

**Research Report
on
“Development of a Certification
Roadmap for IT Professional
Certification” Project**

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(HKCS)**

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Executive Summary

In view of the multitude of qualifications awarded by different bodies, covering different IT professional disciplines, skill levels and experience, there is an initiative for the ICT Industry to prepare an IT Career Matrix and a roadmap for professional qualifications for IT professionals.

New certification titles being conceived in the future must (1) satisfy the immediate and/or most important needs of the IT industry of Hong Kong and (2) not duplicate those already offered locally or internationally to ensure maximum benefits and to avoid duplication of resources.

The matrices and roadmap developed aim to be multi-purposeful and benefit students, IT practitioners, employers, professional bodies, academic and training institutions as well as the Government by providing clear guidelines and benchmarks for the IT industry as a whole. In particular it will allow IT professionals to plan their career development more effectively and certification providers to develop certifications that focus on satisfying the requirements of the Industry.

For this reason, a “Development of a Certification Roadmap for the IT Professional Certification” project was initiated by HKCS and partial funding sponsorship has been obtained from OGCIO.

A 3 x 7 generic job titles matrix was first developed to identify the generic job

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responsibilities for 7 job categories at 3 competency levels. The 3 competency levels are (1) Master (2) Specialist and (3) Practitioner. The 7 job categories are (1) Software Engineering/Software Development (2) Quality Assurance (3) Project Management (ICT) (4) IT Architecture (5) Service Management and Operation (6) Information Security and (7) Multimedia.

A job description for each category at different competency levels is attached in Appendix A-2 in this report.

To complement the 3 x 7 generic job titles matrix, a corresponding competency standards matrix was developed. It serves to identify the task competencies required for each job category at each of the 3 levels. It is based on the complexity, the scale and the unprecedented challenges inherited in a job in addition to the needed industry-specific knowledge, professional skills and soft skills.

Competency Standards for each job category are attached in Appendix B in this report.

In order to create the Certification Roadmap, a review of approximately 1,000 existing local and international IT-related certifications was completed. Based on this review, a mapping exercise and gap analysis was conducted to analyze whether any “gaps” exist in the coverage of certifications for the full spectrum of IT jobs. The mapping was done by comparing the competencies of each job category at each competency level to the knowledge requirements of each certification. If the knowledge required by a certification can fulfill such a competency, then a ‘match’ is indicated for that competency. Outcome can be (1) largely equivalent (2) somewhat relevant (3)

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significantly different.

Based on the research, it is observed that most of the job categories appear to have at least one available certification which is largely equivalent to acknowledge the competency required. As such, it is suggested that no heavy effort is required to develop new certification for most of the job categories. Exceptions are Quality Assurance at Practitioner level and Multimedia at Master level.

There is no available UoC for the category of Multimedia for the time being. This is a fast emerging job category, it is suggested that relevant competency standards can be defined by HKQF as soon as possible so that relevant certification can be created and appropriate resources can be allocated to develop more professionals in this area.

The Gap Analysis summary is attached in Appendix D-1 in this report.

In order to ensure that the findings from the various matrices and gap analyses derived are useful to those in the industry and the public, the report should not be a “snapshot”, but rather a continual process so that findings stay relevant and sustainable to the IT industry over time. As such, a periodic review of available certifications is required. To do this, HKCS will set up a Review Committee and develop a review process for continual review, refinement and expansion of the Matrix and Roadmap.

In addition, continuous efforts were made to strengthen collaboration opportunities between Hong Kong and the Mainland on whether cross and reciprocal recognition of certification is feasible. Continuing efforts will be made towards the alignment of the

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suggested 3 x 7 matrix with those certifications in the Mainland. Certificates issued in the Mainland are primarily technically-focused and shall be able to fill the lack of certification at the technician level in Hong Kong. On the other hand, it is suggested to have additional publicity in the Mainland about the Hong Kong certifications which are more focused on professional development at higher levels. This is complementing to the current certifications in the Mainland on developing their professional and soft skills.

As described, this Roadmap project consists of extensive research on existing certificates and provides information about the availability of existing certificates against each of the levels within the job categories, however, it is not about validating, evaluating or endorsing any existing certifications. Any potential ‘gaps’ in the certification spectrum can be further explored by relevant stakeholders for appropriate actions.

Glossary

A

ACA	Adobe Certified Associate
ACE	Adobe Certified Expert
ACI	Adobe Certified Instructor

C

CASQ	Certified Associate in Software Quality
CAST	Certified Associate in Software Testing
CEIAEC	工业和信息化部教育与考试中心
CISA	Certified Information Systems Auditor
CISM	Certified Information Security Manager
CPIT	Certified Professional of IT
CPIT (APM)	Certified Professional of IT – Associate Project Manager
CPIT (Info Sec)	Certified Professional of IT – Information Security Officer
CPIT (PD)	Certified Professional of IT – Project Director
CPIT (QAM)	Certified Professional of IT – Quality Assurance Manager
CPIT (SA)	Certified Professional of IT – Systems Architect
CSDA	Certified Software Development Associate
CSDP	Certified Software Development Professional
CSQA	Certified Software Quality Analyst

E

EDB	Education Bureau
ERB	Employment Retraining Board

H

HKCS	Hong Kong Computer Society
HKIE	Hong Kong Institute of Engineers
HKQF	Hong Kong Qualifications Framework
HKITPC	Hong Kong Institute for IT Professional Certification
HKU	University of Hong Kong
HKU SPACE	HKU School of Professional and Continuing Education

I

ICT	Information and Communications Technology
IEEE	Institute of Electrical and Electronics Engineers
ISACA	Information Systems Audit and Control Association
IT	Information Technology
ITAC	Industry Training Advisory Committee
ITIL	Information Technology Infrastructure Library
IVE	Hong Kong Institute of Vocational Education

O

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OGCIO Office of the Government Chief Information Officer

P

PgMP Program Management Professional

PMI Project Management Institute

PMP Project Management Professional

PRINCE2 PROjects IN Controlled Environments 2

Q

QAI Quality Assurance International

S

SCMP South China Morning Post

SCS Specification of Competency Standards

SME Small and Medium Enterprises

SCS_ict_0.1.pdf Specification of Competency Standards – Software Products and
Software Services (SW) Branch, Information and
Communication Technology Industry Hong Kong

U

UoC Unit of Competencies

V

VTC Vocational Training Council

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Chapter 1 : Background and Objectives

1. Background

- 1.1 In view of the multitude of qualifications awarded by different bodies, covering different IT professional disciplines skill levels and experience, there is a need for the ICT Industry (the Industry) to prepare a roadmap of qualifications.
- 1.2 Based on this roadmap, new titles being conceived in the future must satisfy the immediate and/or most important needs of the Industry and not duplicate those already offered locally or internationally. In this way, maximum benefits are achieved as resources and efforts are put to good use in future development projects.
- 1.3 This roadmap will allow IT professionals to plan their career development more effectively and certification providers to develop certifications that focus on satisfying the requirements of the Industry.
- 1.4 To develop this roadmap, a “Development of a Certification Roadmap for the IT Professional Certification” project (the Project) was initiated by HKCS and partial funding sponsorship has been obtained from OGCIO.
- 1.5 HKCS is the project owner and take the lead in implementing the project.

HKCS has subcontracted HKITPC as the implementation agent to grant

Certified Professional of IT (CPIT) titles. These titles include assessment-based senior IT management titles as well as examination-based entry level IT practitioner titles.

- 1.6 HKCS has contracted HKU SPACE to develop the Matrix and Roadmap, and conduct a market survey.

2. Project Objectives

- 2.1 The objective of this project is to identify the needs for developing local certifications. If current certifications can satisfy the competency standards for a specific job category, there is no need to introduce any local certifications. On the other hand, if there are areas that existing certification cannot fulfill, opportunities exist to either introduce a new local certification or to embellish existing certifications to meet the competency requirements.
- 2.2 This Roadmap project is not about validating, evaluating or endorsing any existing certifications. Any potential ‘gaps’ in the certification spectrum can be further explored by relevant stakeholders.

3. Market Research Objectives

- 3.1 To review all IT certifications (covering local, overseas and China Mainland)

available that can satisfy the qualification needs of job titles in the Matrix.

- 3.2 To understand and confirm stakeholders’ needs towards existing and new certifications required in their business operation and professional practice.
- 3.3 To identify the value of certifications to stakeholders, the desirability of certifications, and the appeal for customized certifications.
- 3.4 To understand the willingness of employers to recognize as well as sponsor certifications in their workplaces.
- 3.5 To promote the Roadmap and Plan.

4. Members of the Project Team

- Mrs. Agnes Mak, MH, JP - Honorary Advisor
- Mrs. Theresa Lui - Project Director
- Mr. Timothy Hui - Project Manager (from August 2010 to July 2011)
- Mr. Ming Li – Project Manager (from May 2010 to July 2010)

5. Acknowledgement

Professionals from across the IT industry have contributed to this project as members of the Steering Committee, Industry Panel and Expert Groups. The project would not be successful without their support and insights, and the Project Team would like to express sincere gratitude to these professionals listed in sections 5.1 to 5.4 below.

5.1 Steering Committee

- Ir. Stephen Lau, JP (Chairperson)
- Ir. Dr. K P Chow
- Mr. Daniel Eng
- Mr. Andy Ho
- Prof. Jimmy Lee
- Mr. Sunny Lee, JP
- Ir. Albert Leung
- Mr. Eric Lung
- Mrs. Agnes Mak, MH, JP (Project Advisor)
- Mr. H P Suen
- Dr. C K Wong
- Mr. Raymond Wong
- Mr. Michael Yung

5.2 Industry Panel

- Dr. C K Wong (Chairperson)
- Ir. Dr. C L Chan
- Mr. Raymond Chan
- Prof. Patrick Chau
- Ir. Dr. K P Chow
- Mr. Andy Ho
- Mr. Gabriel Pang
- Mr. Raymond Wong
- Mr. Raymond Yu

5.3 Expert Groups

- Prof. Yeung Yuet-Bor (Chairperson)

Information Security

- Mr. Andy Ho (Team Convener)
- Mr. Frank Chow

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- Mr. Daniel Eng
- Dr. Wai Wa Fung
- Mr. Michael Huen
- Mr. Vincent Ip
- Mr. Calvin Lam
- Mr. Luke Ma
- Mr. Kenneth Wong
- Mr. Sang Young

Multimedia

- Dr. Eric Liu (Team Convener)
- Dr. Chak Man Ng
- Mr. Wilson Yuen

Project Management (ICT)

- Mr. Anthony Lung (Team Convener)

Quality Assurance

- Mr. Luke Ma (Team Convener)
- Mr. Frank Chow
- Mr. Michael Huen

Software Engineering/Software Development

- Ir. Clifford Tse (Team Convener)
- Dr. Thomas Lee
- Mr. Eric Lung

IT Architecture

- Mr. K C Fung (Team Convener)
- Dr. Kent Leung

Service Management and Operation

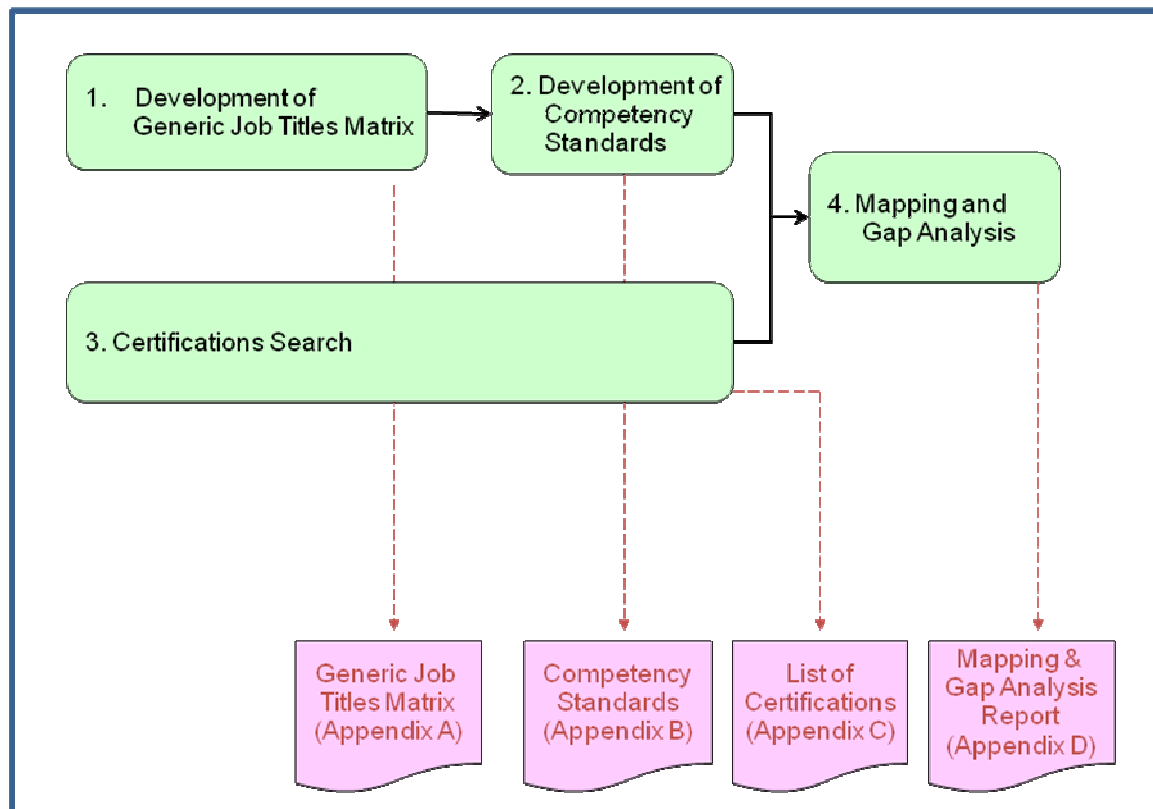
- Mr. H P Suen (Team Convener)
- Mr. Derek Fu
- Ms. Yantl Sze
- Mr. Anthony Yeung

5.4 HKU SPACE research team

- Dr. Raymond Szeto (Project Director)
- Mr. Teddy Chan
- Mr. Stephen Cheng
- Dr. Joseph Chui
- Mr. Alex Kwan
- Mr. Kelvin Lee
- Ms. Eilean So
- Mr. Clement Wong

Chapter 2 : Methodology

The Roadmap project was conducted in 4 phases:



1. Development of Generic Job Titles Matrix

- 1.1 The objective of this first phase was to identify the generic job responsibilities for the 7 job categories by 3 competency levels. (Remarks: Originally it was planned to adopt 8 job categories by 3 competency levels. Please refer to Point 2.3 of Chapter 2 for explanation). The Project Team obtained the foundation work already carried out by Dr. C.K. Wong as well as the biennial Manpower Survey Report – IT Sector done by the Vocational Training Council of Hong

Kong. They have produced documents listing some common job titles used in the IT industry, as well as some general job descriptions for these job titles.

- 1.2 Using these previous works as a foundation, the Project Team then reviewed relevant recruitment advertisements in newspapers, such as the SCMP, as well as websites, such as Jobsdb.com and Monster.com, to understand the most up-to-date job requirements and job titles in the market. With input from the Expert Groups in this Project, enhancements were made to complete the job descriptions in some of the job categories.
- 1.3 The output from this phase is a high-level 3 x 7 matrix with suggested generic job titles for each job category split according to the 3 competency levels (ref. Appendix A-1). The detailed job descriptions for each generic job title are also documented as reference material for employers as well as job seekers (ref. Appendix A-2).

2. Development of Competency Standards

- 2.1 Based on the Generic Job Titles Matrix, the next phase was to identify the competencies relevant to each generic job title. Stated in point 48 and 49 of SCS_ict_0.1.pdf (i.e. Specification of Competency Standards for ICT) issued by HKQF, Unit of Competencies (UoCs) are the basic building blocks for work

competencies. The ICT ITAC allows different users, e.g. recruiters, of the SCS to form clusters of UoCs freely to suit their own needs. For details of SCS and UoC in the Industry, please refer to Specification of Competency Standards (SCS) of SCS_ict_0.1.pdf (Chapter 3).

- 2.2 The Project Team follows this approach and identifies the relevant UoCs for each job description solicited from the Generic Job Titles Matrix. Additional competencies currently not included in existing UoCs, but are perceived to fit with the generic job titles (by both the research team and Expert Group members) are also incorporated in the subsequent mapping exercise and gap analysis.
- 2.3 A single item in one job description list may encompass several UoCs, and conversely a UoC may be required for several job roles.
- 2.4 For one particular job category, i.e. Multimedia, the UoCs have not been defined by the HKQF. These will be identified by the Project Team together with the respective Expert Group.
- 2.5 For the Information Service job category, the UoCs tend to be general management and systems management-related. Due to similarities with the Systems Management and Operations job category, after consulting with the respective Expert Groups and gaining endorsement from the Industry Panel and

the Steering Committee of this Project on 19 May 2011, it was decided that the Information Service job category should be merged with Systems Management and Operation, and renamed to Service Management and Operation.

- 2.6 The output is a set of Competency Standards, one per job category, sub-divided into the 3 competency levels (ref. Appendix B). Establishing these standards is important as current and future certifications should be based on these competencies and not on job responsibilities.

3. Certifications Search

- 3.1 This phase ran in parallel to the first two phases. While the Generic Job Titles Matrix and the Competency Standards were being developed, another team of researchers systematically scanned through the websites of organizations offering certifications in the 7 IT job categories. These organizations were mostly professional associations, vendors and training providers. Since there are so many certifications offered globally, only those from the major industrialized countries or regions where Hong Kong have close bonding, such as USA, UK, Australia, Canada, Japan, Singapore, and China Mainland were collected. The Project Team believed these to be the most relevant and representative to the Hong Kong Industry.

- 3.2 The output is a list of certifications commonly available around the world for respective categories (Ref. Appendix C-1). It should be noted that certifications are continuously evolving with new ones being introduced and old ones being phased out. As such, this list only represents a snapshot of the situation at the time of the study, and is by no means exhaustive.

4. Mapping and Gap Analysis

- 4.1 The last phase was to map the List of Certifications to the Competency Standards by the 7 job categories and the 3 competency levels. The objective was to identify whether there are any ‘gaps’ in the coverage of the existing certifications for the whole spectrum of IT jobs.
- 4.2 Vendor specific certification falls out of the scope of this research.
- 4.3 The mapping was completed by comparing the competencies of each job category at each competency level to the knowledge requirements of each certification. If the knowledge required by a certification can fulfill such a competency, then a ‘match’ is indicated.
- 4.4 3 levels of matching were defined and endorsed by the Industry Panel and Steering Committee of this project. In each job category, for those certifications that matched to a large number of competencies (at least 65%), the certifications

were classified as ‘largely equivalent’. For those certifications that matched to very few of the competencies (less than 20%), they were classified as ‘significantly different’. For those certifications whose matching falls between ‘large equivalent’ and “significantly different”, they were classified as ‘somewhat relevant’. The certification classification was based only on the number of competencies it matched, without any weightings assigned to account for differences in the importance of those competencies.

4.5 However, a point should be noted. A certificate awarding for a particular job category may have been classified into the category of “significantly different” due to a lack of adequate information for the mapping (either without examination syllabus or awarding criteria).

4.6 To summarize the matching exercise, a 3 x 7 gap analysis matrix is produced (ref. Appendix D-1), in which the highest level of matching is adopted for each cell in the matrix. Cells with ‘largely equivalent’ or ‘somewhat relevant’ classifications indicate that there is at least one international certification covering those areas, and it will be subject to review whether more certifications in those areas are required. On the other hand, cells with ‘significantly different’ classifications indicate opportunities for additional certifications, and are worth further exploration.

