selection of the appropriate technology at the appropriate time in the appropriate circumstance. The Guide therefore does not focus on the rapidly changing technologies, although their general principles are described in relevant topics.

It is hoped that you will find this Guide useful and provide you with the knowledge and resources you need in supporting lifelong career development.

A handwritten signature in black ink that reads 'Trekker Armstrong'.

Trekker Armstrong, I.S.P., ITCP/IP3P  
Chair, Canadian Council for IT Professionals (CCITP) – 2012

## What are the characteristics of a professional?

CIPS has defined an IT Professional as someone who has:

- A demonstrated mastery of an appropriate portion of the CIPS Common Body of Knowledge
- A commitment to abide by the CIPS Code of Ethics.
- A commitment to follow the CIPS Risk Management Guidelines.
- Autonomy, responsibility and authority and works under broad direction.
- Demonstrated a complexity of work and performs work that requires the application of a significant range of fundamental principles in a variety of contexts.
- Essential skills to take a structured and effective approach to own work and demonstrate leadership potential.
- The ability to analyse, diagnose, design, plan, execute and evaluate work to time, cost and quality targets, exhibiting thorough familiarity with available methods, procedures, tools, equipment and standards associated with own area of specialization and making correct choices from alternatives.
- The ability to communicate effectively, both orally and in writing, with clients, customers, colleagues and subordinates.
- An understanding of the relationship of own specialization or area of responsibility to the employing organization as a whole and takes customer requirements fully into account when making proposals and/or carrying out work.
- Taken continuous initiatives to keep skills up to date and maintain awareness of developments in the IT industry.

## Purpose

The purpose of the *CIPS Guide to the Common Body of Knowledge for Computing and IT (CBOK)* is:

- To provide a consensually validated characterization of the bounds of the IT discipline and promote a consistent view of IT.
- To provide topical access to the Common Body of Knowledge for Computing and IT (CBOK).
- To characterize the contents of the IT discipline.
- To provide a foundation for curriculum development, program accreditation and for individual professional certification.

## Intended Audiences

The Guide is oriented toward a variety of audiences. It aims to serve public and private organizations in need of a consistent view of IT for defining education and training requirements, classifying jobs, developing performance evaluation policies. In addition, professional societies (such as CIPS) can use the CBOK for defining the certification rules, accreditation policies for post secondary education curricula, and guidelines for professional practice. The CBOK is also useful for students learning the IT profession and educators and trainers engaged in defining curricula and course content.

## Introduction to the Guide

The *CIPS Guide to the Common Body of Knowledge for Computing and IT (CBOK)* is subdivided into eight knowledge areas:

- Professionalism and Ethics in Computing and IT
- Law and Regulations Relevant to Computing and IT
- Mathematics Foundations for Computing and IT
- Technical Knowledge for Computing and IT
- Quality Issues for Computing and IT
- Process Knowledge for Computing and IT
- Business Knowledge for Computing and IT

The knowledge areas are designed to provide a high level distinction among the various concepts, allowing the readers to find their way quickly to subjects of interest. Upon finding a subject, readers are referred to sub-topics, a definition of the sub-topics, a Bloom's knowledge level, and a list of references.

As an aid, notably to curriculum developers, each sub-topic has been provided a Bloom's knowledge level. The concept is that educational objectives can be classified into categories representing increasing depth. These must not, however, be viewed as a definitive classification, but much more as a starting point. Furthermore, in addition to identifying the Bloom's knowledge level for the Core level, different Blooms taxonomy levels have been identified for specific disciplines or education programs (i.e. software engineering, IS, business analysis).

The Bloom's knowledge levels are presented as follows:

- **Vocabulary:** Every computing and information technology professional should be able to understand the terminology in a conversation about this topic, to "know what they don't know" so they can delegate to others, and to know when others may or may not be competent in the area.
- **Comprehension:** Every computing and information technology professional should be able to intelligently discuss the topic and perform basic tasks using knowledge of the topic.
- **Application:** Every computing and information technology professional should be able to apply the knowledge so as to perform tasks in the area with a level of competence ordinarily expected in a work environment.



Almost all topics have references. The references are intended to:

- Help test creators determine material to test;
- Help learners master the material
- Serve as a resource so people can look up information

There are a total number of 264 references (books, web pages, papers). The CBOK is the 'guide' pointing to these references which are the 'body of knowledge'. The Guide does not attempt to be comprehensive in its references. Material was selected in part because—taken as a collection—it provides coverage of the topics described.

## Timeline of the CBOK Development

Certification and Accreditation Criteria Review	Summer/Fall 2012
The CBOK goes public	Spring 2012
Approval of the CBOK by CIPS	Spring 2012
Finalized the CBOK	Winter 2011
Second Draft Completed	Fall 2011
Review Results	Fall 2011
Stakeholder Consultation	Summer 2011
First Draft Completed	Spring 2011
Development of the CBOK	2010 – early 2011
Start of the CBOK Project	January 2010

## Common Body of Knowledge for Computing and IT (CBOK) Committee



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Dr. Peter King, I.S.P., ITCP



Dr. Wayne Cutcliffe



Jon Nightingale, I.S.P., ITCP



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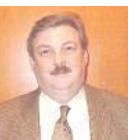
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Dr. Danny Yakimchuk



Gina van Dalen, CAE

## Review Team

Consultation on the draft Guide took place through an outreach campaign involving the broader IT community. This consultation wrapped up in the early fall of 2011. Over 175 individuals took part in the consultation. Following is a listing of those individuals who participated and agreed to have their name made public.

- Bonaventure Ayonote
- Ken Bainey
- Nadir Belkhiter
- Ed Bickley
- John Blackwell
- Ian Blanchard
- Harold Boley
- Gerald L. Caissy
- Craig Campbell
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- Ali Mrehach
- Janice Muir
- Rhonda Murdoch
- Daryle Niedermayer
- Yury Potapovich
- Don Tolson
- James Sweeney
- Alexey Sysoev
- James Williams

## The Evolution of the CBOK

The completion of the 2012 version of the *Guide to the Common Body of Knowledge* marks a milestone in reaching agreement on the content of the IT discipline. It, however, does not mark an end. The Guide will continue to evolve over time to meet the emerging needs of the IT community. Planning for the evolution process has started and will require approval by the CIPS Board of Directors.

CIPS is also working on ensuring that the CBOK has widespread adoption in the community of stakeholders. Presentations are made to the academic community, which is encouraged to use the CBOK in academic papers. Consultation is also taking place with the international community.

CIPS is now working with the Certification Council, which initially developed the criteria for the CIPS Professional Certification (ISP and ITCP), and the Accreditation Councils to reconcile the CBOK with these Councils' respective criteria.

It is anticipated that the 2012 the *Guide to the Common Body of Knowledge* will also be translated into French.

## CIPS Guide to the Common Body of Knowledge

### Knowledge Areas and Topics in the Body of Knowledge

#### A Professionalism and Ethics in Computing and IT

**A1 History:** History of computing and IT; computing prehistory; history of hardware, software, and networking; pioneers of computing. (vocabulary) [[R0002](#) , [R0003](#) , [R0005](#) , [R0006](#) , [R0008](#) , [R0009](#) ]

**A2 The profession:** Governing bodies and societies at the provincial, national and international level (CIPS, IFIP, ACM, engineering societies, others); roles of societies to protect society, advance knowledge, etc. (vocabulary) [[R0150](#) , [R0151](#) , [R0153](#) , [R0154](#) , [R0155](#) , [R0156](#) , [R0157](#) ]