- 4.7 There are 2 other deliverables prior to the production of this final report (i.e. the final deliverable). The first deliverable is the Generic Job Titles Matrix. The second deliverable is the Competency Standards Matrix.
- 4.8 There are 3 levels of approval for each deliverable. A deliverable is individually approved by the respective Expert Groups first, and then endorsed in the Expert Group Meeting. It is then forwarded to the Industry Panel for its endorsement, before it is finally accepted by the Steering Committee.

5. Validation Process

- 5.1 After completion of the initial mapping exercise and gap analysis, the research findings underwent a validation process.
- 5.2 The validation is divided into 2 phases – (1) face-to-face interview (2) public consultation sessions.
- 5.3 Face-to-face interviews were conducted with 30 employers, professional bodies and academia individually to obtain their opinions on the initial findings obtained at earlier stages. Survey questionnaires are attached in this report as Appendix E-1, E-2 and E-3. Survey questionnaires act as discussion guides and are not submitted to interviewees for their completion. Samples are selected from recruitment agencies; government departments; non-governmental bodies;

banks; IT vendors; IT outsourcing service firms; e-business firms; logistics providers; public utility providers and telecommunication providers. The wide spectrum of interviewees selected provides a good representation of industry employers’ view as a whole.

5.4 Samples were selected from organizations of various employment size:

- 10-20
- Several hundreds
- About 1,000
- Over 50,000

thus providing a valid representation of different sized organizations.

5.5 The initial findings from phase 1 were further validated by conducting 2 sessions of public consultation - one was mainly for employers and the other was mainly for professional bodies, academia and training providers. All interested public was welcome to join either or both.

Chapter 3 : Findings

General acceptance of the 3 x 7 Matrix by public

1. In the Industry, there is a broad spectrum of jobs/tasks under different job categories.

For each job category, a mix of different levels of competency is required to perform a job/task depending on the complexity, the scale and the unprecedented challenges inherited. Competency, as described by HKQF, includes the following 4 dimensions (1) Knowledge and Intellectual skills (2) Mastery of the right process (3) Wisdom to apply appropriate knowledge and skills towards the job, degree of autonomy & accountability (4) Strength in communication, IT and numeracy. These dimensions of competency identified are generally accepted across industries and academia as crucial to perform a job with quality.

2. The classification of job/task categories in the Industry was based upon the work previously completed by the VTC of Hong Kong and Dr. C.K. Wong in their biennial Manpower Survey Report – IT Sector, in addition to the work from the ICT ITAC which identified 8 functional areas during SCS development in the Industry. These classifications of functional areas (job category) also receive public acceptance. Therefore the Project Team used these as a foundation to build up the

matrices.

3. The SCS mainly comprises task-based competency standards, which are benchmarks for skills required to perform different job functions of the Industry, including industry-specific knowledge, professional skills and soft skills. In the development of SCS for the Industry, the ICT ITAC identified most of the level of competency required to perform the respective IT jobs are in the region of Level 4 to Level 6 under the 7 competency level hierarchy of HKQF. This reflects the nature of IT industry is knowledge based and plays an important role in the knowledge economy. For the details of 7 competency levels, please refer to Qualifications Framework (QF). (http://www.hkqf.gov.hk/guie/HKQF_GLD.asp)
4. Considering the respective categories defined by aforesaid bodies, competency dimension defined by the HKQF in their generic level descriptor, as well as under the advice of Industry Panel of this Project, the Project Team proposed to develop a matrix template of 3 competency levels x 7 job categories of the Industry. All subsequent research works were based on this 3 x 7 matrix template.
5. After the development of the generic job titles matrix, the competency standards matrix and the completion of initial mapping exercise and gap analysis, the research

proceeded next to the validation process. The validation is divided into 2 phases.

First of all, a face-to-face interview was conducted with a number of employers, professional bodies and academia individually to obtain their opinions on the subject. The initial findings from phase 1 were then summarized, presented and proceeded to the next phase for a second validation. 2 public consultation sessions were conducted to validate the findings. One consultation session was for employers. Another consultation session was for professional bodies, academia and training institutions. In summary, most attendees in all public consultation sessions (including previous sessions held at earlier stage) are supportive of the research work done as well as the initial findings obtained.

The 3 x 7 Matrix

6. The 3 proposed competency levels are (1) Master (2) Specialist (3) Practitioner.

(Definition of the 3 competency levels are listed in point 7 – point 9 below.) The 7 proposed job categories are (1) Software Engineering/Software Development (2) Quality Assurance (3) Project Management (ICT) (4) IT Architecture (5) Service Management and Operation (6) Information Security and (7) Multimedia.

7. The definition of Master Level Competency includes:

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- Being able to apply knowledge and skills in a broad range of professional work activities
- Practising significant autonomy in determining and achieving personal and/or group outcomes
- Accepting accountability in related decision making including use of supervision
- Demonstrating leadership and/or make an identifiable contribution to change and development
- Functional area wise:
 - Involving functions in which the majority of job assignments involve complex and exceptionally difficult problems
 - Requiring advance and comprehensive technical knowledge in one or more specialty areas
 - Requiring anticipation of customer (both internal and external) and systems needs, and formulation and implementation of plans to meet these needs
 - Requiring development of solutions that combine information and ideas in new and unprecedented ways
 - Accepting work assignments that generally include team coordination, project planning, strategic planning, work lead and training functions
 - Working independently

8. The definition of Specialist Level Competency includes:

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- Performing tasks involving planning, design, and technical skills, and involving some management functions
- Accepting responsibility and accountability with broad parameters for determining and achieving personal and/or group outcomes
- Working under mentors or senior qualified practitioners
- Dealing with ethical issues, seeking guidance of others where appropriate
- Functional area wise:
 - Having the majority of the job functions in one or more technical specialty area(s)
 - Ability to handle multiple assignments
 - Accepting work assignments which may include team coordination, work lead and training functions
 - Requiring minimal to moderate supervision
 - Accepting work assignments that are of moderate to high complexity and require a wide range of problem solving skills
 - Developing practical and thorough solutions
 - Developing proactive applications (standard and non-standard)
 - Exploring and adapting applications with changing technologies
 - Identifying, evaluating and resolving routine and non-routine problems
 - Integrating, coordinating and interpreting technical information

9. The definition of Practitioner level Competency includes:

- Performing skilled tasks that require some discretion and judgment, and undertaking a supervisory role

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- Undertaking self-directed and some directive activities
- Operating within broad general guidelines or functions
- Taking responsibility for the nature and quantity of own outputs
- Meeting specified quality standards
- Accepting some responsibility for the quantity and quality of the output of others
- Functional area wise,
 - Being able to perform assignments of low to medium complexity
 - Taking up limited technical, problem solving, training and team coordination responsibilities
 - Taking up limited responsibility for interpretation and communication of information, ideas and instructions

10. With regard to the IT job market under different categories at different levels, there are many different job titles, but performing similar tasks and functions. To avoid confusion, the Project Team proposes some suggested title in the following Generic

Job Titles Matrix (Appendix A-1):

Job Category Competency Level	Software Engineering / Software Development	Quality Assurance	Project Management (ICT)	IT Architecture	Service Management and Operation	Information Security	Multimedia
Master	Software Engineering Manager	Software Quality Assurance Manager	IT Project Director	IT Architect Manager	Service Operation Manager	Information Security Manager	Multimedia Content Manager
Specialist	Senior Software Engineer	Software Quality Assurance Specialist	IT Project Manager	Senior IT Architect	System Operation Specialist	Information Security Specialist	Multimedia Content Specialist
Practitioner	Software Engineer	Software Quality Assurance Professional	Assistant Manager, IT Projects	IT Architect	System Operation Officer	Information Security Officer	Multimedia Content Developer

11. Based on advice from Expert Groups and endorsement by the Industry Panel, the Project Team worked out the generic job descriptions of each job category. (Point 12 – Point 18 below) For a more detailed description to differentiate job roles for different competency levels, please refer to Appendix A-2.

12. Generic Job Descriptions for Software Engineering/Software Development: (ref. Appendix A2.1)

- Participate in the strategic management of software development
- Provide technical direction in the design, development and testing of software systems, sub-systems, components and frameworks
- Oversee the software development life cycle and resolve problems
- Manage technical resources and human resources
- Take the lead in designing training programmes to clients and subordinates
- Carry out quality control and quality assurance in software development
- Understand the business implications of technical solutions and assist in defining the technology solutions to support any future business requirements
- Act as the key interface between business and technology teams in defining and influencing business requirements and assist in developing the appropriate system solutions
- Undertake software deployment, maintenance, migration, decommissioning assignments as necessary
- Arrange user training

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- Perform programming
- Monitor and report system testing and user acceptance

13. Generic Job Descriptions for Quality Assurance: (Ref. Appendix A2.2)

- Establish standards, policies and guidelines to ensure that the software developed by and implemented in the organization is of high quality
- Design testing strategies for information systems and software
- Develop or adopt tools to support these testing strategies
- Develop and conduct the test plans

14. Generic Job Descriptions for Project Management (ICT): (Ref. Appendix A2.3)

- Plan, direct and coordinate activities for designated IT projects to ensure that goals or objectives are achieved within a prescribed time frame and budget
- Review project proposals or plans to determine time frame, budget, procedures, staffing requirements and allocation of resources for various phases of the project
- Provide technical advice to the project team and resolve problems together with the team
- Oversee project documentation
- Communicate project progress, risks, expectations, time lines, milestones and other key project metrics to clients and team members
- Manage project closures and review lessons learned

15. Generic Job Descriptions for IT Architecture: (Ref. Appendix A2.4)

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- Define, prioritize and document architecture vision and principles for an organization
- Define, review and validate network architecture principles
- Define, review and document a technology architecture baseline
- Establish processes to monitor the adopted architecture principles, design guidelines and resultant designs

16. Generic Job Descriptions for Service Management and Operation: (Ref. Appendix A2.5)

- Contribute to the planning of IT service strategy, service design, service transition and service operation
- Manage the service portfolio and service catalogue
- Ensure applicable processes are in place to support service design, service transition and service operation
- Maintain IT service continuity plans to meet user requirements

17. Generic Job Descriptions for Information Security: (Ref. Appendix A2.6)

- Establish standards, policies and guidelines to protect the information assets of an organization
- Design and implement defensive mechanisms to detect and prevent malicious attacks and intrusion into information systems; as well as to guard against unauthorized disclosure and tampering of information assets of the organization
- Investigate and report incidents of security breach
- Design and implement security audit standards and procedures, and conduct security audits to ensure compliance as well discover vulnerabilities

18. Generic Job Descriptions for Multimedia: (Ref. Appendix A2.7)

- Design and create web pages, animation graphics and multimedia content for integration with IT applications in accordance with business requirements, strategies and directions
- Plan and manage the design and production of multimedia, which include animated sequences such as digital modeling of 3-D objects, lighting effects, textual effects and various motion effects; and digital games based on various technology platforms

19. Based on the Generic Job Titles Matrix developed, a Competency Standards Matrix

is compiled. Details are attached herewith as Appendix B with contents as follows:

- B-1: Suggested relevant working experience required for awarding a certification at each respective competency level.
- B-3: Competency standards – Software Engineering/Software Development
- B-4: Competency standards – Quality Assurance
- B-5: Competency standards - Project Management (ICT)
- B-6: Competency standards - IT Architecture
- B-7: Competency standards - Service Management and Operation
- B-8: Competency standards - Information Security
- B-9: Competency standards - Multimedia

Perceived value of the 3 x 7 Matrix

20. This matrix covers a great majority of IT job categories performed by professionals working in Hong Kong and it reflects the current employment picture of the Hong Kong IT industry. The matrix can be multi-purposeful to benefit respective stakeholders, namely students, IT practitioners, employers, professional bodies, academia and training institutions as well as the Government.
21. As additional information, it is observed that most IT professionals working in Hong Kong are in the Software Engineering/Software Development as well as Project Management (ICT). Professionals are not evenly distributed among all job categories.
22. For students and individuals who are interested in working in the Industry, it is expected that this matrix (can be regarded as career matrix) can offer a holistic view and insight of the Industry in Hong Kong and allow for better career development planning. An informal survey on the general public reflected that a lot of people in Hong Kong viewed the scope of IT jobs on the market to be quite narrow and dull, and mainly confined to programming jobs. This impression may discourage people from entering this profession. This matrix can rectify this myopia and attract more

youth to join this interesting and challenging industry.

23. For practitioners who are already in the IT profession, the 3 x 7 matrix aims to provide a path for their personal development and career advancement, and enable them to understand the necessary competencies required for career promotion.

Feedback indicated that people are often confused by the myriad of certifications and courses in the market. There is a strong need to provide a roadmap and guidance on the industry, so that they understand which areas need to be trained or strengthened.

24. For employers, the matrix, together with the job descriptions and related task-based competencies, can facilitate them in the hiring process. It allows employers to define precisely the skills and experience required in their recruiting efforts for the right professionals. It provides a convenient checklist for their development of their IT departments

25. For professional bodies, the matrix helps to reflect the industry perception of the need areas for best practices, as well as the consensual core requirements for employability. It allows professional bodies to identify what gaps there are in professional qualifications and therefore the most meaningful certifications to

develop or to fine tune in the current certifications. It also provides a framework for cross recognition of certifications with professional bodies overseas.

26. For academia and training institutions, the current SCS of IT industry developed jointly by ICT ITAC and EDB provides good references already for the accreditation of school curricula and the design of continuing professional development materials. This matrix can provide added value by identifying in more detail the necessary competencies required for a particular discipline at a particular level. It helps academia, training providers and human resources departments develop appropriate programmes in a responsive manner, especially on higher education level, to meet the needs of this knowledge-based industry in the right direction.

27. In the case of Hong Kong, with the transformation of the academic framework to 3-3-4, academic programmes in IT discipline will likely become more generic across functional categories. Professional certification on task competency bases, which needs to pass different assessments prior to its grant, might play a more important role in benchmarking more specific competencies necessary to perform a job for a particular category.

28. For the Government, in order to maintain the competitiveness of the IT Industry workforce, this matrix will help to identify focus areas for supporting the further development of specific qualifications.

Collective findings and comments received on the 3 x 7 Matrix

29. The 3 x 7 matrix is generally accepted by the research respondents. Feedback was also obtained on alternative options, which are suggested to be considered in the continuous review process.

- The competency should be technically focused and should not include managerial or soft skills. Managers and professionals at Master level are 2 distinct groups of individuals. Managers may not need to possess the technical expertise, and a basic IT knowledge is adequate.
- Managerial skills are required only for some job categories but not all. It depends on which category being referred to.
- Even professionals at Specialist level should possess some managerial or soft skills (e.g. communication skills).
- The opinion about the number of levels varied, some suggested 2 levels suffice while other suggest to add a technician level.
- The IT industry is quite diversified. It is difficult to have a set of unified competency standards to cover all.

30. The current matrix for the time being is 2-dimensional, i.e. 3 competency levels x 7 job categories. Suggestions are received whether additional dimensions can be

incorporated into the matrix to make it more informative, say to add a dimension of industry domain.

31. Based on the interviews, most respondents accept the division of the IT industry into the 7 major job categories. Some suggest incorporating additional categories of Business Intelligence, Networking, Computer Forensics, Cloud Computing and Unified Communication in the matrix, which are emerging quickly in recent years. One advantage to add new categories in an agile manner is that the industry can then put early efforts in identifying required competencies and arrange appropriate training to perform the job. In this way, it will benefit different stakeholders to meet the changing demand proactively. Some respondents do not comment explicitly whether such classification is good enough or not but appreciate having a foundation to start with which will be subject to regular review and adjustments in future.

32. Employers, professional bodies and academia generally have a positive view that the Career Matrix can inspire youth and individuals to have a holistic view of IT industry. It is also believed that the Career Matrix can facilitate continuous career development for IT professionals and to allow certification bodies to develop a framework of unified qualifications that would meet industrial requirements.

33. A majority of the respondents view that both technical and soft skills are equally important in performing the job, defeating some extreme views claiming that only technical skills are important.
34. As additional information, respondents generally regard HKQF as useful in detailing the relevant competencies to perform different types of IT jobs. Yet not many respondents really look into the papers in details. The current matrix developed could offer them convenient references.
35. Among different factors in determining whom to hire, a majority of employers think that relevant working experience is the most important, followed by possession of certain professional certifications or academic awards or performance during interview *pari passu*. Certification acts as a reference point or benchmark to convince employers that the bearer has possessed the minimum relevant competencies required to perform a particular task. Certification is more helpful in identifying the right candidate at the Practitioner level but less helpful in identifying professionals at the senior level. No employer will rely solely on certification to recruit a candidate.
36. Regarding relevant length of working experience an IT professional should possess,

a majority of respondents view that

- Master Level: 10 years +
- Specialist Level: 5 years+
- Practitioner Level: 1 year+

(Ref. Appendix B, B-1)

37. Certification appears more important for consultants. In general, clients do not necessarily need the consultant to possess high IT proficiency. With professional certification, it will be helpful for clients to identify the right consultant with right qualifications.

38. Young and mature professionals view the usefulness of certification differently.

Compared to mature professionals, young professionals are more enthusiastic to join in the certification chase. They hope that certificates will help them gain quicker promotions or pay rises. On the other hand, most mature professionals, having worked in the field for a number of years often have already established themselves in his/her profession at a higher level, and certification is a “nice-to-have”. Therefore unless it is purely necessary, mature professionals are less interested in obtaining certifications.

39. With the exception of a few, there is no strong inclination that an employer will encourage its staff to obtain particular certifications. Most of the employers adopt a

“nice-to-have” attitude. In other words, there is no indication of a strong relationship between education/training sponsorship and the mandate for staff to obtain a particular certificate. If there is an education/training sponsorship for staff scheme, it serves to encourage staff for an overall personal development instead of requiring the staff to advance his/her IT proficiency.

40. An interesting finding worth noting from employers of small and medium enterprises (SME) is that they always have contradictory emotions towards whether to encourage staff to take certification examinations. While endorsing an advancement of IT proficiency amongst their staff is desirable, there is a concern that with a greater IT proficiency, and proper certification, they are under pressure to grant staff promotions and/or pay rises otherwise they risk losing that staff member.

41. But there is a strong message from both employers of SMEs and large corporations that the successful awarding of a particular certificate or certificates will never be the sole determining factor for pay rise and promotion. Attitudes, aptitudes and past working experience are all important factors in consideration.

42. For Specialist level or above for most of the 7 job categories, possession of a basic

academic background (a first degree, higher diploma, or equivalent) appears to be a norm. Without that, candidates usually fail to pass the first round of recruitment selection.

Other Findings

43. For a vendor specific product, vendor certification is good enough to reflect the competencies an individual bears for deployment or application of that particular product. But from the perspective of employers, the vendor certification acts as an admission ticket only in order to win the employment, candidates also need to possess some degree of experience in the operation of that particular product.

Computer solution vendors upgrade or transform their products into newer versions from time to time with added features. Some of the features need training and new certifications emerge. However, employers are not really determined to ask employees to obtain a newer version of vendor specific certificate so long the employees can manage to master the product in newer version. On the other hand, possession of certain certifications cannot replace internal training, which aims to train staff to perform an assigned job tailored for the organization.