**A3 Social responsibility and impact on society:** Responsibility to protect the public; corporate social responsibility; personal pro-bono donation of expertise; disastrous failures such as the Therac-25; personal impact such as the replacement of people through automation; impact of uses of computing, such as breaches of privacy; community, national and international impact. (comprehension) [[R0200](#) , [R0201](#) , [R0202](#) , [R0203](#) , [R0204](#) , [R0205](#) ]

**A4 Impact on the environment:** Green computing, waste disposal (comprehension) [[R0250](#) , [R0251](#) , [R0252](#) , [R0253](#) , [R0254](#) , [R0255](#) , [R0256](#) , [R0257](#) ]

**A5 Codes of ethics:** Codes of ethics of CIPS and other societies; discipline procedures for breach of codes; acceptable use policies; resolving ethical dilemmas (application) [[R0300](#) , [R0301](#) , [R0302](#) , [R0303](#) , [R0304](#) , [R0305](#) ]

**A6 The labour market:** Current and projected supply and demand; occupational characteristics; education and training requirements; classification systems and crosswalks; labour in a mature profession (fair and open competition; independence in thought and outlook) (vocabulary) [[R0350](#) , [R0351](#) ]

**A7 Standards for skills and education:** Accreditation (the Seoul Accord and its graduate attributes); bodies of knowledge such as CIPS CBOK and SWEBOK; skills frameworks such as SFIA (vocabulary) [[R0400](#) , [R0401](#) , [R0402](#) , [R0403](#) , [R0404](#) , [R0405](#) , [R0406](#) , [R0407](#) , [R0408](#) , [R0409](#) ]

**A8 Professional recognition:** Certifications such as ISP and ITCP (comprehension) [[R0450](#) , [R0451](#) , [R0452](#) , [R0453](#) , [R0454](#) , [R0455](#) , [R0456](#) , [R0457](#) , [R0458](#) ]

#### B Law and Regulations Relevant to Computing and IT

**B1 Tort and liability:** Basic definitions and principles of tort and liability; duty of care; standards of care (vocabulary) [[R1000](#) ]

**B2 Contracts:** Requirements of a valid contract; breach of contract; fixed-price vs. time-and-materials contracts; service-level and operational-level agreements; license agreements, including those for open source; outsourcing agreements; source code escrow agreements; cloud computing contracts (comprehension) [[R1050](#) , [R1000](#) ]

**B3 Privacy and access-to-information law:** The Privacy Act, PIPEDA; UN and OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data; US Patriot Act (comprehension) [[R1100](#) , [R1101](#) , [R1102](#) , [R1103](#) , [R1104](#) ]

**B4 Intellectual property law:** Patents, copyright, trade secrets, trademarks (comprehension) [[R1150](#) ]

**B5 Accountability:** Sarbanes Oxley and similar laws (vocabulary) [[R1200](#) , [R1201](#) , [R1202](#) , [R1203](#) ]

**B6 Whistle blowing and ethical dissent:** Legal protections for whistle blowers (vocabulary) [[R1300](#) ]

**B7 Law regarding access for the disabled:** Provincial disabilities acts (vocabulary) [[R1350](#) , [R1351](#) , [R1352](#) , [R1353](#) ]

**B8 Computer Crime:** Computer-based fraud, cyber bullying, cyberterrorism, piracy, hacking, virus dissemination, spam, phishing, spoofing, cyber defamation, denial of service attacks, cyber-stalking, obscene or offense content. (comprehension) [[R1400](#) , [R1401](#) , [R1402](#) ]

**B9 Workplace health and safety:** Freedom from harassment, repetitive stress injury (comprehension) [[R1450](#) , [R1451](#) , [R1452](#) , [R1453](#) ]

## C Mathematics Foundations for Computing and IT

**C1 Boolean logic:** Boolean operators, truth tables, Venn diagrams, inference rules (application) [[R2000](#) , [R2001](#) , [R2002](#) , [R2003](#) ]

**C2 Probability and statistics:** Rules of probability; analysis of simple data such as experiment results (comprehension) [[R2100](#) , [R2101](#) ]

**C3 Predicate logic:** Quantifiers, first order logic (including description logic), modal logic (comprehension) [[R2000](#) , [R2001](#) , [R2004](#) , [R2005](#) ]

**C4 Discrete mathematics:** (vocabulary) [[R2200](#) , [R2201](#) ]

**C5 Numerical computation and analysis:** Numerical errors; computational algorithms (vocabulary) [[R2300](#) , [R2301](#) , [R2302](#) , [R2303](#) , [R2304](#) , [R2305](#) ]

**C6 Differential and Integral Calculus:** (vocabulary) [[R2400](#) , [R2402](#) , [R2403](#) ]

## D Technical Knowledge for Computing and IT

**D1 Concept of a system:** Notion of a system in general; systems thinking (application) [[R3000](#) , [R3001](#) ]

**D2 Use of computers and IT systems:** Use of command line-based tools and graphical interfaces to control computers with different form factors and operating systems (mainframe, micro, mobile device, etc.); use of spreadsheets and word processors (application) [[R3100](#) ]

**D3 Software elements of a computer system:** Operating system, device drivers; maintenance, upgrading and patching of installed operating system and applications (comprehension) [[R3200](#) , [R3201](#) , [R3202](#) ]

**D4 Hardware elements of a computer system:** Processors, memory, busses, cache, I/O devices, internal and external storage, power supplies; computer troubleshooting, repair, installation and preventative maintenance. (comprehension) [[R3300](#) ]

**D5 Programming basics:** Control constructs (loops, selection) and conditions; functions/methods and recursion; structured programming; objects and classes; use of APIs, libraries and components; concurrency and parallelism (application) [[R3400](#) , [R3401](#) , [R3402](#) , [R3403](#) , [R3404](#) , [R3405](#) ]

**D6 Programming language types:** Procedural vs. logic vs. functional languages; level of abstraction (microcode, assembler, compiler, interpreter, etc.); statically vs. dynamically typed languages (comprehension) [[R3500](#) , [R3501](#) , [R3502](#) ]

**D7 Data structures:** Arrays, linked lists, hash tables and trees (application) [[R3600](#) , [R3601](#) , [R3602](#) , [R3603](#) , [R3604](#) , [R3605](#) ]

**D8 Algorithms:** Searching (binary search); selecting an efficient sort algorithm; basic notions of space and time complexity and of computability (application) [[R3605](#) , [R3701](#) ]

**D9 Information and data modeling:** Modeling data and information; use of notations including UML class diagrams and Entity-Relationship Diagrams (application) [[R4000](#) , [R4001](#) , [R4002](#) , [R4050](#) , [R4051](#) , [R8350](#) , [R4003](#) ]

**D10 Databases:** Tables, columns, keys, querying using SQL; normalization; relational and alternative models (application) [[R4100](#) , [R4101](#) , [R4104](#) , [R4106](#) ]

**D11 Business process and activity modeling:** Modeling activities and business processes, including BPEL, BPMN and UML activity diagrams (comprehension) [[R4200](#) , [R4050](#) , [R4051](#) , [R8350](#) , [R4201](#) ]



**D12 Software architecture and modeling:** Architectural patterns including client-server, layering, web architecture, pipe-and-filter, input-process-output; use of notations including UML for software architecture (comprehension) [[R4300](#) , [R4301](#) , [R4050](#) , [R8350](#) , [R4302](#) , [R4303](#) , [R4304](#) ]

**D13 Enterprise architecture and modeling:** The information technology services, processes and infrastructure of an enterprise; data architecture and technology architecture. (comprehension) [[R4400](#) , [R4401](#) ]

**D14 Networking:** Network architecture; OSI model and layers, including TCP-IP; addressing and subnetting; switching and routing (comprehension) [[R4500](#) , [R4501](#) , [R4502](#) ]