44. Findings in China Mainland

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- In order to get a better picture on IT professional certification development in the Mainland, two interviews were conducted in China Mainland. One interviewee belongs to an outsourcing services firm headquartered in Beijing and another interviewee belongs to a university in Tianjin.
- It should be noted that the sample size is very small, and therefore the findings from the Mainland cannot be taken to be representative of the whole of China Mainland.
- Except for a few reputable international certifications, most people are unaware of the availability of professional certifications for the IT industry. In addition, the certificates they know are mainly vendor-specific.
- Currently, there are 27 certifications available for IT professionals (18 certifications during the mapping exercise). The certificates are issued by an organization called CEIAEC (工业和信息化部教育与考试中心). This organization is not a government department but an organization approved by the Ministry of Industry and Information Technology of the People’s Republic of China (中华人民共和国工业和信息化部).
- There are 3 levels of certifications, namely High, Medium, Low.
- It is observed that certification examination takers need to attain Level 4/6 of the College English Test of Mainland as part of the requisites to award the certification. This reflects the global importance of English usage in IT industry.
- The two respondents from China Mainland have little knowledge about these certificates and they are unsure of the general recognition of the certificates.
- In Hong Kong, professional bodies work closely with training and academic providers to design training or academic contents. There are also examples of

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reciprocal recognition and articulation among programmes or awards developed by different bodies. But this was not the case in the Mainland. The Project Team was told by the respondents that they had little knowledge about whether collaboration or cross referencing of the above mentioned certification in academic programme development

Mapping and Gap Analysis

45. Mapping Exercise and Gap Analysis

- For details about how to conduct the mapping exercise and gap analysis please refer to Chapter 2.
- The purpose of the mapping exercise and gap analysis is to analyze whether there are any gaps in the coverage of the existing certifications for the full spectrum of IT jobs.
- By comparing the competencies of each job category at each competency level to the knowledge requirements of each certification, there are 3 possible outcomes, i.e. (1) largely equivalent (2) somewhat relevant (3) significantly different
- Criteria ranking the degree of mapping
 - If there is over 65% mapped against the identified competencies, it is treated as “largely equivalent”
 - Between 20 – 65%, it is treated as “somewhat relevant”
 - If under 20%, it is treated as “significantly different”
- A list of certifications available for respective job categories is attached as Appendix C-1 in this report. The list is by no means exhaustive and only represents the situation at time of research. Certifications appear under this list indicate that they have some degrees of mapping (i.e. largely equivalent, somewhat relevant or significantly different) with the competency standards already defined. Readers are suggested to explore further details from their websites or other sources if they are interested in obtaining their certificates.

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- A full list of certifications reviewed is also attached as Appendix C-2 in this report for reference.

46. Overall view of Gap Analysis

Most of the job categories appear to have at least one available certification which is largely equivalent to acknowledge the competency required at respective levels.

(Ref. Appendix D-1). However it will be worth noting that it is sometimes inconvenient for interested persons to obtain some certifications which are initiated by overseas bodies (i.e. either financially or logistically).

Appendix D-1 - Gap Analysis Summary							
Job Category \ Competency Level	Software Engineering/ Software Development	Quality Assurance	Project Management (ICT)	IT Architecture	Service Management and Operation	Information Security	Multimedia
Master							
Specialist							
Practitioner							
	= largely equivalent						
	= somewhat relevant						
	= significantly different						

47. The Project Team has no intention to evaluate, validate, approve, endorse, or rank, any existing professional certification. It is believed that each certificate or equivalent issued or granted by respective professional bodies have their own set of awarding criteria and focus. The current project related work aims to facilitate the

Industry to establish a common language so that there can be public awareness regarding the competencies deemed necessary by employers. All the competencies defined are based upon existing IT related jobs in the market and the perceived proficiency believed by employers for that role to be completed in a professional manner.

48. It is noted that the Quality Assurance job category at Practitioner level only has “somewhat relevant” mapping under the analysis.

49. For the Multimedia job category, there are only a few certifications which are non-vendor specific. The criteria for awarding those certifications are significantly different from the competency dimension the Project Team viewed necessary to perform the functional area at Master level. There is no available UoC for the category of Multimedia for the time being. The Project Team has passed the outcome of the initial work done in defining the competencies required to HKQF authority for further appropriate action.

50. With the exception of vendor specific certification, it is noted that certifications for Practitioner level are comparatively less than those for Specialist and Master levels.

51. For the difference between competencies covered in certificates and those are in actual demand (i.e. the gap), it is generally viewed that an independent party who can endorse a supplementary certificate to cover the missing content might be helpful.

The Respective Job Categories

52. Highlights of each job category are listed in the following sections under point 54 –

60. For details regarding job descriptions and their competencies expected, please refer to our Appendix A and B.

53. Software Engineering/Software Development: This is one of the job categories which most IT professionals are working in, and one of the categories with well established competencies. The existing certifications such as the CPIT (SA) from HKITPC and the CSDA and CSDP from IEEE can adequately cover the 3 competency levels. On the other hand, the project Team is of opinion that admission into the membership of HKIE can also be seen as satisfying Master and Specialist levels of competencies despite it is with a different assessment model.

54. Quality Assurance: the Master and Specialist levels are well-covered by

certifications such as CPIT (QAM) from HKITPC and CASQ, CAST and CSQA from QAI. For the Practitioner level, however, it is found that no existing certifications can cover all the competencies required, and it is worth exploring this opportunity for an entry-level certification in this job category.

55. Project Management (ICT): This is another one of the job categories which most IT professionals are working in and also one with well established competencies. And also one with well established competencies. . This area is well-covered by existing certifications such as PMP and PgMP from PMI, Prince2 from the UK Government, and CPIT (PD) and CPIT (APM) from HKITPC.

56. IT Architecture: There are many certifications related to this area such as the 3 certifications from the Open Group, namely Certified IT Architecture, Master Certified IT Architecture and Distinguished Certified IT Architecture can cover the 3 levels of competency. The CPIT (SA) from HKITPC can also cover the required competencies adequately.

57. Service Management and Operation: The ITIL certifications such as ITIL® V3 Foundation, ITIL® V3 Intermediate and ITIL® V3 Expert can adequately cover the

competencies required.

58. Information Security: It is well-covered with certifications such as CISA and CISM from ISACA, and the CPIT (Info Sec) from HKITPC.

59. Multimedia: The competencies for this area are not fully defined. Nevertheless, it is found that for Practitioner and Specialist levels, some vendor-specific certifications such as ACE, ACA and ACI from Adobe can cover most competencies required. However for the Master level, there are no appropriate certifications. Since this area is still evolving rapidly, it may be difficult to explore this ‘gap’ in certifications at this stage.

Chapter 4 : Conclusions

1. Through a series of Expert Group meetings, Industry Panel meetings, Steering Committee meetings including representatives of key professional bodies, academia and the Industry, with input validated by subsequent randomly selected face-to-face interviews as well as several rounds of public consultation, general support has been received on the project from the industry, the professional bodies and the Government (in particular OGCIO, EDB and ERB). Most view that outcomes from this study can be beneficial to different stakeholders of the Industry.

(Point 22 – Point 28 of Chapter 3)
2. It is strongly believed that the various matrices and gap analysis derived should be a living working information document instead of a “snapshot” report. It is a common wish to make the document sustainable and continuously useful to the Industry. To achieve this, a periodic review of available certifications is required. HKCS has set up a Review Committee with Terms of Reference for continuing review, refinement and expansion of the Matrix and Roadmap.
3. During the research, it is observed that award of certification is not the only approach to recognize competencies possessed by an IT professional. There could

be different assessment models and approaches such as membership admission.

The Industry should seek ways for complementariness, articulation and reciprocal recognition.

4. Though there are different views expressed on the definition of 3 levels of competency and the 7 job categories, the current 3 x 7 matrix is believed to be an acceptable starting model to reflect the IT career roadmap with strategic purpose. China Mainland also adopts a 3 levels hierarchy of competency in certification. It will be easier for qualification alignment between certifications issued by the Mainland and Hong Kong. On an ongoing basis, there should be continuing effort in listening to feedback from the IT industry to enhance the current 3x7 matrix.
5. Academic award and professional certification are complementary to each other especially after the transformation of academic system of Higher Education in Hong Kong. While academic training is more focus on generic competencies across all functional areas, professional certification training is more focused on specific competencies necessary to perform a job for a particular category. Therefore professional certification has its role.
6. For Multimedia, there is no UoC defined yet. This is a fast emerging job category,

and it is believed something needs to be done to keep Hong Kong competitive.

These include identifying the appropriate competencies and allocating resources in training.

Chapter 5 : Recommendations

1. The Review Committee set up for continuing review, refinement and expansion of the various matrices and Roadmap should be adequately represented by different stakeholders for easy buy-in. Despite having no apparent consensus on determining how many competency levels need to be adopted, it is suggested that we use the matrices developed by this research (i.e. the 3 x 7 matrices) as a starting document to trigger further discussion. Discussion will include whether additional job categories should be incorporated as well as whether further levels of competency should be imposed plus whether more in-depth exploration of competencies on particular industry domains should be pursued.
2. As the Industry changes very fast both in context and content, it is suggested that review regarding the mapping of necessary competencies with professional certifications should be more frequent and be able to keep abreast of the latest development,
 - 2.1 This can facilitate academia to develop training and educational programmes agilely and in the right direction.
 - 2.2 It helps the Government to identify focus areas for supporting the further development of specific qualifications.
 - 2.3 It allows employers to have convenient cross referencing of the skills and

experience required in their recruiting efforts for the right professionals.

3. With exception of point 4 & 5 below, there are no major gaps between necessary competencies with professional certifications. It is suggested that no heavy efforts will be needed to create additional certification locally. Nevertheless HKCS will welcome to share with professional bodies the findings of this research in relations to the certificates they awarded to the public. The sharing can offer additional information to the respective professional bodies so that they might consider to embellish their existing certifications by incorporating additional relevant competencies which are viewed from a different perspective. On the other hand, HKCS or other professional bodies might conduct workshops as part of their continuing professional training programmes for those competencies which their certifications have not covered.
4. For areas where mapping is somewhat relevant and/or significantly different, for the time being, we refer to Practitioner level in Quality Assurance, some efforts might be considered for the benefit of the Industry. This includes the creation of a new certification and provision of appropriate training.

5. In the future, if there are some areas where mapping is somewhat relevant and/or significantly different (i.e. there is a gap), more efforts might be necessary for the benefit of the Industry. Efforts include:
 - 5.1 Scope expanded on such certification to cover the missing content.
 - 5.2 Supplementary certificate, endorsed by an independent party to cover the missing content. Further discussion can be made on the composition of such independent party.
6. Not all job natures are needed to be performed by individuals with competency up to Specialist or Master level. It can be considered to create some certifications at Practitioner level so that more individuals can have chance to enter the Industry with lower qualifications.
7. Further exploration is encouraged if the inclusion of a technician level is beneficial to the Industry as a whole.
8. Different professional bodies might have different models and approaches to recognize task competency in respective levels. It is believed that stakeholders in the Industry should strive for complementation, articulation and reciprocal recognition.

9. It is observed that it is sometimes inconvenient to attend examinations of some overseas certifications. Efforts can be made to:
- 9.1 Investigate feasibility of collaboration with those overseas bodies for more convenient assessment mode (both financially and logistically).
 - 9.2 Develop certifications locally.
10. Do more publicity starting from high school to attract more youth from joining the Industry.
11. Seek collaboration with China Mainland regarding recognition cross border. At present certifications awarded in the Mainland is comprised of 3 levels, namely High, Medium, Low. Their perception regarding those 3 levels is not exactly in line with our perception. Continuing efforts will be exerted towards the accommodation of certifications awarded in the Mainland to the suggested 3 x 7 matrix. Their certificates issued are primarily technically-focused and might be able to fill the lack of certification gaps in the technician level in Hong Kong . On the other hand, it is suggested to have additional publicity of Hong Kong certifications which are more focused on training professionals at higher levels. This will be a complement

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to current certifications in the Mainland on developing their professional and soft skills.

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Appendices

Appendix A-1 – Generic Job Titles Matrix

Job Category Competency Level	Software Engineering / Software Development	Quality Assurance	Project Management (ICT)	IT Architecture	Service Management and Operation	Information Security	Multimedia
Master	Software Engineering Manager	Software Quality Assurance Manager	IT Project Director	IT Architect Manager	Service Operation Manager	Information Security Manager	Multimedia Content Manager
Specialist	Senior Software Engineer	Software Quality Assurance Specialist	IT Project Manager	Senior IT Architect	System Operation Specialist	Information Security Specialist	Multimedia Content Specialist
Practitioner	Software Engineer	Software Quality Assurance Professional	Assistant Manager, IT Projects	IT Architect	System Operation Officer	Information Security Officer	Multimedia Content Developer

Appendix A-2 – Generic Job Titles for respective categories

A2.1 Job Category – Software Engineering/Software Development

Competency Level – Master

General Job Description	Generic Job Titles
1. Participate in the strategic management of software development. 2. Provide technical direction in the design, development and testing software systems, subsystems, components and frameworks for the meeting of their respective specifications and general requirements. 3. Oversee the software development life cycle and resolve complex and exceptionally difficult problems. 4. Manage technical resources and human resources in software development project as well as taking the lead in designing training programmes to clients and subordinates. 5. Oversee and review work of the team.	Suggested Title : Software Engineering Manager Relevant titles in the industry : ▪ IT director (including this functional responsibility) ▪ System development manager ▪ Principal software engineer/analyst ▪ General Manager, MIS (including this functional responsibility) ▪ VP, Professional Service (including this functional responsibility) ▪ Development director/manager (including this functional responsibility) ▪ Application architect ▪ Applications development & support manager ▪ Manager, Technical Development

Competency Level – Specialist

General Job Description	Generic Job Titles
6. Undertake to design and develop software in accordance to the adopted architecture design patterns and constraints. 7. Translate business and user requirements into system requirement specifications. 8. Carry out quality control and quality assurance in software development. 9. Understand the business implications of technical solutions, and assist in defining the technology solutions to support any future business requirements. 10. Assist and perform some management functions. Oversee the works performed by the subordinates. 11. Undertake software deployment, maintenance, migration, decommissioning assignments as necessary.	Suggested Title : Software Engineer Relevant titles in the industry : ▪ software engineer ▪ analyst programmer ▪ programmer ▪ Business Analyst ▪ Application support analyst
General Job Description	Generic Job Titles
12. Act as the Key interface between business and technology teams in defining and influencing business requirements and assist in developing the appropriate system solutions. 13. Arrange User Training.	▪ Application developer ▪ Developer ▪ Software analyst/assistant software analyst ▪ Usability Designer/consultant/engineer

Competency Level – Practitioner

General Job Description	Generic Job Titles
13. Apply the various techniques, technologies and practices as appropriate to develop high quality software efficiently and effectively. 14. Develop, implement and maintain the software application system directed by senior. 15. Perform programming with specific language/tools/technology (e.g. Unix, Java, C++). 16. Monitor and report system testing and user acceptance. Prepare and assist business users on User Acceptance Test (UAT). 17. Perform system testing/ debugging. 18. Undertake software quality assurance assignment under the supervision of senior. 19. Assist software deployment, migration and decommissioning under the supervision of senior.	Suggested Title : Software Engineer Relevant titles in the industry : ▪ software engineer ▪ analyst programmer ▪ programmer ▪ Business Analyst ▪ Application support analyst ▪ Application developer ▪ Developer ▪ Software analyst/assistant software analyst ▪ Usability Designer/consultant/engineer

A2.2 Job Category – Quality Assurance

Competency Level – Master

General Job Description	Generic Job Titles
1. Establish standards, procedures and guidelines to improve and ensure the quality of software developed by and/or implemented in the organization. 2. Lead, coach and develop a team of software quality engineers. 3. Keep up-to-date with industry regulations development. 4. Manage relationships with internal peers as well as external business partners. 5. Provide thought leadership and strategic direction as it relates to software quality assurance.	Suggested Title: IT Quality Assurance Manager Relevant titles in the industry: ▪ Software Quality Assurance Manager; ▪ Software Quality Assurance Consultant; ▪ Senior Manager – Software Quality Assurance

Competency Level - Specialist

General Job Description	Generic Job Titles
6. Implement software quality assurance best practices and tools for the QA team. 7. Develop and/or adopt appropriate tools to support system test strategies. 8. Design software test strategies as well as develop test plans in accordance with these strategies. 9. Develop, publish, implement and maintain test plans to meet QA specifications 10. Analyse test results to improve on the test plans and processes. 11. Report, document and track software issues	Suggested Title: IT Quality Assurance Specialist Relevant titles in the industry: ▪ Senior Software Test Engineer; ▪ Lead Quality Assurance Engineer; ▪ Senior Software Quality Assurance Analyst ▪ Principal Software Quality Assurance Analyst

Competency Level – Practitioner

General Job Description	Generic Job Titles
12. Conduct system and software test activities according to the adopted plans. 13. Run functional tests, customer scenario testing, stress testing, performance testing, and scalability testing on different OS and platforms systematically. 14. Document test results. 15. Record detailed metrics and monitor to track the progress and outcomes of the testing process. 16. Report progress on test activities.	Suggested Title: IT Quality Assurance Officer Relevant titles in the industry: ▪ Software Tester ▪ Software Test Engineer ▪ Software Quality Assurance Analyst ▪ Software Quality Assurance Technician

A2.3 Job Category – Project Management (ICT)

Competency Level – Master

General Job Description	Generic Job Titles
1. Plan, direct and coordinate activities of designated IT project to ensure that goals or objectives of project are achieved within prescribed time frame and budget. 2. Review project proposal or plan to determine time frame, budget, procedures, staffing requirements and allocation of resources to various phases of project. 3. Establish work plan and staffing for each project phase and arranges for necessary staff recruitment. 4. Confer with project staff to conform to work plan and to assign responsibilities and authorities. 5. Direct and coordinate activities of project personnel to ensure project in proper progress. 6. Review project progress reports prepared by project personnel and modify schedules or plans as necessary. Prepare reports for management, clients and other related parties. 7. Provide technical advice to project team and resolve problems together with the team. 8. Take overall responsibility for quality management of major projects or programmes. 9. Oversee budget and ensure financial accountability. 10. Supervise project delivery to meet clients’ needs. 11. Train staff to achieve effectiveness of project development, implementation and reviews. 12. Network with relevant bodies for future project development. 13. Take responsibility for project control and quality assurance. 14. Help to resolve cross-organizational issues and eliminate roadblocks to drive timely completion of projects.	Suggested Title : IT Project Director Relevant titles in the industry : ▪ Vice-President, IT Projects ▪ Chief IT Project Manager ▪ Chief IT Project Engineer

Competency Level – Specialist

General Job Description	Generic Job Titles
15. Explain implications of any change to IT project scope and / or objectives to the client and project team. 16. Lead the project team to achieve proper progress while prioritizing the stages in the work plan. 17. Oversee project documentation. 18. Manage the project with the client stakeholders, team members and contract personnel for solutions within the project constraints. 19. Establish with the Project Director and maintain a workable schedule for all phases of the project. 20. Track and report on team hours and expenses on a periodic basis. 21. Manage the project budget. 22. Communicate progress, risks, expectations, time lines, milestones and other key project metrics to clients and team members. 23. Define skill sets (competencies) required for the project based on project specifications and requirements. 24. Determine resource requirements for the completion of project. 25. Manage clients’ interaction and relationship. 26. Communicate with clients to identify needs and evaluate alternative business solutions. 27. Ensure project meets internal and client expectations with respect to quality, budget, delivery schedules and requirements. 28. Escalate issues and ensure timely resolution with responsibility. 29. Take charge of project closures and reviews lessons learned.	Suggested Title : IT Project Manager Relevant titles in the industry : ▪ IT Project Coordinator ▪ IT Project engineer