**D15 Organization of a data centre:** Layout; capacity; support infrastructure (power system, cabling, HVAC); managing system configurations (vocabulary) [[R4600](#) , [R4601](#) ]

**D16 Web concepts:** Web pages and websites; tables and forms; rich Internet applications, AJAX, Web 2.0; XML schemas, documents and transformations; JSON; semantic web concepts. (comprehension) [[R4700](#) , [R4701](#) , [R4702](#) ]

**D17 Real time systems concepts:** Hard real time, soft real time (vocabulary) [[R4800](#) ]

D18 Parsing and grammars: Writing grammars, use of parsing tools (vocabulary) [[R4850](#) , [R4851](#) , [R4852](#) , [R4853](#) ]

## E Quality Issues for Computing and IT

**E1 Quality models:** Quality systems (people, process, technology control, assurance verification, validation, acceptance, assessment, appraisal, audit); ISO (9001, 12207); CMM (CoBit, CMMI) (vocabulary) [[R5000](#) ]

**E2 External quality:** Efficiency, reliability, availability; accuracy of calculations (comprehension) [[R5100](#) , [R0157](#) ]

**E3 Human factors quality:** User interface design; usability, consumability, ergonomics; evaluation methods; accessibility (comprehension) [[R5200](#) , [R5201](#) , [R5202](#) , [R5203](#) , [R5204](#) ]

**E4 Internal quality:** Maintainability, reusability, migratability, operability, scalability (comprehension) [[R5100](#) ]

**E5 Security and privacy:** Logical and physical security; risks, threats, attack methods, breaches, vulnerabilities, safeguards, remediation; security domains (operating systems, network, data); social engineering; secure coding; basic cryptography; confidentiality, integrity and availability (identification, authentication, authorization, accounting and auditing business continuity and disaster recovery planning (comprehension) [[R5400](#) , [R5401](#) , [R5402](#) ]

**E6 Safety and critical systems:** Hazards, accidents and incidents; public safety (emergency and disaster scenarios); safety-instrumented systems; mission-critical systems (comprehension) [[R5500](#) , [R5501](#) ]

## F Process Knowledge for Computing and IT

**F1 Types of stakeholders:** Clients, users, management; role, needs, and perspectives of each type (vocabulary) [[R8000](#) , [R8001](#) , [R8002](#) , [R8350](#) ]

**F2 System development lifecycle:** Stages including requirements, design, implementation, deployment, retirement (application) [[R8100](#) , [R8101](#) , [R8102](#) , [R8103](#) , [R8104](#) , [R8350](#) , [R4303](#) ]

**F3 Categories of development methods:** Agile, iterative, prototyping (comprehension) [[R8150](#) , [R8103](#) , [R8104](#) , [R4303](#) , [R8151](#) , [R8152](#) , [R8153](#) ]

**F4 Types of requirements:** Quality, platform, functional (comprehension) [[R8250](#) , [R8103](#) , [R8104](#) , [R8350](#) , [R8252](#) ]

**F5 Gathering and validating requirements:** Interviewing, brainstorming; completeness, unambiguity, etc. (application) [[R8252](#) , [R8250](#) ]

**F6 Design principles:** Divide and conquer, reduce coupling, encapsulation; design patterns (application) [[R8350](#) , [R8351](#) , [R8352](#) , [R8103](#) , [R8104](#) ]

**F7 Testing principles:** Unit vs. system; black vs. white box; coverage; test cases; test plans; test-driven development (application) [[R8380](#) , [R8381](#) , [R8382](#) , [R8383](#) , [R8384](#) ]

**F8 Inspection principles :** Examining or measuring to verify whether an activity, component, result, product, service or process conforms to specified requirements. (comprehension) [[R8350](#) , [R8501](#) , [R8403](#) , [R8404](#) ]

**F9 Decision-making methods:** Intervention, financial; cost-benefit analysis; return on investment (comprehension) [[R8390](#) ]