Competency Level – Practitioner

General Job Description	Generic Job Titles
30. Coordinate the preparation of internal and external reports by gathering, analyzing and summarizing data and information from various sources. 31. Prepare materials for management reports. 32. Evaluate and monitor the performance and efficiency of project or program to ensure that the target dates are met. 33. Develop, design and establish reporting standards within the IT organization. 34. Work on overall project planning through reporting on project schedules and deliverables. 35. Provide support to the Project Manager in planning, managing and monitoring major projects from concepts to implementation. 36. Assist in the preparation of project or program budgets. 37. Assist in the preparation of a variety of reports covering budget status and forecast reports, etc. 38. Assist the Project Manager in duties as assigned.	Suggested Title : Assistant Manager, IT Projects Relevant titles in the industry : ▪ IT Project Analyst ▪ IT Project Executive ▪ IT Project Administrator

A2.4 Job Category – IT Architecture

Competency Level – Master

General Job Description	Generic Job Titles
1. Establish policies, standards and guidelines to manage the overall frameworks of enterprise architecture. 2. Review, approve and govern all enterprise IT standards, security, policies and guidelines to align with business strategy. 3. Manage the IT architecture team to oversee and develop architecture and framework at the enterprise level. 4. Work with Chief Information Office (CIO) and all business unit heads to ensure that the enterprise architecture meets business requirements. 5. Align the application software architecture with all business needs and users expectation. 6. Ensure the technology architecture and network architecture to be compatible with the business application requirements. 7. Provide professional advice to senior management on IT trends, strategy and architecture roadmap.	Suggested Title : IT Architect Manager Relevant titles in the industry : ▪ Head of Architecture ▪ Chief Technology Officer (CTO) ▪ Principal Architect ▪ Manager – IT Architecture ▪ IT Director ▪ Chief Architect

Competency Level – Specialist

General Job Description	Generic Job Titles
8. Design and oversee the overall frameworks of enterprise architecture to solve business challenges. 9. Lead and coordinate with vendors and IT architecture team to deliver best solutions regarding to technical architecture, physical architecture and data architecture. 10. Analyze, draft and review all enterprise IT standards, security, policies and guidelines to align with business architecture strategy. 11. Design and oversee the application software architecture to meet all business needs and users expectation. 12. Design and oversee the technology architecture and network architecture that compatible with the business application requirements. 13. Mentor the junior team members in order to build up a strong IT architecture team.	Suggested Title : Senior IT Architect Manager Relevant titles in the industry : ▪ Lead Architect ▪ Senior Architect ▪ Chief Architect ▪ Enterprise Architect ▪ IT Architect ▪ Software Architect ▪ Business Architect ▪ System Architect

Competency Level – Practitioner

General Job Description		Generic Job Titles
14.	Design, develop, test and support the architecture components in support of the overall enterprise architecture framework.	Suggested Title : IT Architect Relevant titles in the industry : ▪ Network Architect ▪ Server Architect ▪ Storage Architect ▪ Data Architect ▪ System Analyst ▪ IT Solutions Analyst
15.	Coordinate with vendors to deliver best solutions regarding to technical architecture, physical architecture and data architecture.	
16.	Design, develop, test and support the application software architecture.	
17.	Design, develop, test and support the technology architecture and network architecture components.	
18.	Work with IT architect practitioners of different specialties to develop the overall systems architecture of a complex solution.	
19.	Work with software developer or infrastructure specialist for the realization of the architecture components.	

A2.5 Job Category – Service Management and Operation

Competency Level – Master

General Job Description	Generic Job Titles
1. Contribute to the planning of IT service strategy, service design, service transition and service operation. 2. Manage the service portfolio and service catalog. 3. Ensure applicable processes are in place to support service design, service transition and service operations. 4. Ensure that services provided to users meet or exceed that prescribed service level. 5. Maintain IT service continuity plan to meet user requirements. 6. Plan and promote new services to meet business objectives. 7. Manage the department budget; control the income and expenditure to get best value for the company.	Suggested Title :Service Operations Manager Relevant titles in the industry : ▪ Computer Operations Manager ▪ Computer Services Manager ▪ Data Center Manager ▪ Data Center Services Manager ▪ Services Support Manager ▪ IT Operation Manager ▪ Service Management Manager ▪ IT Manager ▪ IT Director

Competency Level – Specialist

General Job Description	Generic Job Titles
8. Prepare management and technical reports for information and/or decision of senior level. 9. Improve service commitment by periodically survey users about service quality and solicit improvement suggestions. 10. Provide 2nd level support to frontline operations staff. Manage the third level support (in-house and/or vendor) to trouble-shoot and resolve operation problems. 11. Provides technical expertise and overall management of IT infrastructure technical management 12. Supervise frontline operations staff (computer operators, network, help desk, technical support) 13. Enforce full compliances of security standards in terms of data center physical security and information access control. 14. Analyze current systems usage against planned capacity, and recommend solutions and preventive actions that meet both present and future needs.	Suggested Title: System Operations Specialist Relevant titles in the industry: ▪ Help Desk Supervisor ▪ Help Desk Manager-in-charge ▪ Computer Operations Supervisor ▪ Network Supervisor ▪ Network Operations Officer ▪ Business Support Officer - IT outsourcing ▪ Operations Support Manager

General Job Description	Generic Job Titles
15. Work with hardware and software vendors on software version upgrade, configuration changes, technical support and product evaluation. 16. Prescribe and ensure documentation standards and ensure all operating procedures are up-to-date. Implement cost-effective physical and logical security solutions to protect company assets. 17. Implement appropriate service asset and configuration management process. 18. Enforce established change and problem management procedures. 19. Ensure reliable facilities are provided to data center. 20. Follow established release management process to implement system changes.	▪ Senior Operation Analyst ▪ Senior Technical Support Analyst

Competency Level – Practitioner

General Job Description	Generic Job Titles
21. Use appropriate tools to monitor overall systems and network performance, utilization, availability, capacity, security and healthiness so that pro-active actions can be taken to prevent or resolve problems. 22. Maintain log-books or operating records per shift. Conduct shift handover to ensure un-completed changes and incidents are followed-up by the incoming shift. 23. Work in team and follow the procedures based on quality and established standard, to achieve effectiveness and efficiency in the delivery and support of service. 24. Provide prompt support to user on day to day operation problems on PCs, printers, office standard software, etc. 25. Take corrective action per documented procedures to handle incident, and escalate to supervisor if the incident is not fixed within predefined time frame. 26. Communicate with support personnel and users on potential service outage, to carry out preventive maintenance, hardware installation, software implementation, etc. 27. Handle calls at service desk and communications with users.	Suggested Title : Systems Operation Officer Relevant titles in the industry : ▪ Help Desk Representative ▪ Customer Service Representative ▪ Computer Operator ▪ System Operator ▪ User Support ▪ Desktop Support Specialist ▪ Service Technician ▪ Field Technician ▪ Network Operator ▪ Technical Support Engineer (Desk-side / Help Desk) ▪ LAN/WAN Administrator ▪ System Administrator

A2.6 Job Category – Information Security

Competency Level – Master

General Job Description	Generic Job Titles
1. Establish standards, procedures and guidelines to protect the security of the information asset within an organization. 2. Ensure that the security standards and guidelines are aligned with business strategies. 3. Establish and manage the defensive mechanism to detect and prevent the intrusion as well as malicious attacks into the information systems operated by the organization. 4. Establish and manage the security audit standards and procedures. 5. Establish organizational-wide security awareness program. 6. Be responsive to advancement in information security technologies and their applicability to the organization. 7. Act as the departmental focal person at executive management level.	Suggested Title: Information Security Manager Relevant titles in the industry: ▪ Chief Security Officer (CSO) ▪ Information Security Manager ▪ Consultant (Information Security)

Competency Level – Specialist

General Job Description	Generic Job Titles
8. Design, implement and test information security controls to guard against the unauthorized disclosure and tempering of information asset belonging to the organization. 9. Investigate incidents of security breach detected or reported. 10. Assess and implement tools to enable better identification, monitoring, and response to information risks. 11. Identify and analyse programs and implementation of security related to IT systems. 12. Provide security guidance as needed to all stakeholders throughout the System Development Life Cycle. 13. Provide security guidance in response to specific end user and management inquiries. 14. Support ongoing Security Awareness throughout the organization. 15. Identify technical and operational security threats and vulnerabilities associated with the planned concept of operation and system design and recommend appropriate solutions. 16. Conduct system audit to ensure compliance, to detect violation and vulnerability.	Suggested Title: Information Security Specialist Relevant titles in the industry: ▪ Computer Forensic Specialist ▪ Information Security Specialist ▪ Information System Auditor ▪ System Assessor

Competency Level – Practitioner

General Job Description	Generic Job Titles
16. Identify and report risk and compliance issues and monitor corrective actions. 17. Provide technical and operational support for IT security. 18. Monitor and assess administrative, physical, and technical security controls, such as audit log review, accounts review, training compliance, patch reporting, configuration management and security impact analysis. 19. Conduct security functional requirements testing, as assigned, of system applications and components, 20. Support policy and procedures preparation and implementation. 21. Provide support for documentation and maintenance of the security infrastructure.	Suggested Title: Information Security Officer Relevant titles in the industry: ▪ Information Security Officer ▪ Computer Forensic Officer ▪ Information Security Engineer

A2.7 Job Category – Multimedia

Competency Level – Master

General Job Description	Generic Job Titles
1. Establish and maintain Corporate Internet/Intranet architecture. 2. Design and implement multimedia application/tools based on industry best practices. 3. Plan and manage the design and production of multimedia products, including multimedia websites and computer games. 4. Provide creative direction and manage multimedia projects, including computer animation, audio-visual production from concept development to production. 5. Manage the implementation process for the organization’s website updates, collaborating with cross-functional teams. 6. Establish and maintain web and/or computer game development framework, policies, standards, common components based on industry best practice. 7. Maintain and improve enterprise web portal and design global deployment architecture based on industry best practice.	Suggested Title: Multimedia Content Manager Relevant titles in the industry: ▪ Creative Director (Digital Media) ▪ Computer Animation Director ▪ Multimedia Technical Director ▪ Multimedia Production Director ▪ Digital Development Manager ▪ Computer Game Producer

Competency Level – Specialist

General Job Description	Generic Job Titles
8. Set coding guidelines and does code reviews for multimedia product development team. 9. Design and supervise production of multimedia applications. 10. Design and supervise production of multimedia projects including computer animation and audio-visual production. 11. Design and supervise production of multimedia website. 12. Design and supervise production of computer games for various technology platforms.	Suggested Title: Multimedia Content Specialist Relevant titles in the industry: ▪ Digital Effect Specialist (Colour Grading) ▪ Web Application Architect ▪ Computer Animation Supervisor ▪ Multimedia Production Supervisor ▪ Web Designer ▪ Computer Game Designer/Writer ▪ Computer Game Artist ▪ Lead Game Programmer

Competency Level – Practitioner

General Job Description	Generic Job Titles
13. Develop and test computer games for the various technology platforms. 14. Develop, test and implement multimedia websites and web applications. 15. Monitor, measure and report online web analytics to improve traffic for multimedia applications. 16. Produce, capture and editing of different digital media elements including audio, video, digital image, graphics and animation. 17. Update website content and design. 18. Design and production of multimedia projects including computer animation and audio-visual productions.	Suggested Title : Multimedia Content Developer Relevant titles in the industry : ▪ Animator ▪ Visual Effects Designer ▪ Computer Animator ▪ Web Designer ▪ Multimedia Designer ▪ Game Programmer ▪ Computer Game Tester ▪ Website Developer

Appendix B – Competency Standards Matrix

B.1 Suggested requirements for relevant working experience needed to award a certification at a respective competency level

Master:

- Minimum 10 years of working experience, of which not less than 8 years in relevant areas
- Interviewed and endorsed by a panel of judges

Specialist:

- Assessment-based
- Minimum 5 years of working experience, of which not less than 3 years in relevant areas

Practitioner:

- Assessment-based
- Minimum 1 year of working experience required, preferably in related areas

B.2 Note

The codes (ITSWXXXXXX) under the competency column are the Units of Competencies as defined in the Qualifications Framework for ICT Industry (SCS_ict_0.1.pdf)
(ref. www.hkqf.gov.hk)

B.3 Job Category – Software Engineering/Software Development**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Participate in strategic management of software development.	Have knowledge about the functions of the tactical plans & the mission statement and the goals on IT strategies of the corporation; able to define relevant tactical plans according to the approved IT strategies & identify the criteria for each individual tactical plan in a professional manner. (ITSWSM604A) - p.72 Understand the organization's objectives, have broad knowledge of the IT applicable to the organization's industry, able to identify and evaluate IT that support the organization's objectives with a high degree of expertise and professionalism. (ITSWSM613A) - p.82 Have knowledge in the execution of the tactical plans; co-ordinate the execution of approved IT strategies and plans; execute them in a professional manner; monitor & review the progress of each tactical plan; report the progress. (ITSWSM605A) - p.73 A basic understanding of project management. Have knowledge in various methods to measure the effectiveness of the execution; evaluate the effectiveness of the executions of the strategies and plans in a professional manner; provide professional suggestions to improve the effectiveness of the execution of the strategies and plans. (ITSWSM606A) - p.74 Have knowledge in various inputs for scope planning and definition; in the tools and techniques for scope planning and definition; in various outputs of scope planning and definition; in scope statement and a scope management plan. (ITSWSM501A) – p.89
2.	Provide technical direction in the design, development and testing software systems, subsystems, components and frameworks for the meeting of their respective specifications and general requirements.	Understand the requirements of an architecture design of software/system; formulate an architecture design; analyze and evaluate the formulated architecture design; exhibit professional skills in the formulation of architecture design. (ITSWDM601A) - p.271 Understand the requirements of an high level design of software/system; formulate a high level design; analyse and evaluate the formulated high level design; exhibit professional skills in the formulation of high level design. (ITSWDM602A) - p.273 Understand the requirements of a detailed level design of software/system; formulate a detailed level design; analyze and evaluate the formulated detailed level design; exhibit professional skills in the formulation of detailed level design. (ITSWDM603A) - p.275 Understand the risk factors in software deployment or migration; perform risk assessment on software deployment & migration; report the risk assessment to stakeholders; perform risk assessment on software deployment and migration in a professional manner. (ITSWDM610A) - p. 286 Understand the requirements in software deployment or migration; develop and define a software deployment or migration plan and a contingency plan; update the developed plan; define software deployment /migration

No.	Job Description	Competency
		plan in a professional manner. (ITSWDM611A) - p. 287 Understand the defined standard operating environment; coordinate the work of software deployment and/or migration; monitor and track the deployment and migration processes; maintain proper communications; monitor the deployment /migration process in a professional manner. (ITSWDM612A) - p. 288 Understand the principles and concepts of change control policy; develop change control policy of system configuration management; implement change control policy of system configuration management; exhibit professional skills in the development and implementation of change control policy. (ITSWDM604A) - p.277 Understand the principles and concepts of system configuration management; develop software configuration management plan; implement the plan; exhibit professional skills in the development and implementation of that plan. (ITSWDM605A) - P.278 Possess the ability to learn and deploy new technology and development skills.
3.	Oversee the phases in the software development life cycle and resolve complex and exceptionally difficult problems.	Understand the various requirements involved in software releases and control; obtain approval for the requirements identified in a software release; demonstrate a high degree of expertise and professionalism in identification and development of requirements for that. (ITSWDM606A) - p.280 Understand the processes for risk assessment on software releases and control; perform the risk assessment activities on software releases and control with a high degree of expertise and professionalism. (ITSWDM607A) - p.282 Understand the requirements for software releases and control plan; define the software releases and control plan with a high degree of expertise and professionalism. (ITSWDM608A) - p. 283 Have the knowledge to execute and monitor the software releases and control plan; to verify and validate the outcomes of released software and existing software; execute and monitor the software releases and control plan; perform the software releases and control plan and verification and validation activities with a high degree of expertise and professionalism. (ITSWDM609A) - p.284 Understand the rationale to perform software decommissioning; identify the responsible person or team in a decommission project; define the scope and conditions where a software decommissioning policy applies; formulate and document a decommissioning policy and Plan; ensure organizational policy or guideline and regulatory requirements, if any, are observed. (ITSWDM613A) – p.289 Understand the interests of business partners; communicate effectively and efficiently with various types of stakeholders such as customers, colleagues, vendors/suppliers, industry peers, and business partners; maintain a professional relationship with various business partners. (ITSWG619A) - p.460

No.	Job Description	Competency
4.	Manage technical resources and human resources in software development project as well as leading the design of training programmes to clients and subordinates.	Understand IT related resources; find out the return of investment; allocate and prioritize IT and related resources. (ITSWG614A) - p.456 Understand the risk factors faced by the organization; understand the processes of risk assessment; identify and assess the risk factors related to IT with a high degree of expertise and professionalism. (ITSWG609A) - p.452 Have knowledge of current IT risk mitigation techniques; understand the requirements for a risk mitigation plan; develop risk mitigations strategies and plans related to IT with a high degree of expertise and professionalism. (ITSWG610A) - p.453 Have knowledge about risk factors to be reviewed; execute and monitor risk mitigation plans; review risk factors related to IT with a high degree of expertise and professionalism; execute and monitor risk mitigation plans with a high degree of expertise and professionalism. (ITSWG611A) - p.454 Have knowledge of different types of contingency plans related to IT; integrate the contingency planning at all phases of the computer system life cycle; prepare contingency planning policy; understand the business impact and preventive controls; develop contingency plan in a professional manner; make estimate on the cost involved for a recovery process. (ITWSM609A) - p.77
5.	Oversee and review work of the team.	Have knowledge of the theories and techniques of leading and motivating a team; apply suitable skills in leading and motivating a team; lead and motivate a team with a high degree of expertise and professionalism to execute business strategies and plans. (ITSWG604A) – p. 447 Have knowledge of the theories and techniques of delegation; apply suitable skills in delegating responsibilities; delegate responsibilities to staff with a high degree of expertise and professionalism in order to achieve business goals or accomplish software development projects. (ITSWG606A) – p.449 Understand change; cope with changes positively; grasp opportunities for improvement. (ITSWG613A) - p.455

Competency Level – Specialist

Competency Requirements		
No.	Job Description	Competency
6.	Undertake to design and develop software in accordance to the adopted architecture design patterns and constraints.	Understand the user requirement process; formulate and analyse user requirements of the Application; develop user requirements with users of the software application; prioritize functional requirements in a professional manner. (ITSWDM501A) - p.259 Comprehend design documentations; decompose programme modules; develop programme modules in a professional manner. (ITSWDM504A) - p.262 Understand version control mechanism; manage programme source; maintain programme source; act in line with software configuration management. (ITSWDM505A) - p.263
7.	Translate business and user requirements into system requirement specifications.	Comprehend Software Requirements Specification (SRS); prepare the SRS; validate user requirements in a professional manner. (ITSWDM502A) - p.260 Understand the requirements for verification and validation of design documentations; verify and validate different levels of software/system design; perform the verification and validation of design documentations in a professional manner. (ITSWDM503A) - p.261
8.	Carry out quality control and quality assurance in software development.	Have the knowledge to design checklists for inspecting programme source and software documents; perform inspection of programme source and software documents; revise and update the checklist after an inspection; perform inspection of programme source and software documents in a professional manner. (ITSWDM506A) - p.264 Have the knowledge to design test plans according to the software requirements specification (SRS) and other software documents; develop test plans for various levels of testing; ensure the total cost for software testing is within budget; develop test plans for various levels of testing in a professional manner. (ITSWDM507A) - p.266
9.	Understand the business implications of technical solutions, and assist in defining the technology solutions to support any future business requirements.	Have basic insights into the business of the industry; understand the strategic innovation of ICT; identify business opportunities. (ITSWG508A) - p. 422
10.	Assist and perform some management functions. Oversee the works performed by the subordinates.	Know the background information about team building; build an effective management, software development, maintenance, or service provision team. (ITSWG515A) - p.431 Understand characteristics of effective technical communication; know the audience and information needed to be conveyed; consolidate information for delivery; deliver corporate message related to software development, maintenance, and service provision effectively. (ITSWG512A) - p. 426 Know the principles of presentation; prepare for a presentation; deliver presentation on information related to software development, maintenance, and service provision in logical order; improve effectiveness of presentation. (ITSWG514A) - p.429