**F10 Process visualization techniques:** Pert charts, Gantt charts (vocabulary) [[R8410](#) ]

**F11 Metrics and measurement:** Measuring products and processes; goal-question-metric method (vocabulary) [[R8415](#) ]

**F12 Change, version and configuration management:** Identification of configuration items; tools for version control and configuration management (application) [[R8420](#) ]

**F13 Risk management:** Types of risks, including obsolescence, lifecycle risks; risk identification; risk assessment; risk mitigation; risk re-evaluation (comprehension) [[R8430](#) , [R8501](#) , [R8432](#) , [R8433](#) ]

**F14 Information management:** Functional classification; record keeping; document management; retention and disposition authorities; e-discovery; access to information demands (vocabulary) [[R8450](#) , [R8451](#) , [R8452](#) , [R8453](#) ]

**F15 Standards:** Standards bodies; categorization of standards; SE, Networking, It etc. / IEEE, ISO, ITU; process and quality standards (ISO 12207, 9000, 2910; CMM) (vocabulary) [[R8480](#) , [R8481](#) ]

**F16 Continuous improvement of processes:** (comprehension) [[R8500](#) , [R8501](#) , [R8382](#) ]

## G Business Knowledge for Computing and IT

**G1 Organization of a business involving IT or computing:** Computing and IT businesses; IT within the business; projects, portfolios, programs and operations (vocabulary) [[R9100](#) ]

**G2 Value analysis:** Time value of money; discounted cash flow (vocabulary) [[R9200](#) ]

**G3 Business software application types:** ERP, Financial, HR, performance management, analytics, business intelligence (vocabulary)

**G4 Business continuity, disaster recovery:** (comprehension) [[R9400](#) , [R9401](#) ]

**G5 International business:** (vocabulary)

**G6 Electronic commerce:** (comprehension)

**G7 Service management:** Help desk; service desk; service-level agreements; workflow review and approvals (comprehension) [[R9700](#) , [R9701](#) , [R9702](#) , [R9703](#) ]

**G8 Security management:** Policies, procedures and standards (comprehension) [[R9800](#) ]

**G9 System acquisition:** Consider Business Cases, statements of work, procurement vehicles-MERX, solicitations, direct, assessment and award processes (vocabulary) [[R9850](#) , [R9851](#) , [R9853](#) ]

## H Soft skills

**H1 Problem solving:** Reasoning methods, research methods, general analysis methods (application) [[R9900](#) ]

**H2 Written communication:** Reports, business cases, strategies, plans, briefing notes, memos, email (application) [[R9910](#) , [R9911](#) , [R9912](#) , [R9913](#) ]

**H3 Oral communication:** Presentations, speeches, training, demonstrations (application) [[R9930](#) , [R9931](#) , [R9932](#) , [R9933](#) , [R9934](#) , [R9935](#) , [R9936](#) , [R9937](#) , [R9938](#) ]

**H4 Negotiating skills:** Listening, bargaining, win-win (comprehension) [[R9940](#) , [R9941](#) , [R9942](#) , [R9943](#) , [R9944](#) , [R9945](#) ]

**H5 Workplace culture:** Shared belief system of values and processes within an organization; dealing with supervisors and clients; mentoring; professional development; succession planning; personality types (comprehension) [[R9950](#) , [R9951](#) , [R9952](#) ]

**H6 Change management:** Leading people through transitions respecting their different stages of accepting change. (comprehension) [[R9960](#) , [R9961](#) , [R9962](#) , [R9963](#) , [R9964](#) ]

**H7 Leadership:** Leading by example, and not having to be the senior executive/role. Leadership based on the principle of being earned by those that choose to follow. (comprehension) [[R9972](#) , [R9973](#) , [R9974](#) , [R9975](#) , [R9976](#) , [R9977](#) , [R9978](#) , [R9971](#) ]