No.	Job Description	Competency
11.	Undertake software deployment, maintenance, migration, decommissioning assignments as necessary.	Understand various tools and techniques in identifying functional requirements of an existing software; identify extra functional requirements of an existing software; revise the software documents accordingly; identify extra functional requirements of an existing software in a professional manner. (ITSWDM508A) - p. 267 Understand various tools and techniques in identifying non-functional requirements of an existing software; identify extra non-functional requirements of an existing software; revise the software documents accordingly; identify extra non-functional requirements of an existing software in a professional manner. (ITSWDM509A) - p. 268 Understand the defined goals to be achieved upon software deployment or migration; identify the business requirements for software deployment and migration; identify the stakeholders in software deployment and migration; identify the limitations, constraints and risks for the software to be deployed or migrated; specify a standard operating environment; identify the constraints, risks, and the Standard Operating Environment (SOE) for a software to be deployed/migrated in a professional manner. (ITSWDM510A) - p.269 Comprehend the details in software decommissioning policy and plan; ensure decommissioning criteria are met; remove account and credential information; remove software and hardware components. (ITSWDM511A) - p. 270
12.	Act as the Key interface between business and technology teams in defining and influencing business requirements and assist in developing the appropriate system solutions.	Understand characteristics of effective communication; know the audience and the information needed to be conveyed; consolidate information for delivery; deliver message related to business or software products and software services to team members and clients effectively. (ITSWGGS402A) - p.406 Know the behaviour in listening; develop listening skills; demonstrate proficiency in listening to clients and team members on business information related to software products and software services. (ITSWGGS403A) - p.407 Know the principles of presentation; prepare for a presentation; deliver effective presentation on information related to general business and technical information to team members and clients in logical order; improve effectiveness of presentation. (ITSWGGS404A) - p.409
13.	Arrange User Training.	Understand characteristics of effective communication; know the audience and the information needed to be conveyed; consolidate information for delivery; deliver message related to business or software products and software services to team members and clients effectively. (ITSWGGS402A) - p.406 Know the principles of presentation; prepare for a presentation; deliver effective presentation on information related to general business and technical information to team members and clients in logical order; improve effectiveness of presentation. (ITSWGGS404A) - p.409

Competency Level – Practitioner

Competency Requirements		
No.	Job Description	Competency
14.	Apply the various techniques, technologies and practices as appropriate to develop high quality software efficiently and effectively.	Obtain product certifications awarded by vendors or academia or authority.
15.	Develop, implement and maintain the software application system directed by senior.	Obtain product certifications awarded by vendors or academia or authority.
16.	Perform programming with specific language/tools/technology (e.g. Unix, Java, C++).	Obtain product certifications awarded by vendors or academia or authority.
17.	Monitor and report system testing and user acceptance. Prepare and assist business users on User Acceptance Test (UAT).	Understand characteristics of effective communication; know the audience and the information needed to be conveyed; consolidate information for delivery; deliver message related to business or software products and software services to team members and clients effectively. (ITSWGGS402A) - p.406 Know the principles of presentation; prepare for a presentation; deliver effective presentation on information related to general business and technical information to team members and clients in logical order; improve effectiveness of presentation. (ITSWGGS404A) - p.409
18.	Perform system testing/ debugging.	Have the knowledge to design and develop test plans and software simulator to facilitate different levels of testing; perform various levels of testing, which may involve the use of a software simulator; perform all testing activities in a professional manner. (ITSWDM401A) - p.251 Have the knowledge to report the results of different levels of testing; report the discrepancies between the software and its related documents; report the discrepancies between software and its related documents in a professional manner. (ITSWDM402A) - p. 252 Have the knowledge to select appropriate debugger; locate and fix the logical error; perform debugging of programmes in a professional manner. (ITSWDM403A) - p. 253
19.	Undertake software quality assurance assignment under the supervision of senior.	Have the knowledge to design and develop test plans and software simulator to facilitate different levels of testing; perform various levels of testing, which may involve the use of a software simulator; perform all testing activities in a professional manner. (ITSWDM401A) - p.251 Have the knowledge to report the results of different levels of testing; report the discrepancies between the software and its related documents; report the discrepancies between software and its related documents in a professional manner. (ITSWDM402A) - p. 252 Have the knowledge to select appropriate debugger; locate and fix the logical error; perform debugging of programmes in a professional manner. (ITSWDM403A) - p. 253 Understand the process of performing software audit and how to select appropriate tools for software audit; perform software audit, with the use of selected tools where applicable; prepare software audit report ; perform software audit and record the audit findings for continuous improvement in a professional manner. (ITSWDM404A) - p. 254

No.	Job Description	Competency Level
20.	Assist software deployment, migration and decommissioning under the supervision of senior.	Understand the relationship between the deployed or migrated software with other systems; perform verification and validation of the deployed or migrated software; ensure independent operation in the verification and validation process; verify and validate that the deployed / migrated software and the existing software are functioning properly in a professional manner. (ITSWDM405A) - p.255 Understand the software decommissioning policy; identify components to be removed; identify information to be removed; classify and archive information with potential usage; observe data protection requirements. (ITSWDM406A) - p. 257 Understand the functionalities of the decommissioned software; verify and validate the remaining software; document test results for future reference; verify and validate that the remaining software are functioning properly. (ITSWDM407A) - p. 258

B.4 Job Category – Quality Assurance**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Establish standards, procedures and guidelines to improve and ensure the quality of software developed by and/or implemented in the organization.	Formulate quality assurance (QA) policies and procedures. (ITSWQA602A) - p. 404 Determine quality policies and define quality requirements for a project. (ITSWPM613A) - p. 133
2.	Lead, coach and develop a team of software quality engineers.	Establish a quality assurance (QA) entity. (ITSWQA601A) - p. 402 Recruit, retain and develop IT staff. (ITSWGSS521A) - p. 441 Lead and motivate a team. (ITSWGSS604A) - p. 447
3.	Keep up-to-date with industry regulations development.	Comply with relevant laws and regulatory requirements. (ITSWGSS624A) - p. 465
4.	Manage relationships with internal peers as well as external business partners.	Manage and maintain the portfolio and relationship with business partners. (ITSWGSS618A) - p. 459
5.	Provide thought leadership and strategic direction as it relates to software quality assurance.	Develop a project quality management plan for project execution. (ITSWPM614A) - p. 98

Competency Level – Specialist

Competency Requirements		
No.	Job Description	Competency
6.	Implement software quality assurance best practices and tools for the QA team.	Implement quality assurance (QA) policies and procedures. (ITSWQA501A) - p. 395 Assist in quality assurance (QA) certification and international standards adoption. (ITSWQA502A) - p. 396 Plan and execute organizational quality initiatives. (ITSWQA503A) - p. 397
7.	Develop and/or adopt appropriate tools to support system test strategies.	Perform inspection for the program code and software documents. (ITSWDM506A) - p. 264
8.	Design software test strategies as well as develop test plans in accordance with these strategies.	Plan quality assurance (QA) activities of a software product. (ITSWQA506A) - p. 401
9.	Develop, publish, implement and maintain test plans to meet QA specifications.	Develop test plans for various levels of testing. (ITSWDM507A) - p. 266

No.	Job Description	Competency
10.	Analyse test results to improve on the test plans and processes.	Develop test plans for various levels of testing. (ITSWDM507A) - p. 266
11.	Report, document and track software issues.	Conduct project closure with regard to quality. (ITSWPM615A) - p. 94
12.	Other responsibilities.	Perform software audit. (ITSWDM404A) - p. 254 Plan and conduct training for quality assurance (QA) activities. (ITSWQA504A) - p. 398 Prepare quality assurance (QA) requirements of a software product. (ITSWQA505A) - p. 399

Competency Level – Practitioner

Competency Requirements		
No.	Job Description	Competency
13.	Conduct system and software test activities according to the adopted plans.	Perform quality assurance activities of a software product. (ITSWQA401A) - p. 391 Debug a program. (ITSWDM403A) - p. 253
14.	Run functional tests, customer scenario testing, stress testing, performance testing, and scalability testing on different OS and platforms systematically.	Perform testing activities to facilitate different levels of testing. (ITSWDM401A) - p. 251
15.	Document test results.	Report discrepancies between software and its related documents. (ITSWDM402A) - p. 252
16.	Record detailed metrics and monitor to track the progress and outcomes of the testing process.	Evaluate the quality of a software product. (ITSWQA402A) - p. 393
17.	Report progress on test activities.	Report discrepancies between software and its related documents. (ITSWDM402A) - p. 252

B.5 Job Category – Project Management (ICT)**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Plan, direct and coordinate activities of designated IT project to ensure that goals or objectives of project are achieved within prescribed time frame and budget.	Perform an initial project feasibility study. (ITSWPM601A) – p.117 Prepare a project charter and kick-off package as well as information. (ITSWPM602A) – p.118 Prepare an initial project plan. (ITSWPM603A) - p.119 Execute the project plan. (ITSWPM604A) -p.121 Monitor and control project execution. (ITSWPM605A) -p.122 Conduct project closure with regard to integration. (ITSWPM606A) -p.124 Establish a risk management approach and process for a project. (ITSWPM617A) -p.138 Develop a risk management plan. (ITSWPM618A) -p.139 Develop a risk response plan. (ITSWPM619A) -p.141 Conduct project closure with respect to project risk management. (ITSWPM620A) -p.142 Conduct project procurement planning. (ITSWPM622A) -p.144
2.	Review project proposal or plan to determine time frame, budge, procedures, staffing requirements and allocation of resources to various phases of project.	Monitor and control the project scope. (ITSWPM607A) - p.125 Conduct project closure with regard to project scope. (ITSWPM608A) – p.126 Develop a project schedule. (ITSWPM609A) – p.127 Prepare a preliminary cost model. (ITSWPM610A) – p.129 Develop the project cost. (ITSWPM611A) – p.130 Conduct cost review upon project completion. (ITSWPM612A) – p.132
3.	Establish work plan and staffing for each project phase and arrange for necessary staff recruitment.	Perform an initial project feasibility study. (ITSWPM601A) – p.117 Prepare a project charter and kick-off package as well as information. (ITSWPM602A) – p.118 Prepare an initial project plan. (ITSWPM603A) – p.119 Execute the project plan. (ITSWPM604A) – p.121 Monitor and control project execution. (ITSWPM605A) - p.122 Conduct project closure with respect to the project team. (ITSWPM616A) - p.137 Define the organizational structure of a project. (ITSWPM511A) - p.100 Establish organization plan. (ITSWPM512A) - p.101

Competency Requirements		
No.	Job Description	Competency
		Establish and develop the project team. (ITSWPM513A) - p.102 Manage project team. (ITSWPM514A) - p.104 Conduct project closure with respect to the project team. (ITSWPM616A) - p.137 Conduct project procurement planning. (ITSWPM622A) -p.144
4.	Confer with project staff to conform to work plan and to assign responsibilities and authorities.	Establish a preliminary project communications plan. (ITSWPM515A) – p.105 Develop a project communications plan. (ITSWPM516A) – p.106
5.	Direct and coordinate activities of project personnel to ensure project in proper progress.	Conduct project performance reporting. (ITSWPM517A) – p.107 Define the organizational structure of a project. (ITSWPM511A) – p.100 Conduct project closure with respect to project communications. (ITSWPM518A) – p.108
6.	Review project progress reports prepared by project personnel and modify schedules or plans as necessary. Prepare reports for management, clients and other related parties.	Develop a project schedule. (ITSWPM609A) – p.127
7.	Provide technical advice to project team and resolves problems together with the team.	Prepare a project charter and kick-off package as well as information. (ITSWPM602A) – p.118 Develop a project quality management plan for project execution. (ITSWPM614A) – p.134 Establish a risk management approach and process for a project. (ITSWPM617A) – p.138 Establish preliminary procurement policies and procedures. (ITSWPM621A) – p.143 Conduct cost review upon project completion. (ITSWPM612A) - p.132 Develop the project cost. (ITSWPM611A) - p.130
8.	Take overall responsibility for quality management of major projects or programmes.	Determine quality policies and define quality requirements for a project. (ITSWPM613A) – p.133 Develop a project quality management plan for project execution. (ITSWPM614A) – p.134
9.	Oversee budget and ensure financial accountability.	Prepare a preliminary cost model. (ITSWPM610A) – p.129 Develop the project cost. (ITSWPM611A) – p.130 Conduct cost review upon project completion. (ITSWPM612A) - p.132
10.	Supervise project delivery to meet clients’ needs.	Perform an initial project feasibility study. (ITSWPM601A) – p.117

Competency Requirements		
No.	Job Description	Competency
		Monitor and control the project scope. (ITSWPM607A) - p.125 Conduct project closure with regard to project scope. (ITSWPM608A) – p.126 Develop a project schedule. (ITSWPM609A) – p.127 Monitor, control and update project schedule. (ITSWPM504A) – p.93 Conduct project closure with respect to time. (ITSWPM505A) – p.94
11.	Train staff to achieve effectiveness of project development, implementation and reviews.	Establish and develop the project team. (ITSWPM513A) – p.102
12.	Network with relevant bodies for future project development.	Establish a risk management approach and process for a project. (ITSWPM617A) – p.138 Execute the project plan. (ITSWPM604A) - p.121 Conduct source selection and/or contract development. (ITSWPM523A) - p.113
13.	Take responsibility for project control and quality assurance.	Determine quality policies and define quality requirements for a project. (ITSWPM613A) – p.133 Develop a project quality management plan for project execution. (ITSWPM614A) – p.134 Conduct project closure with regard to quality. (ITSWPM615A) – p.136
14.	Help to resolve cross-organisational issues and eliminates the project constraints.	Execute the project plan. (ITSWPM604A) - p.121

Competency Level – Specialist

Competency Requirements		
No.	Job Description	Competency
15.	Explain implications of any changes to IT project scope and / or objectives to the client and project team.	Monitor and control the project cost. (ITSWPM508A) – p.97 Manage project team. (ITSWPM514A) – p.104
16.	Lead the project team to achieve proper progress while prioritizing the stages in the work plan.	Define project scope. (ITSWPM501A) – p.89 Monitor, control and update project schedule. (ITSWPM504A) – p.93 Execute the risk management and response plans. (ITSWPM519A) – p.109 Monitor and control the risks of a project. (ITSWPM520A) – p.110 Conduct solicitation. (ITSWPM522A) – p.112

Competency Requirements		
No.	Job Description	Competency
17.	Oversee project documentation.	Define project scope. (ITSWPM501A) – p.89 Conduct project performance reporting. (ITSWPM517A) – p.107 Award Contract. (ITSWPM524A) – p.114 Conduct contract administration and contract monitoring. (ITSWPM525A) – p.115
18.	Manage the project with the client stakeholders, team members and contract personnel for solutions within the project constraints.	Monitor, control and update project schedule. (ITSWPM504A) – p.93 Manage the execution of a project quality management plan. (ITSWPM509A) – p.98 Monitor and control the project quality. (ITSWPM510A) – p.99 Establish and develop the project team. (ITSWPM513A) – p.102 Manage project team. (ITSWPM514A) – p.104 Conduct solicitation planning. (ITSWPM521A) – p.111 Conduct solicitation. (ITSWPM522A) – p.112 Conduct contract administration and contract monitoring. (ITSWPM525A) – p.115 Conduct source selection and/or contract development. (ITSWPM523A) – p.113
19.	Establish with the Project Director and maintains a workable schedule for all phases of the project.	Monitor, control and update project schedule. (ITSWPM504A) – p.93 Manage the execution of a project quality management plan. (ITSWPM509A) – p.98 Develop a project communications plan. (ITSWPM516A) – p.106
20.	Track and report on team hours and expenses on a periodic basis.	Execute and manage the project scope. (ITSWPM502A) – p.91 Monitor, control and update project schedule. (ITSWPM504A) – p.93
21.	Manage the project budget.	Execute and manage the project cost. (ITSWPM507A) – p.96 Monitor and control the project cost. (ITSWPM508A) – p.97 Articulate the time and effort requirements needed for product-based planning. (ITSWPM503A) – p.92 Articulate the project costing requirements. (ITSWPM506A) – p.95
22.	Communicate progress, risks, expectations, time lines, milestones and other key project metrics to clients and team members.	Develop a project communications plan. (ITSWPM516A) – p.106
23.	Define skill sets (competencies) required for the project based on project specifications and requirements.	Define project scope. (ITSWPM501A) – p.89 Manage the execution of a project quality management plan. (ITWSPM 509A) p.98 Establish organizational plan. (ITSWPM512A) – p.101 Conduct project performance reporting. (ITSWPM517A) – p.107 Articulate the time and effort requirements needed for product-based planning. (ITSWPM503A) – p.92
24.	Determine resource requirements for the completion of project.	Establish organizational plan. (ITSWPM512A) – p.101 Articulate the time and effort requirements needed for product-based planning.

Competency Requirements		
No.	Job Description	Competency
		(ITSWPM503A) -p.92 Articulate the project costing requirements. (ITSWPM506A) -p.95 Conduct source selection and/or contract development. (ITSWPM523A) - p.113
25.	Manage clients’ interaction and relationship.	Execute and manage the project scope. (ITSWPM502A) – p.91 Conduct project closure with regard to time. (ITSWPM505A) – p.94
26.	Communicate with clients to identify needs and evaluate alternative business solutions.	Develop a project communications plan. (ITSWPM516A) – p.106 Conduct solicitation planning. (ITSWPM521A) – p.111
27.	Ensure project meets internal and client expectations with respect to quality, budget, delivery schedules and requirements.	Conduct project closure with respect to time. (ITSWPM505A) – p.94 Monitor and control the project quality. (ITSWPM510A) – p.99 Define the organizational structure of a project. (ITSWPM511A) – p.100 Conduct project closure with respect to project communications. (ITSWPM518A) – p.108 Articulate the project costing requirements. (ITSWPM506A) - p.95
28.	Escalate issues and ensure timely resolution with responsibility.	Monitor and control the project quality. (ITSWPM510A) – p.99 Conduct project closure with respect to project communications. (ITSWPM518A) – p.108
29.	Take charge of project closures and review lessons learned.	Conduct project closure with respect to project communications. (ITSWPM518A) – p.108 Conduct contract closeout. (ITSWPM526A) – p.116

Competency Level - Practitioner

Competency Requirements		
No.	Job Description	Competency
30.	Coordinate the preparation of internal and external reports by gathering, analyzing and summarizing data and information from various sources.	Prepare the project schedule. (ITSWPM401A) – p.83 Perform information distribution. (ITSWPM404A) – p. 86 Establish project communications documentation requirements. (ITSWPM403A) – p. 85
31.	Prepare materials for management reports.	Perform information distribution. (ITSWPM404A) – p. 86 Establish project communications documentation requirements.

Competency Requirements		
No.	Job Description	Competency
		(ITSWPM403A) – p. 85
32.	Evaluate and monitor the performance and efficiency of project or programme to ensure that the target dates are met.	Prepare the project schedule. (ITSWPM401A) – p.83 Execute and manage the project schedule. (ITSWPM402A) – p.84 Implement project time reporting. (ITSWPM405A) – p.87
33.	Develop, design and establish reporting standards within the IT organization.	Prepare the project schedule. (ITSWPM401A) – p.83 Implement project time reporting. (ITSWPM405A) – p.87 Communicate with stakeholders at project checkpoints. (ITSWPM406A) – p.88
34.	Work on overall project planning through reporting on project schedules and deliverables.	Prepare the project schedule. (ITSWPM401A) – p.83
35.	Provide support to the Project Manager in planning, managing and monitoring major projects from concepts to implementation.	Prepare the project schedule. (ITSWPM401A) – p.83 Execute and manage the project schedule. (ITSWPM402A) – p.84
36.	Assist in the preparation of project or programme budgets.	Prepare the project schedule. (ITSWPM401A) – p.83 Perform information distribution. (ITSWPM404A) – p.86
37.	Assist in the preparation of a variety of reports covering budget status and forecast reports, etc.	Prepare the project schedule. (ITSWPM401A) – p.83 Implement project time reporting. (ITSWPM405A) – p.87
38.	Assist the Project Manager in duties as assigned.	Prepare the project schedule. (ITSWPM401A) – p.83

B.6 Job Category – IT Architecture**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Establish policies, standards and guidelines to manage the overall frameworks of enterprise architecture.	Define, prioritise and document architecture vision and principles for an organization. (ITSWAR601A) – p.171 Define, review and validate network architecture principles. (ITSWAR509A) – p.156 Define data management policies and architecture principles. (ITSWAR608A) – p.179
2.	Review, approve and govern all enterprise IT standards, security, policies and guidelines to align with business strategy.	Establish processes to monitor the adopted architecture principles, design guidelines and resultant designs. (ITSWAR603A) – p.174 Define, review and document a technology architecture baseline. (ITSWAR614A) – p.168 Review the current baseline and develop a target business architecture for an organization. (ITSWAR605A) – p.176 Review, design and re-engineer business processes to form a new business architecture. (ITSWAR607A) – p.178
3.	Manage the IT architecture team to oversee and develop architecture and framework at the enterprise level.	Manage technology architecture life cycle. (ITSWAR616A) – p.192 Manage application integration architecture life cycle. (ITSWAR517A) – p.165
4.	Work with Chief Information Office (CIO) and all business unit heads to ensure that the enterprise architecture meets business requirements.	Define metrics and methodologies to measure business performance of applying new technologies. (ITSWAR505A) – p.152 Define metrics to ensure that a technology architecture meets the business goals. (ITSWAR508A) – p.155
5.	Align the application software architecture with all business needs and users expectation.	Keep in-house practices in line with industry best practices. (ITSWAR520A) – p.168
6.	Ensure the technology architecture and network architecture to be compatible with the business application requirements.	Define and develop various architecture design building blocks (components) for an organization. (ITSWAR503A) – p.149 Define and establish a data architecture (ITSWAR610A) – p.182
7.	Provide professional advice to senior management on IT trends, strategy and architecture roadmap.	Promote and explain the new business architecture to stakeholders in an organization. (ITSWAR506A) – p.153 Advocate and explain the adopted architecture design methodology to stakeholders. (ITSWAR602A) – p.173

Competency Level – Specialist

Competency Requirements		
No.	Job Description	Competency
8.	Design and oversee the overall frameworks of enterprise architecture to solve business challenges.	Capture, analyse and model various viewpoints of a business architecture. (ITSWAR606A) – p.177
9.	Lead and coordinate with vendors and IT architecture team to deliver best solutions regarding to technical architecture, physical architecture and data architecture.	Evaluate and select architecture design options and related architecture artifacts. (ITSWAR501A) – p.147 Design and construction of network architecture. (ITSWAR512A) – p.160 Check usability of a target data architecture. (ITSWAR612A) – p.184
10.	Analyze, draft and review all enterprise IT standards, security, policies and guidelines to align with business architecture strategy.	Build, evaluate and review a target technology architecture reference model. (ITSWAR615A) – p.190 Enforce compliance of the enterprise data standards. (ITSWAR613A) – p.186
11.	Design and oversee the application software architecture to meet all business needs and users expectation.	Establish guidelines on adoption of application integration architecture. (ITSWAR515A) – p.163 Establish processes to manage the implementation of adopted architecture designs. (ITSWAR604A) – p.175 Recommend application integration architecture models. (ITSWAR617A) – p.194
12.	Design and oversee the technology architecture and network architecture that compatible with the business application requirements.	Determine technology mix for the design and development of embedded software systems. (ITSWAR620A) – p.198 Recommend embedded software architecture models. (ITSWAR619A) – p.196
13.	Mentor the junior team members in order to build up a strong IT architecture team.	Review and make improvements to the relevant architecture development initiatives. (ITSWAR502A) – p.148 Develop application software architecture models. (ITSWAR519A) – p.167 Develop a network technology architecture model. (ITSWAR510A) – p.157 Develop application integration architecture resources. (ITSWAR618A) – p.195 Exercise lifecycle management on the adopted embedded software architecture. (ITSWAR623A) – p.202 Perform lifecycle management of the network architecture. (ITSWAR514A) – p.162

Competency Level – Practitioner

Competency Requirements		
No.	Job Description	Competency
14.	Design, develop, test and support the architecture components in support of the overall enterprise architecture framework.	Model and analyse network architecture. (ITSWAR513A) – p.161 Build a data architecture registry. (ITSWAR609A) – p.180 Construct a data architecture for an information system. (ITSWAR611A) – p.183 Perform gap analysis of the current business architecture against the target business architecture. (ITSWAR504A) – p.150 Perform gap analysis of the current network architecture against the business requirements. (ITSWAR511A) – p.159 Ensure operable application integration architecture is in place. (ITSWAR516A) – p.164
15.	Coordinate with vendors to deliver best solutions regarding to technical architecture, physical architecture and data architecture.	Model technology architecture. (ITSWAR507A) – p.154
16.	Design, develop, test and support the application software architecture.	Understand key characteristics of various application software architecture models. (ITSWAR518A) – p.166 Understand key characteristics of embedded software systems. (ITSWAR521A) – p.169
17.	Design, develop, test and support the technology architecture and network architecture components.	Document the abstracted layer design of the network architecture. (ITSWAR401A) – p.145
18.	Work with IT architect practitioners of different specialties to develop the overall systems architecture of a complex solution.	Maintain a common library of reusable embedded software components. (ITSWAR622A) – p.201
19.	Work with software developer or infrastructure specialist for the realization of the architecture components.	Maintain a library of reusable application components. (ITSWAR402A) – p.146

B.7 Job Category – Service Management and Operation**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Contribute to the planning of IT service strategy, service design, service transition and service operation.	Establish and maintain the service level management process. (ITSWOS612A) – p.383 Develop risk mitigation strategies and plans related to IT. (ITSWG610A) – p.453 Formulate relevant tactical plans based on the approved IT strategies and policies. (ITWSM604A) – p.72
2.	Manage the service portfolio and service catalog.	Establish and maintain configuration management process. (ITSWOS610A) – p.381 Manage the complex system support services. (ITSWOS617A) – p.388
3.	Ensure applicable processes are in place to support service design, service transition and service operations.	Manage exceptional database operations process. (ITSWOS615A) – p.385 Establish and maintain database operations process. (ITSWOS616A) – p.386 Understand IT operations and IT processing. (ITSWG620A) – p.461 Adopt and adapt international standards concerning information security as appropriate. (ITSWG623A) – p.464
4.	Ensure that services provided to users meet or exceed that of prescribed service level.	Establish and maintain the performance and capacity management processes. (ITSWOS609A) – p.378 Manage the exceptional problems. (ITSWOS603A) – p.374
5.	Maintain IT service continuity plan to meet user requirements.	Perform disaster impact assessment and mitigation. (ITSWOS611A) – p.382 Develop business continuity plans and disaster recovery plans related to IT request. (ITWSM609A) – p.77 Identify and assess the risk factors related to IT. (ITSWG609A) – p.452 Manage contingency situations. (ITWSM505A) – p.62 Monitor and control of the implementation of Disaster Recovery Plan. (ITWOS512A) – p.361
6.	Plan and promote new services to meet business objectives.	Manage the emergency change request. (ITSWOS605A) – p.376 Manage product/services brand through the use of IT. (ITWSM508A) – p.67
7.	Manage the department budget; control the income and expenditure to get best value for the company.	Establish a business case for an IT investment. (ITSWG617A) – p.458 Allocate and prioritize IT and related resources. (ITSWG614A) – p.456 Prepare a budget based on the IT plan. (ITWSM504A) – p.61 Utilize the given IT and related resources. (ITSWG520A) – p.440

Competency Level - Specialist

Competency Requirements		
No.	Job Description	Competency
8.	Prepare management and technical reports for information and/or decision of senior level.	Collect and distribute disseminate information. (ITWSM506A) – p.64
9.	Improve service commitment by periodically survey users about service quality and solicit improvement suggestions.	Monitor and control of the service level fulfillment. (ITWOS506A) – p.348 Manage the service relationship with the customers and suppliers. (ITWOS514A) – p.362
10.	Provide 2 nd level support to frontline operations staff. Manage the third level support (in-house and/or vendor) to trouble-shoot and resolve operation problems.	Establish and maintain system support services process. (ITWOS529A) – p.368 Deliver system support services. (ITWOS424A) – p.328 Monitor and control system support services. (ITWOS425A) – p.330
11.	Provide technical expertise and overall management of IT infrastructure technical management.	Monitor and control of the database operations services. (ITWOS517A) – p.366
12.	Supervise frontline operation staff (computer operators, network, help desk, technical support).	Establish and maintain the help desk process. (ITWOS523A) – p.335 Recruit, retain and develop IT staff. (ITWGS521A) – p.441
13.	Enforce full compliances of security standards in terms of data center physical security and information access control.	Deliver the security services for operations. (ITWOS521A) – p.370 Define operational security protection processes. (ITWOS522A) – p.371
14.	Analyze current systems usage against planned capacity, and recommend solutions and preventive actions that meet both present and future needs.	Recommend availability improvement plans. (ITWOS505A) – p.346 Prepare capacity upgrade plan. (ITWOS509A) – p.356 Deliver performance and capacity management service. (ITWOS508A) – p.354 Monitor and control of the performance and capacity management services. (ITWOS510A) – p.358
15.	Work with hardware and software vendors on software version upgrade, configuration changes, technical support and product evaluation.	Manage the exceptional system operations services. (ITWOS528A) – p.364
16.	Prescribe and ensure documentation standards and ensure all operating procedures are up-to-date. Implement cost-effective physical and logical security solutions to protect company assets.	Conduct operation security risk assessment and audit. (ITWOS530A) – p.372 Establish and maintain the system operations process. (ITWOS422A) – p.324

No.	Job Description	Competency
17.	Implement appropriate service asset and configuration management process.	Monitor and control of the configuration management services. (ITSWOS511A) – p.360 Deliver configuration management services. (ITSWOS408A) – p.315
18.	Enforce established change and problem management procedures.	Maintain a change schedule. (ITSWOS503A) – p.341 Manage the day-to-day operation of a change management process.s (ITSWOS504A) – p.342 Establish and maintain the change management process. (ITSWOS525A) – p.344 Monitor and control of the problem management services. (ITSWOS502A) – p.337 Establish and maintain the problem management process. (ITSWOS524A) – p.339
19.	Ensure reliable facilities are provided to data center.	Establish and maintain the availability management process. (ITSWOS526A) – p.350
20.	Follow established release management process to implement system changes.	Establish and maintain the release management process. (ITSWOS527A) – p.352 Deliver the release management services. (ITSWOS407A) – p.311 Monitor and control the release management services. (ITSWOS419A) – p.312

Competency Level – Practitioner

Competency Requirements		
No.	Job Description	Competency
21.	Use appropriate tools to monitor overall systems and network performance, utilization, availability, capacity, security and healthiness so that pro-active actions can be taken to prevent or resolve problems.	Perform stock-take of IT assets. (ITSWOS201A) – p.291 Deliver availability management services. (ITSWOS406A) – p.308 Deliver the database operations services. (ITSWOS413A) – p.326 Deliver service level management services. (ITSWOS420A) – p.320
22.	Maintain log-books or operating records per shift. Conduct shift handover to ensure un-completed changes and incidents are followed-up by the incoming shift.	Maintain the help desk knowledge database. (ITSWOS302A) – p.295 Deliver the change management services. (ITSWOS405A) – p.307 Maintain the security control documents. (ITSWOS418A) – p.332 Monitor and control the system operation services. (ITSWOS304A) – p.298 Deliver the system operations services. (ITSWOS305A) – p.300 Ensure continuous operations of the computing environment. (ITSWOS410A) – p.316

No.	Job Description	Competency
23.	Work in team and follow the procedures based on quality and established standard, to achieve effectiveness and efficiency in the delivery and support of service.	Apply technical changes and patches to the hardware and software components. (ITSWOS308A) – p.304 Maintain the problem management knowledge database. (ITSWOS303A) – p.297 Conduct tests and drills to support the Disaster Recovery Plan. (ITSWOS411A) – p.318
24.	Provide prompt support to user on day to day operation problems on PCs, printers, office standard software, etc.	Recover failed hardware and software components. (ITSWOS307A) – p.303 Manage the day-to-day operations of service delivery. (ITSWOS421A) – p.322
25.	Take corrective action per documented procedures to handle incident, and escalate to supervisor if the incident is not fixed within pre-defined time frame.	Deliver the problem management services. (ITSWOS403A) – p.305 Analyse and fix the hardware and software failure. (ITSWOS423A) – p.327
26.	Communicate with support personnel and users on potential service outage, to carry out preventive maintenance, hardware installation, software implementation, etc.	Deliver field support services. (ITSWOS306A) – p.302
27.	Handle calls at service desk and communications with users.	Deliver Help Desk services. (ITSWOS301A) – p.292

B.8 Job Category – Information Security**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Establish standards, procedures and guidelines to protect the security of the information asset within an organization.	Establish and maintain information security policies. (ITSWIS601A) - p. 203 Develop information security strategy and obtain management buy-in. (ITSWIS621A) - p. 235 Establish corporate information security standards. (ITSWIS612A) - p. 243 Develop a risk management process. (ITSWIS604A) - p. 237 Define strategies and prioritize options to mitigate risk. (ITSWIS504A) - p. 212 Ensure compliance to necessary worldwide security standards, e.g. ISO27001, PCI-DSS. Ensure proper security risk assessment process is defined and followed.
2.	Ensure that the security standards and guidelines are aligned with business strategies.	Establish metrics to manage information security governance framework. (ITSWIS609A) - p. 241 Develop a business case and perform an enterprise value analysis. (ITSWIS603A) - p. 234 Evaluate and assess effectiveness of corporate information security practices. (ITSWIS507A) - p. 217
3.	Establish and manage the defensive mechanism to detect and prevent the intrusion as well as malicious attacks into the information systems operated by the organization.	Establish a business continuity planning strategy. (ITSWIS519A) - p. 229 Integrate information security programme requirements into an enterprise's life cycle activities. (ITSWIS607A) - p. 240
4.	Establish and manage the security audit standards and procedures.	Develop an information system security audit plan. (ITSWIS618A) - p. 249
5.	Establish organizational-wide security awareness program.	Facilitate cross functional teams for crisis management. (ITSWIS616A) - p. 247 Develop, propose and promulgate an enterprise's information security policies. (ITSWIS611A) - p. 242
6.	Be responsive to advancement in information security technologies and their applicability to the organization.	Minimize information security risks. (ITSWIS525A) - p. 215
7.	Act as the departmental focal person at executive management level.	Establish reporting and communication channels. (ITSWIS502A) - p. 209 Promote accountability in managing information security risks. (ITSWIS524A) - p. 214

Competency Level – Specialist

Competency Requirements		
No.	Job Description	Competency
9.	Design, implement and test information security controls to guard against the unauthorized disclosure and tempering of information asset belonging to the organization.	Ensure information security procedures and guidelines support information security policies. (ITSWIS402A) - p. 203 Develop information security practices and procedures. (ITSWIS506A) - p. 216 Create and maintain plans to implement information security governance framework. (ITSWIS606A) - p. 239
10.	Investigate incidents of security breach detected or reported.	Investigate an information security incident. (ITSWIS517A) - p. 227 Establish procedures for documenting security incident. (ITSWIS512A) - p. 221 Devise processes for detecting, identifying and analyzing security incident. (ITSWIS613A) - p. 244
11.	Assess and implement tools to enable better identification, monitoring, and response to information risks.	Develop methods to satisfy information security policy requirements. (ITSWIS505A) - p. 213
12.	Identify and analyse programs and implementation of security related to IT systems.	Develop information security practices and procedures. (ITSWIS506A) - p. 216
13.	Provide security guidance as needed to all stakeholders throughout the System Development Life Cycle.	Ensure risk management related activities are integrated into life cycle processes. (ITSWIS503A) - p. 211
14.	Provide security guidance in response to specific end user and management inquiries.	Develop, propose and promulgate an enterprise’s information security policies. (ITSWIS611A) - p. 242
15.	Support ongoing Security Awareness throughout the organization.	Provide awareness training program to staff dealing with business continuity planning. (ITSWIS522A) - p. 232 Develop information security awareness programme. (ITSWIS509A) - p. 219
16.	Identify technical and operational security threats and vulnerabilities associated with the planned concept of operation and system design and recommend appropriate solutions.	Identify and evaluate risks. (ITSWIS605A) - p. 238
17.	Conduct system audit to ensure compliance, to detect violation and vulnerability.	Develop an information system security audit plan. (ITSWIS618A) - p. 249 Prepare and deliver information system security audit report. (ITSWIS514A) - p. 223

No.	Job Description	Competency
18.	Other responsibilities.	Provide advice on computer forensics. (ITSWIS515A) - p. 235 Prepare and present forensics investigation report. (ITSWIS518A) - p. 228 Manage the execution of response and recovery plans. (ITSWIS511A) - p. 220 Plan and maintain business continuity solutions. (ITSWIS620A) - p. 250 Develop response and recovery plans. (ITSWIS614A) - p. 245

Competency Level – Practitioner

Competency Requirements		
No.	Job Description	Competency
19.	Identify and report risk and compliance issues and monitor corrective actions.	Report significant changes in risks. (ITSWIS401A) - p. 204 Evaluate and follow up on the recommendations in the information system security audit report. (ITSWIS526A) - p. 224 Enact information system security audit plan. (ITSWIS513A) - p. 222
20.	Provide technical and operational support for IT security.	Conduct drill test on business continuity planning. (ITSWIS521A) - p. 231 Securely and properly handle computer forensics evidence. (ITSWIS516A) - p. 226
21.	Monitor and assess administrative, physical, and technical security controls, such as audit log review, accounts review, training compliance, patch reporting, configuration management and security impact analysis.	Support and implement information security practices and procedures. (ITSWIS404A) - p. 206
22.	Conduct security functional requirements testing, as assigned, of system applications and components.	Ensure availability, integrity and confidentiality of information systems. (ITSWIS508A) - p. 218
23.	Support policy and procedures preparation and implementation.	Support and implement information security practices and procedures. (ITSWIS404A) - p. 206 Implement information security awareness programme. (ITSWIS405A) - p. 207
24.	Provide support for documentation and maintenance of the security infrastructure.	Prepare and deliver information system security audit report. (ITSWIS514A) - p. 223 Develop effective security guidelines / controls in compliance to the security policies.