**H8 Teamwork:** Cooperating with others (application) [R9979 ]

**H9 Strategic planning:** Theory and application of strategic planning and outcomes-based performance reporting. (vocabulary) [[R9980](#) , [R9981](#) , [R9982](#) , [R9983](#) , [R9984](#) , [R9985](#) , [R9986](#) , [R9987](#) ]

**H10 Portfolio management:** Priority Setting; investment planning; risk management; asset lifecycle; management of licenses, hardware, and applications (vocabulary) [[R9991](#) , [R9992](#) , [R9993](#) , [R9994](#) , [R9995](#) , [R8501](#) ]

## Blooms taxonomy levels for specific disciplines or education programs

Core Blooms Level (Tab C)	Topics in the BOK		Blooms taxonomy levels for specific disciplines or education programs										
	ID	Short description	CS grad	SE grad	IS/IT grad	General engineer/ developer	software developer	Embedded systems designer	Business systems designer	/IT	Inter-action/ UI designer	IT services & support specialist	Business analyst
		<b>Professionalism and Ethics in Computing and IT</b>											
v	A1	History	v	v	v	v		v	v		v	v	v
v	A2	The profession	v	v	v	v		v	v		v	v	v
c	A3	Social responsibility and impact on society	c	c	c	a		a	a		a	c	c
c	A4	Impact on the environment	v	v	v	c		c	c		c	c	c
a	A5	Codes of ethics	c	c	c	a		a	a		a	a	a
v	A6	The labour market	v	v	v	v		v	v		v	v	v
v	A7	Standards for skills and education	v	v	v	v		v	v		v	v	v
c	A8	Professional recognition	v	v	v	c		c	c		c	c	c
		<b>Law and Regulations Relevant to Computing and IT</b>											
v	B1	Tort and liability	v	v	v	c		c	c		v	v	c
c	B2	Contracts	v	v	v	c		c	c		c	c	c
c	B3	Privacy and access-to-information law	c	c	c	c		c	a		c	c	c
c	B4	Intellectual property law	v	v	v	c		c	c		c	a	c
v	B5	Accountability	v	v	v	v		v	a		v	a	a
v	B6	Whistle blowing and ethical dissent	v	v	v	v		v	v		v	v	v
v	B7	Law regarding access for the disabled	v	v	v	c		v	c		a	a	c
c	B8	Computer Crime	v	v	v	c		c	c		c	a	c
c	B9	Workplace health and safety	v	v	v	c		c	c		c	a	c
		<b>Mathematics Foundations for Computing and IT</b>											
a	C1	Boolean logic	a	a	a	a		a	a		a	a	a

c	C2	Probability and statistics	a	a	c	a	a	a	c	a	c	c
c	C3	Predicate logic	c	a	c	a	a	c	c	c	c	c
v	C4	Discrete mathematics	c	c	v	c	c	v	v	v	v	v
v	C5	Numerical computation and analysis	v	v	v	v	v	v	v	v	v	v
v	C6	Differential and Integral Calculus	v	v	v	v	v	v	v	v	v	v

**Technical Knowledge for Computing and IT**

a	D											
a	D1	Concept of a system	a	a	a	a	a	a	a	a	a	a
a	D2	Use of computers and IT systems	a	a	a	a	a	a	a	a	a	a
c	D3	Software elements of a computer system	a	a	a	a	a	a	a	a	a	a
c	D4	Hardware elements of a computer system	c	c	c	c	c	c	c	a	c	c
a	D5	Programming basics	a	a	a	a	a	a	a	a	a	a
c	D6	Programming language types	a	a	v	a	a	a	c	c	c	c
a	D7	Data structures	a	a	c	a	a	a	a	a	a	a
a	D8	Algorithms	a	a	c	a	a	a	a	a	a	a
a	D9	Information and data modeling	a	a	c	a	a	a	a	a	a	a
a	D10	Databases	c	c	a	a	a	a	a	a	a	a
c	D11	Business process and activity modeling	c	c	a	a	c	a	c	a	a	a
c	D12	Software architecture and modeling	c	a	c	a	a	a	c	c	c	c
c	D13	Enterprise architecture and modeling	v	v	c	c	c	c	c	c	c	c
c	D14	Networking	c	c	v	c	c	c	c	a	a	c
v	D15	Organization of a data centre	v	v	c	v	v	c	v	a	a	c
c	D16	Web concepts	c	c	c	c	c	a	a	a	a	c
v	D17	Real time systems concepts	v	c	v	c	a	v	v	v	v	v
v	D18	Parsing and grammars	v	c	v	c	c	v	v	v	v	v