B.9 Job Category – Multimedia**Competency Level – Master**

Competency Requirements		
No.	Job Description	Competency
1.	Establish and maintain Corporate Internet/Intranet architecture.	Define, prioritize and document architecture vision and principles related to Internet/Intranet for an organization. (ITSWAR601A) – p.171
2.	Design and implement multimedia application/tools based on industry best practices.	Select appropriate multimedia technologies for business purposes. (ITWSM613A) - p.82
3.	Plan and manage the design and production of multimedia products, including multimedia website and computer games.	Propose an architecture design (AD) and production of multimedia products. (ITSWDM601A) - p.271
4.	Provide creative direction and manage multimedia projects, including computer animation, audio-visual production from concept development to production.	Understand IT project management for multimedia projects. (ITSWG621A) - p.462
5.	Manage the implementation process for the organization’s website updates, collaborating with cross-functional teams.	Define software releases and control plan for multimedia projects. (ITSWDM608A) - p.283 Execute and monitor the software releases and control plan for multimedia projects. (ITSWDM609A) - p.284
6.	Establish and maintain web and/or computer game development framework, policies, standards, common components based on industry best practice.	Identify and evaluate multimedia technologies that support the objectives of an organisation (ITWSM612A) - p.81
7.	Maintain and improve enterprise web portal and design global deployment architecture based on industry best practice.	Define a software deployment / migration plan for multimedia projects. (ITSWDM611A) - p.287

Competency Level – Specialist

Competency Requirements		
No.	Job Description	Competency
8.	Set coding guidelines and does code reviews for multimedia product development team.	Perform inspection for the program code and software documents for multimedia projects. (ITSWDM506A) - p.264
9.	Design and supervise production of multimedia applications.	Propose a high level design (HLD) of the multimedia application software. (ITSWDM602A) - p.273 Propose a detailed level design (DLD) of the multimedia application software. (ITSWDM603A) - p.275

No.	Job Description	Competency
10.	Design and supervise production of multimedia projects including computer animation and audio-visual production.	Propose a high level design (HLD) of the multimedia project based on its design and technical requirements. Propose a detailed level design (DLD) of the multimedia project based on its design and technical requirements.
11.	Design and supervise production of multimedia website.	Propose a high level design (HLD) of the multimedia website based on its design and technical requirements. Propose a detailed level design (DLD) of the multimedia website based on its design and technical requirements.
12.	Design and supervise production of computer games for various technology platforms.	Propose a high level design (HLD) of the computer game software. Propose a detailed level design (DLD) of the computer game software.

Competency Level – Practitioner

Competency Requirements		
No.	Job Description	Competency
13.	Develop and test computer games for the various technology platforms.	Develop program modules of the multimedia products based on its design documents. (ITSWDM504A) - p.262 Apply skills in object-oriented design and object-oriented languages.
14.	Develop, test and implement multimedia websites and web applications.	Verify and validate the remaining multimedia products are functioning properly. (ITSWDM407A) - p.255 Use development software and IT tools to build websites.
15.	Monitor, measure and report online web analytics to improve traffic for multimedia applications.	Monitor and control the system operation services of multimedia products. (ITSWQS304A) - p.298
16.	Produce, capture and editing of different digital media elements including audio, video, digital image, graphics and animation.	Produce and prepare audio soundtracks. Produce and prepare digital video footage. Produce and prepare 2D and 3D animation. Produce and prepare 2D and 3D graphics. Produce and prepare digital images.
17.	Update website content and design.	Identify extra functional requirements of an existing multimedia product. (ITSWDM508A) - p.267
18.	Design and production of multimedia projects including computer animation and audio-visual productions.	Develop computer animation based on its design documents. Develop audio-visual production based on its design documents

Appendix C-1 - List of Certifications Available for Respective Categories

(in alphabetical order by job category and name of certificates)

Information Security

Master Level	
(ISC)2	Certified Information Systems Security Professional
(ISC)2	Certified Secure Software Lifecycle Professional
EC-Council	EC-Council Network Security Administrator
GIAC	GIAC Certified Project Manager Certification
GIAC	GIAC Security Essentials Certification
GIAC	GIAC Security Leadership Certification
ISACA	Certified in Risk and Information Systems Control
ISACA	Certified in the Governance of Enterprise IT
ISACA	Certified Information Security Manager
ISACA	Certified Information Systems Auditor
SCP	Security Certified Network Professional
Specialist Level	
(ISC)2	Certified Information Systems Security Professional
(ISC)2	Certified Secure Software Lifecycle Professional
Check Point Software Technologies Ltd.	Check Point Certified Master Architect
EC-Council	Certified EC-Council Security Specialist
EC-Council	EC-Council Network Security Administrator
GIAC	GIAC Certified Project Manager Certification
GIAC	GIAC Information Security Fundamentals
GIAC	GIAC Security Essentials Certification
GIAC	GIAC Security Leadership Certification
HKITPC	CPIT - Information Security Officer
ISACA	Certified in Risk and Information Systems Control
ISACA	Certified in the Governance of Enterprise IT
ISACA	Certified Information Security Manager
ISACA	Certified Information Systems Auditor
SCP	Security Certified Network Professional
Practitioner Level	
(ISC)2	Certified Information Systems Security Professional
(ISC)2	Certified Secure Software Lifecycle Professional
Check Point Software Technologies Ltd.	Check Point Certified Master Architect
Cisco	CCIE Security Certification
EC-Council	Certified EC-Council Security Specialist
EC-Council	EC-Council Network Security Administrator
GIAC	GIAC Information Security Fundamentals
GIAC	GIAC Security Leadership Certification
HKITPC	CPIT - Information Security Officer
ISACA	Certified in Risk and Information Systems Control

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ISACA	Certified Information Security Manager
ISACA	Certified Information Systems Auditor
SCP	Security Certified Network Professional

IT Architecture

Master Level	
CEIAEC	系统架构设计师
HKITPC	CPIT - Systems Architect
ISACA	Certified Information Systems Auditor (CISA)
Open Group	Distinguished Certified IT Architect
Open Group	Master Certified IT Architect
Specialist Level	
CEIAEC	系统架构设计师
CEIAEC	网络工程师
CompTIA	CTP+ Certification
HKITPC	CPIT - Systems Architect
ISACA	Certified Information Systems Auditor (CISA)
Open Group	Certified IT Architect
Open Group	Distinguished Certified IT Architect
Open Group	Master Certified IT Architect
Practitioner Level	
CEIAEC	系统架构设计师
CEIAEC	网络工程师
CompTIA	CTP+ Certification
HKITPC	CPIT - Systems Architect
ISACA	Certified Information Systems Auditor (CISA)
Open Group	Certified IT Architect
Open Group	Distinguished Certified IT Architect
Open Group	Master Certified IT Architect

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Multimedia

Master Level	
Adobe	Adobe Certified Associate (Flash, Dreamweaver, InDesign, Illustrator, Photoshop, Premiere, AfterEffects)
Microsoft	Microsoft Certified IT Professional
Specialist Level	
Adobe	Adobe Certified Associate (Flash, Dreamweaver, InDesign, Illustrator, Photoshop, Premiere, AfterEffects)
Microsoft	Microsoft Certified IT Professional
Practitioner Level	
Adobe	Adobe Certified Associate (Flash, Dreamweaver, InDesign, Illustrator, Photoshop, Premiere, AfterEffects)
Adobe	Adobe Certified Expert - Master (Flash, Dreamweaver, InDesign, Illustrator, Photoshop, Premiere, AfterEffects)
Adobe	Adobe Certified Instructor
CEIAEC	多媒体应用设计师
Microsoft	Microsoft Certified IT Professional
Microsoft	Microsoft Certified Professional Developer (Web Developer)
Microsoft	Microsoft Certified Technology Specialist (.NET Framework, Web Applications)

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Project Management (ICT)

Master Level	
CEIAEC	信息系统项目管理师
CEIAEC	系统集成项目管理工程师
CompTIA	CompTIA Project+
EC-Council	EC-Council Project Management in Information Technology Security
GIAC	GIAC Certified Project Manager Certification
HKITPC	CPIT - Associate Project Manager
HKITPC	CPIT - Project Director
PMI	Certified Associate in Project Management
PMI	Program Management Professional
PMI	Project Management Professional
PRINCE2	PRINCE2 Registered Foundation
PRINCE2	PRINCE2 Registered Practitioner
QAI	Certified Software Project Manager
SCS	Certified IT Project Management
SCS	Certified IT Project Manager (Associate)
SCS	Certified IT Project Manager (Senior)
Specialist Level	
CEIAEC	信息系统项目管理师
CEIAEC	系统集成项目管理工程师
CompTIA	CompTIA Project+
EC-Council	EC-Council Project Management in Information Technology Security
GIAC	GIAC Certified Project Manager Certification
HKITPC	CPIT - Associate Project Manager
HKITPC	CPIT - Project Director
PMI	Certified Associate in Project Management
PMI	Program Management Professional
PMI	Project Management Professional
PRINCE2	PRINCE2 Registered Foundation
PRINCE2	PRINCE2 Registered Practitioner
QAI	Certified Software Project Manager
SCS	Certified IT Project Management
SCS	Certified IT Project Manager (Associate)
SCS	Certified IT Project Manager (Senior)
Practitioner Level	
CEIAEC	信息系统项目管理师
CEIAEC	系统集成项目管理工程师
CompTIA	CompTIA Project+
EC-Council	EC-Council Project Management in Information Technology Security
GIAC	GIAC Certified Project Manager Certification
HKITPC	CPIT - Associate Project Manager
HKITPC	CPIT - Project Director

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PMI	Certified Associate in Project Management
PMI	Program Management Professional
PMI	Project Management Professional
PRINCE2	PRINCE2 Registered Foundation
PRINCE2	PRINCE2 Registered Practitioner
Practitioner Level	
QAI	Certified Software Project Manager
SCS	Certified IT Project Management
SCS	Certified IT Project Manager (Associate)
SCS	Certified IT Project Manger (Senior)

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Quality Assurance

Master Level	
HKITPC	CPIT - Quality Assurance Manager
ISACA	Certified Information Systems Auditor (CISA)
QAI	Certified Associate in Software Quality
QAI	Certified Associate in Software Testing
QAI	Certified Software Quality Analyst
SCS	Certified Software Quality Analyst
Specialist Level	
HKITPC	CPIT - Quality Assurance Manager
ISACA	Certified Information Systems Auditor (CISA)
QAI	Certified Associate in Software Quality
QAI	Certified Associate in Software Testing
QAI	Certified Software Quality Analyst
QAI	Certified Software Tester
SCS	Certified Software Quality Analyst
Practitioner Level	
HKITPC	CPIT - Quality Assurance Manager
ISACA	Certified Information Systems Auditor (CISA)
QAI	Certified Associate in Software Quality
QAI	Certified Associate in Software Testing
QAI	Certified Software Quality Analyst
QAI	Certified Software Tester
SCS	Certified Software Quality Analyst

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Software Engineering/Software Development

Master Level	
CEIAEC	系统分析师
HKIE	Professional Engineer - Information Discipline
HKITPC	CPIT - Business Analyst
HKITPC	CPIT - Systems Architect
Specialist Level	
CEIAEC	嵌入式系统设计师
CEIAEC	数据库系统工程师
CEIAEC	系统分析师
CEIAEC	软件设计师
CEIAEC	软件评测师
CIW	CIW Web Development Professional
EC-Council	Certified Ethical Hacker
EC-Council	EC-Council Certified Secure Application Developer
EC-Council	EC-Council Certified Secure Programmer
EC-Council	EC-Council Certified Security Analyst
HKIE	Professional Engineer - Information Discipline
HKITPC	CPIT - Business Analyst
HKITPC	CPIT - Systems Architect
IEEE	Certified Software Development Professional
UMTP	Certified Modeler L4
Practitioner Level	
Asso of the International Certified Configuration Manager e.V.	iNTCCM Certified Professional for Configuration Management
British Computer Society	Intermediate Certificate in Software Testing
CEIAEC	嵌入式系统设计师
CEIAEC	数据库系统工程师
CEIAEC	程序员
CEIAEC	系统分析师
CEIAEC	软件设计师
CEIAEC	软件评测师
CIW	CIW Web Design Professional
CIW	CIW Web Development Professional
CIW	CIW Web Foundation Professional
CIW	CIW Web Security Professional
EC-Council	Certified Ethical Hacker
EC-Council	EC-Council Certified Secure Application Developer
EC-Council	EC-Council Certified Secure Programmer
EC-Council	EC-Council Certified Security Analyst
GIAC	GIAC Secure Software Programmer - .NET
GIAC	GIAC Secure Software Programmer - Java

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HKITPC	CPIT - Business Analyst
HKITPC	CPIT - Systems Architect
IEEE	Certified Software Development Associate
IEEE	Certified Software Development Professional
International Requirements Engineering Board	IREB Certified Professional for Requirements Engineering
Practitioner Level	
OMG	OMG Certified Expert in BPM
OMG	OMG Certified Real-time and Embedded Specialist
OMG	OMG Certified UML Professional
QAI	Certified Software Process Engineer
SEI	SEI-Certified PSP Developer

Service Management and Operation

Master Level	
EXIN	ISO/IEC 20000 Auditor
EXIN	ISO/IEC 20000 Practitioner
EXIN	ITIL® V3 Expert
EXIN	ITIL® V3 Intermediate
Specialist Level	
EXIN	ISO/IEC 20000 Auditor
EXIN	ISO/IEC 20000 Foundation
EXIN	ISO/IEC 20000 Practitioner
EXIN	ITIL® V3 Expert
EXIN	ITIL® V3 Foundation
EXIN	ITIL® V3 Intermediate
Practitioner Level	
CEIAEC	信息系统运行管理员
EXIN	ISO/IEC 20000 Auditor
EXIN	ISO/IEC 20000 Foundation
EXIN	ISO/IEC 20000 Practitioner
EXIN	ITIL® V3 Expert
EXIN	ITIL® V3 Foundation
EXIN	ITIL® V3 Intermediate

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Appendix C-2 - List of Certifications scanned

Awarded by	Certified Title	Certificates
Adobe	ACA	Adobe Certified Associate
Adobe	ACE	Adobe Certified Expert
Adobe	ACI	Adobe Certified Instructor
Autodesk		Audodesk 3ds Max 2011
Autodesk		Audodesk 3ds Max Design 2011
Autodesk		Audodesk Inventor 2011
Autodesk		AutoCAD 2011
Autodesk		AutoCAD Civil 3D 2012
Autodesk		Autodesk Maya 2011
British Computer Society		Certificate in IT for Insurance Professionals
British Computer Society		Intermediate Certificate in Software Testing
Brocade	BADCS	Brocade Accredited Data Center Specialist
Brocade	BAFCoES	Brocade Accredited FCoE Specialist
Brocade	BAIS	Brocade Accredited Internetworking Specialist
Brocade	BASCS	Brocade Accredited Server Connectivity Specialist
Brocade	BATSS	Brocade Accredited Technical Support Specialist
Brocade	BCAF	Brocade Certified Architect For FICON
Brocade	BCFA	Brocade Certified Fabric Administrator
Brocade	BCFD	Brocade Certified Fabric Designer
Brocade	BCFP	Brocade Certified Fabric Professional
Brocade	BCFCoEP	Brocade Certified FCoE Professional
Brocade	BCLE	Brocade Certified Layer 4-7 Engineer
Brocade	BCLP	Brocade Certified Layer 4-7 Professional
Brocade	BCNE	Brocade Certified Network Engineer
Brocade	BCNP	Brocade Certified Network Professional
Brocade	BCSM	Brocade Certified SAN Manager
CEIAEC		信息处理技术员
CEIAEC		信息系统监理师
CEIAEC		信息系统管理工程师
CEIAEC		信息系统运行管理员
CEIAEC		信息系统项目管理师
CEIAEC		多媒体应用设计师
CEIAEC		嵌入式系统设计师
CEIAEC		数据库系统工程师
CEIAEC		电子商务技术员
CEIAEC		电子商务设计师
CEIAEC		程序员
CEIAEC		系统分析师
CEIAEC		系统架构设计师
CEIAEC		系统集成项目管理工程师
CEIAEC		网络管理员
CEIAEC		软件设计师

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Awarded by	Certified Title	Certificates
CEIAEC		软件设计师
CEIAEC		软件评测师
Check Point Software Technologies Ltd.	CCMA	Check Point Certified Master Architect
Check Point Software Technologies Ltd.	CCSA	Check Point Certified Security Administrator
Check Point Software Technologies Ltd.	CCSE	Check Point Certified Security Expert
Cisco	CCDA	CCDA Certification
Cisco	CCDP	CCDP Certification
Cisco	CCENT	CCENT Certification
Cisco	CCIE	CCIE R&S Certification
Cisco	CCIE Security	CCIE Security Certification
Cisco	CCIE Wireless	CCIE Wireless Certification
Cisco	CCIP	CCIP Certification
Cisco	CCNA	CCNA Certification
Cisco	CCNA Security	CCNA Security Certification
Cisco	CCNA SP Operations	CCNA Service Provider Operations Certification
Cisco	CCNA Voice	CCNA Voice Certification
Cisco	CCNA Wireless	CCNA Wireless Certification
Cisco	CCNP	CCNP Certification
Cisco		CCNP Service Provider Operations *available July 2010
Cisco	CCNP Wireless	CCNP Wireless Certification
Cisco	CCSP	CCSP Certification
Cisco	CCVP	CCVP Certification
Cisco		Cisco Advanced IP Communications Sales Specialist
Cisco		Cisco Advanced Wireless LAN Design Specialist
Cisco		Cisco Advanced Wireless LAN Design Specialist
Cisco		Cisco Advanced Wireless LAN Field Specialist
Cisco		Cisco Advanced Wireless LAN Sales Specialist
Cisco		Cisco ASA Specialist
Cisco	CCIE Service Provider	Cisco CCIE Service Provider
Cisco	CCIE Service Provider Operations	Cisco CCIE Service Provider Operations
Cisco	CCIE Storage Networking	Cisco CCIE Storage Networking
Cisco	CCIE Voice	Cisco CCIE Voice
Cisco		Cisco Certified Architect
Cisco	CCDE	Cisco Certified Design Expert
Cisco		Cisco Data Center Application Services Design Specialist
Cisco		Cisco Data Center Application Services Support Specialist
Cisco		Cisco Data Center Networking Infrastructure Design Specialist
Cisco		Cisco Data Center Networking Infrastructure Support Specialist
Cisco		Cisco Data Center Networking Sales Specialist
Cisco		Cisco Data Center Storage Networking Design Specialist