**Quality Issues for Computing and IT**

v	E											
v	E1	Quality models	v	v	v	c	v	v	v	v	v	v
c	E2	External quality	a	a	c	a	a	a	c	a	a	c

c	E3	Human factors quality	c	a	a	a	c	a	a	c	c
c	E4	Internal quality	a	a	c	a	a	a	c	c	c
c	E5	Security and privacy	a	a	c	a	a	a	c	a	c
c	E6	Safety and critical systems	a	a	c	a	a	a	c	c	c

**Process Knowledge for Computing and IT**

v	F1	Types of stakeholders	v	c	v	a	v	a	a	a	a
a	F2	System development lifecycle	c	a	c	a	a	a	a	a	a
c	F3	Categories of development methods	c	a	c	a	c	a	c	c	c
c	F4	Types of requirements	c	a	c	a	c	a	c	c	a
a	F5	Gathering and validating requirements	c	a	c	a	a	a	a	a	a
a	F6	Design principles	c	a	c	a	a	a	a	a	a
a	F7	Testing principles	c	a	c	a	a	a	a	a	a
c	F8	Inspection principles	c	a	c	a	a	a	a	c	c
c	F9	Decision-making methods	c	c	c	a	c	a	c	a	a
v	F10	Process visualization techniques	v	c	v	a	v	a	v	c	a
v	F11	Metrics and measurement	v	c	v	a	a	c	c	c	v
a	F12	Change, version and configuration management	a	a	a	a	a	a	a	a	a
c	F13	Risk management	v	c	v	a	c	a	c	a	a
v	F14	Information management	v	v	c	v	v	c	v	a	a
v	F15	Standards	v	c	v	c	c	c	c	c	c
c	F16	Continuous improvement of processes	v	v	v	c	c	c	c	c	c

**Business Knowledge for Computing and IT**

v	G1	Organization of a business involving IT or computing	v	v	c	v	v	a	v	a	a
v	G2	Value analysis	v	c	v	a	v	a	v	a	a
v	G3	Business software application types	v	v	c	v	v	a	v	a	a
c	G4	Business continuity, disaster recovery	v	c	c	c	c	a	c	a	a
v	G5	International business	v	v	v	v	v	v	v	v	c

c	G6	Electronic commerce	v	v	v	c	c	c	c	c	c
c	G7	Service management	v	c	v	c	c	a	c	a	a
c	G8	Security management	v	c	c	c	c	v	c	a	c
v	G9	System acquisition	v	v	c	v	v	v	v	a	c

<b>H</b>			<b>Soft skills</b>								
a	H1	Problem solving	a	a	a	a	a	a	a	a	a
a	H2	Written communication	a	a	a	a	a	a	a	a	a
a	H3	Oral communication	a	a	a	a	a	a	a	a	a
c	H4	Negotiating skills	c	c	c	a	a	a	a	a	a
c	H5	Workplace culture	c	c	c	c	c	c	c	c	c
c	H6	Change management	c	c	c	c	c	c	c	c	c
c	H7	Leadership	c	c	c	c	c	c	c	c	c
a	H8	Teamwork	a	a	a	a	a	a	a	a	a
v	H9	Strategic planning	v	v	v	v	v	c	v	c	a
v	H10	Portfolio management	v	v	v	v	v	v	v	v	c



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