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Awarded by	Certified Title	Certificates
Cisco		Cisco Data Center Storage Networking Sales Specialist (Retired October 31, 2009)
Cisco		Cisco Data Center Storage Networking Support Specialist
Cisco		Cisco Data Center Unified Computing Design Specialist
Cisco		Cisco Data Center Unified Computing Support Specialist
Cisco		Cisco Express Foundation Design Specialist
Cisco		Cisco Express Foundation Field Specialist
Cisco		Cisco Express Foundation Sales Specialist
Cisco		Cisco IP Communications Express Sales Specialist
Cisco		Cisco IP Communications Express Specialist
Cisco		Cisco IP Contact Center Express Specialist
Cisco		Cisco IP Telephony Design Specialist
Cisco		Cisco IPS Specialist
Cisco		Cisco MeetingPlace Design Specialist
Cisco		Cisco MeetingPlace Sales Specialist
Cisco		Cisco MeetingPlace Support Specialist
Cisco		Cisco Network Admission Control Specialist
Cisco		Cisco Rich Media Communications Specialist
Cisco		Cisco Routing and Switching Field Specialist
Cisco		Cisco Routing and Switching Sales Specialist
Cisco		Cisco Routing and Switching Solutions Specialist
Cisco		Cisco Security Sales Specialist
Cisco		Cisco Security Solutions and Design Specialist
Cisco		Cisco TelePresence Installations Specialist
Cisco		Cisco TelePresence Solutions Specialist
Cisco		Cisco Unified Presence Specialist
Cisco		Cisco Unity Design Specialist
Cisco		Cisco Unity Support Specialist
Cisco		CNSS 4013 Recognition
CITRIX	CCA	Citrix Certified Administrator (Application Firewall 8)
CITRIX	CCA	Citrix Certified Administrator (Citrix Access Gateway 4 Advanced Edition)
CITRIX	CCA	Citrix Certified Administrator (Citrix Access Gateway 8 Enterprise Edition)
CITRIX	CCA	Citrix Certified Administrator (Citrix Access Gateway 9 Enterprise Edition)
CITRIX	CCA	Citrix Certified Administrator (Citrix NetScaler 9)
CITRIX	CCA	Citrix Certified Administrator (Citrix WANScaler 4)
CITRIX	CCA	Citrix Certified Administrator (Citrix XenApp 5 for Windows Server 2003)
CITRIX	CCA	Citrix Certified Administrator (Citrix XenApp 5 for Windows Server 2008)
CITRIX	CCA Platinum	Citrix Certified Administrator (Citrix XenApp 5 Platinum Edition)
CITRIX	CCA	Citrix Certified Administrator (Citrix XenApp 6)

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Awarded by	Certified Title	Certificates
CITRIX	CCA	Citrix Certified Administrator (Citrix XenServer 5 Platinum Edition)
CITRIX	CCA	Citrix Certified Administrator (Citrix XenServer 5)
CITRIX	CCA	Citrix Certified Administrator (NetScaler 9 Platinum Edition)
CITRIX	CCA	Citrix Certified Administrator (XenDesktop4)
CITRIX	CCA	Citrix Certified Administrator (XenDesktop5)
CITRIX	CCAA	Citrix Certified Advanced Administrator (Citrix XenApp 5 for Windows Server 2008)
CITRIX	CCEE	Citrix Certified Enterprise Engineer (Citrix XenApp Presentation Server 4)
CITRIX	CCEE	Citrix Certified Enterprise Engineer (Virtualization)
CITRIX	CCIA	Citrix Certified Integration Architect (Citrix XenApp Presentation Server 4)
CITRIX	CCIA	Citrix Certified Integration Architect (Virtualization)
CIW		CIW Database Design Specialist
CIW		CIW E-Commerce Specialist
CIW		CIW Internet Business Associate
CIW		CIW JavaScript Specialist
CIW		CIW Network Technology Associate
CIW		CIW Perl Specialist
CIW		CIW Site Development Associate
CIW		CIW Web Design Professional
CIW		CIW Web Design Specialist
CIW		CIW Web Development Professional
CIW		CIW Web Foundation Professional
CIW		CIW Web Foundations Associate
CIW		CIW Web Security Associate
CIW		CIW Web Security Associate
CIW		CIW Web Security Professional
CIW		CIW Web Security Professional
CIW		CIW Web Security Specialist
CIW		CIW Web Security Specialist
CompTIA	CCNT	Certified in Convergent Network Technologies
CompTIA		CompTIA A+
CompTIA	CDIA+	CompTIA Certified Document Imaging Architect
CompTIA		CompTIA CTP
CompTIA		CompTIA Linux+
CompTIA		CompTIA PDI+
CompTIA		CompTIA Project+
CompTIA		CompTIA Radio Frequency Identification (RFID+)
CompTIA		CompTIA Security+
CompTIA		CompTIA Server+
CompTIA	CTP+	CTP+ Certification
CompTIA		The CompTIA Network+
CWNP	CWAP *	Certified Wireless Analysis Professional

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Awarded by	Certified Title	Certificates
CWNP	CWDP *	Certified Wireless Design Professional
CWNP	CWNA	Certified Wireless Network Administrator
CWNP	CWNE	Certified Wireless Network Expert
CWNP	CWSP	Certified Wireless Security Professional
CWNP	CWTS	Certified Wireless Technology Specialist
CyberSecurity	CSFA	CyberSecurity Forensic Analyst
DassaultSystèmes		CATIA V5 Certified Professional (Expert Level)
DassaultSystèmes		CATIA V5 Certified Professional (Master Level)
DassaultSystèmes		CATIA V5 Certified Professional (Specialist Level)
DassaultSystèmes		ENOVIA Matrix Application Developer
DassaultSystèmes		ENOVIA Matrix Collaboration Consultant
DassaultSystèmes		ENOVIA SmarTeam Application Engineer Specialist (V5R14)
DassaultSystèmes		ENOVIA SmarTeam Application Engineer Specialist (V5R17)
DassaultSystèmes		ENOVIA VPM Navigator Specialist (V5R15)
DSDM		Agile Project Management
EC-Council	ECSS	Certified EC-Council Security Specialist
EC-Council	CEH	Certified Ethical Hacker
EC-Council	CNDA	Certified Network Defense Architect
EC-Council	CSAD	EC-Council Certified Secure Application Developer
EC-Council	ECSP	EC-Council Certified Secure Programmer
EC-Council	ECSA	EC-Council Certified Security Analyst
EC-Council	ECVP	EC-Council Certified VoIP Professional
EC-Council		EC-Council Disaster Recovery Professional
EC-Council		EC-Council Network Security Administrator
EC-Council	PMITS	EC-Council Project Management in Information Technology Security
EC-Council	LPT	Licensed Penetration Tester
EC-Council	Network 5	Network5 Certification
EC-Council	Security 5	Security5 Certification
EC-Council	Wireless 5	Wireless5 Certification
EMC	EMCApD	Application Developer
EMC	EMCISA	Information Storage and Managemen
EMC		Product Technology Specific
EMC	EMCSA	Storage Administrator
EMC	EMCST	Storage Technologist
EMC	EMCSyA	System Administrator
EMC	EMCTA	Technology Architect
EXIN		Microsoft® Operations Framework 4.0 Foundation
EXIN		Application Management Foundation
EXIN		Application Management Foundation based on ASL 2
EXIN		BiSL Business Information Management Foundation
EXIN		Business Information Management Foundation
EXIN		Information Security Foundation based on ISO/IEC 27002
EXIN		Information Security Management Advanced based on ISO/IEC 27002

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Awarded by	Certified Title	Certificates
EXIN		Information Security Management Expert based on ISO/IEC 27002
EXIN		ISO/IEC 20000 Associate Consultant/Auditor
EXIN		ISO/IEC 20000 Consultant Manager
EXIN		ISO/IEC 20000 Executive Consultant/Manager
EXIN		ISO/IEC 20000 Internal Auditor
EXIN		ISO/IEC 20000 Professional: Alignment of IT and the Business
EXIN		ISO/IEC 20000 Professional: Control of IT Services
EXIN		ISO/IEC 20000 Professional: Delivery of IT Services
EXIN		ISO/IEC 20000 Professional: Management and Improvement of ITSM Processes
EXIN		ISO/IEC 20000 Professional: Support of IT Services
EXIN		ITIL® V3 Foundation
EXIN		ITIL® V3 Intermediate
EXIN		ITIL® V3 Managers Bridge
EXIN		TMap NEXT® Advanced
EXIN		TMap NEXT® Foundation
Fortinet	FCNSA	Fortinet Certified Network Security Associate
Fortinet	FCNSP	Fortinet Certified Network Security Professional
GIAC	GAWN	GIAC Assessing Wireless Networks
GIAC	GCED	GIAC Certified Enterprise Defender
GIAC	GCED	GIAC Certified Enterprise Defender
GIAC	GCFW	GIAC Certified Firewall Analyst
GIAC	GCFW	GIAC Certified Firewall Analyst
GIAC	GCFA	GIAC Certified Forensic Analyst
GIAC	GCFA	GIAC Certified Forensic Analyst
GIAC	GCFE *	GIAC Certified Forensics Examiner
GIAC	GCFE	GIAC Certified Forensics Examiner
GIAC	GCIH	GIAC Certified Incident Handler
GIAC	GCIH	GIAC Certified Incident Handler
GIAC	GCIA	GIAC Certified Intrusion Analyst
GIAC	GCIA	GIAC Certified Intrusion Analyst
GIAC	G7799	GIAC Certified ISO-17799 Specialist
GIAC	G7799	GIAC Certified ISO-17799 Specialist
GIAC	GPEN	GIAC Certified Penetration Tester
GIAC	GPEN	GIAC Certified Penetration Tester
GIAC	GCPM	GIAC Certified Project Manager Certification
GIAC	GCPM	GIAC Certified Project Manager Certification
GIAC	GCUX	GIAC Certified UNIX Security Administrator
GIAC	GCUX	GIAC Certified UNIX Security Administrator
GIAC	GCWN	GIAC Certified Windows Security Administrator
GIAC	GCWN	GIAC Certified Windows Security Administrator
GIAC	GISF	GIAC Information Security Fundamentals
GIAC	GISF	GIAC Information Security Fundamentals
GIAC	GISP	GIAC Information Security Professional

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Awarded by	Certified Title	Certificates
GIAC	GISP	GIAC Information Security Professional
GIAC	GLEG	GIAC Legal Issues
GIAC	GLEG	GIAC Legal Issues
GIAC	GREM	GIAC Reverse Engineering Malware
GIAC	GSSP-NET	GIAC Secure Software Programmer - .NET
GIAC	GSSP-NET	GIAC Secure Software Programmer - .NET
GIAC	GSSP-JAVA	GIAC Secure Software Programmer - Java
GIAC	GSSP-JAVA	GIAC Secure Software Programmer - Java
GIAC	GSEC	GIAC Security Essentials Certification
GIAC	GSEC	GIAC Security Essentials Certification
GIAC	GSLC	GIAC Security Leadership Certification
GIAC	GSLC	GIAC Security Leadership Certification
GIAC	GSNA	GIAC Systems and Network Auditor
GIAC	GSNA	GIAC Systems and Network Auditor
GIAC	GWAPT	GIAC Web Application Penetration Tester
GIAC	GWAPT	GIAC Web Application Penetration Tester
HKIE		Professional Engineer - Information Discipline
HKIE		Professional Engineer - Information Discipline
HKITPC	CPIT(APM)	CPIT - Associate Project Manager
HKITPC	CPIT(BA)	CPIT - Business Analyst
HKITPC	CPIT(InfoSec)	CPIT - Information Security Officer
HKITPC	CPIT(PD)	CPIT - Project Director
HKITPC	CPIT(QAM)	CPIT - Quality Assurance Manager
HKITPC	CPIT(SA)	CPIT - Systems Architect
Huawei		HCIE : Huawei Certified Internetwork Expert
Huawei		HCNE : Huawei Certified Network Engineer
Huawei		HCSE : Huawei Certified Senior Network Engineer
IBM		IBM Certified Administrator
IBM		IBM Certified Administrator and SOA Solutions
IBM		IBM Certified Advanced Application Developer
IBM		IBM Certified Advanced Database Administrator
IBM		IBM Certified Advanced Deployment Professional
IBM		IBM Certified Advanced Security Professional
IBM		IBM Certified Advanced System Administrator
IBM		IBM Certified Advanced Technical Expert
IBM		IBM Certified Application Developer
IBM		IBM Certified Associate Developer
IBM		IBM Certified Associate System Administrator
IBM		IBM Certified Business Process Analyst
IBM		IBM Certified DataBase Administrator
IBM		IBM Certified Database Associate
IBM		IBM Certified Deployment Professional
IBM		IBM Certified Integration Developer
IBM		IBM Certified Operator
IBM		IBM Certified SOA Associate

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Awarded by	Certified Title	Certificates
IBM		IBM Certified SOA Solution Designer
IBM		IBM Certified Solution Advisor
IBM		IBM Certified Solution Advisor
IBM		IBM Certified Solution Designer
IBM		IBM Certified Solution Developer
IBM		IBM Certified Solution Expert
IBM		IBM Certified Solution Implementer
IBM		IBM Certified Specialist
IBM		IBM Certified Specialist - SPSS Statistics Level 1
IBM		IBM Certified Specialist - SPSS Statistics Level 1
IBM		IBM Certified Storage Administrator
IBM		IBM Certified Support Professional
IBM		IBM Certified System Administrator
IBM		IBM SPSS Academics
IEEE	CSDA	Certified Software Development Associate
IEEE	CSDP	Certified Software Development Professional
IIBA	CCBA	Certification of Competency in Business Analysis
IIBA	CCBA™	Certification of Competency in Business Analysis™ (CCBA™) Designation
IIBA	CBAP	Certified Business Analysis Professional
IIBA	CBAP®	Certified Business Analysis Professional™ (CBAP®) Designation
International Requirements Engineering Board		IREB Certified Professional for Requirements Engineering
ISACA	CRISC	Certified in Risk and Information Systems Control (CRISC)
ISACA	CGEIT	Certified in the Governance of Enterprise IT (CGEIT)
ISACA	CISM	Certified Information Security Manager (CISM)
ISACA	CISA	Certified Information Systems Auditor (CISA)
ISEB (ITIL)		Managing Across the Lifecycle
Isilon	ICSP	Isilon Certified Storage Professionals
ISTQB	CTAL	Certified Tester Advanced Level
ISTQB	CTEL	Certified Tester Expert Level
ISTQB	CTFL	Certified Tester Foundation Level
JUNIPER NETWORK	JNCIA-ER	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-M	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-AC	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-IDP	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-FW	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-E	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-SSL	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-EX	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-JUNOS	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIA-WXC	Juniper Networks Certified Internet Associate
JUNIPER NETWORK	JNCIE-ER	Juniper Networks Certified Internet Expert
JUNIPER NETWORK	JNCIE-M	Juniper Networks Certified Internet Expert

Research Report on “Development of a Certification Roadmap for IT Professional Certification” Project

Awarded by	Certified Title	Certificates
JUNIPER NETWORK	JNCIP-E	Juniper Networks Certified Internet Professional
JUNIPER NETWORK	JNCIP-M	Juniper Networks Certified Internet Professional
JUNIPER NETWORK	JNCIS-SEC	Juniper Networks Certified Internet Specialist
JUNIPER NETWORK	JNCIS-E	Juniper Networks Certified Internet Specialist
JUNIPER NETWORK	JNCIS-ER	Juniper Networks Certified Internet Specialist
JUNIPER NETWORK	JNCIS-FW	Juniper Networks Certified Internet Specialist
JUNIPER NETWORK	JNCIS-M	Juniper Networks Certified Internet Specialist
JUNIPER NETWORK	JNCIS-SSL	Juniper Networks Certified Internet Specialist
LPI	LPIC-2	Advanced Level Linux Professional
LPI	LPIC-1	Junior Level Linux Professional
LPI	LPIC-3	Senior Level Linux Professional
Microsoft	MCAD	Microsoft Certified Applications Developer
Microsoft	MCA	Microsoft Certified Architect Program
Microsoft	MCDST	Microsoft Certified Desktop Support Technician
Microsoft	MCITP	Microsoft Certified IT Professional
Microsoft		Microsoft Certified Master Program
Microsoft	MCPD	Microsoft Certified Professional Developer
Microsoft	MCSD	Microsoft Certified Solution Developer
Microsoft	MCSA	Microsoft Certified Systems Administrator
Microsoft	MCSE	Microsoft Certified Systems Engineer
Microsoft	MCTS	Microsoft Certified Technology Specialist
Microsoft		Microsoft Certified Technology Specialist for Microsoft Dynamics AX
Microsoft		Microsoft Certified Technology Specialist for Microsoft Dynamics CRM
Microsoft		Microsoft Certified Technology Specialist for Microsoft Dynamics GP
Microsoft		Microsoft Certified Technology Specialist for Microsoft Dynamics NAV
Microsoft		Microsoft Certified Technology Specialist for Microsoft Dynamics SL
Microsoft		Microsoft Office Specialist Certification
Microsoft		Microsoft Visual Studio Certification
National Instruments		National Instruments Certified LabVIEW Architect
National Instruments		National Instruments Certified LabVIEW Associate Developer
National Instruments	CLD	National Instruments Certified LabVIEW Developer
National Instruments		National Instruments Certified LabWindows/CVI Developer
National Instruments		National Instruments Certified TestStand Architects
National Instruments		National Instruments Certified TestStand Developers
Nokia		Nokia Certified Qt Developer
Nokia		Nokia Certified Qt Specialist
Novell	CLDA	Certified Linux Desktop Administrator
Novell		Certified Novell Administrator
Novell	CNE	Certified Novell Engineer
Novell	CNIMA	Certified Novell Identity Manager Administrator
Novell	CNZA	Certified Novell ZENworks® Administrator
Novell		Certified Workload Management Administrator

Research Report on “Development of a Certification Roadmap for IT Professional Certification”
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Awarded by	Certified Title	Certificates
Novell	CWMA	Certified Workload Management Administrator
Novell		Novell Certified Administrator
Novell	NCA ES	Novell Certified Administrator Enterprise Services
Novell		Novell Certified Engineer
Novell	NCE ES	Novell Certified Engineer Enterprise Services
Novell	CLA	Novell Certified Linux Administrator
Novell	Novell CLE 10	Novell Certified Linux Engineer 10
Novell	Novell CLE 11	Novell Certified Linux Engineer 11
Novell	Novell CLP	Novell Certified Linux Professional
Novell		Novell Certified Linux Professional 11
OMG	OCEB	OMG Certified Expert in BPM
OMG	OCRES	OMG Certified Real-time and Embedded Specialist
OMG	OCUP	OMG Certified UML Professional
Oracle	OCS	Agile Product Lifecycle Management 9.3 Certified Implementation Specialist
Oracle	OCS	Data Warehouseing 11g Implementation Specialist
Oracle	OCS	Hyperion BI+ Certified Expert
Oracle	OCS	Hyperion Essbase Certified Expert
Oracle	OCS	Hyperion Financial Management 4.1 Implementation Consultant Certified Expert
Oracle	OCS	Hyperion Financial Management Administrator Certified Expert
Oracle	OCS	Hyperion Planning 4.1 Implementation Consultant Certified Expert
Oracle	OCS	Hyperion Planning Administrator Certified Expert
Oracle	OCS	Identity Administration and Analytics 11g Implementation Specialist
Oracle	OCS	JD Edwards EnterpriseOne Financial Management 9.0 Certified Implementation Specialist
Oracle		OPN Certified Specialist - endorses those Oracle Partners who have completed specified requirements
Oracle	OCP	Oracle 11i Applications Database Administrator
Oracle	OCS	Oracle 11i System Administrator
Oracle	OCS	Oracle 11i Workflow Certified Expert
Oracle	OCA	Oracle 9i Database Administrator Certification
Oracle	OCP	Oracle 9i Database Administrator Certification
Oracle	OCS	Oracle Application Express Developer Certified Expert
Oracle	OCS	Oracle Application Express Developer Certified Expert
Oracle	OCS	Oracle Application Grid Implementation Specialist
Oracle	OCS	Oracle Application Integration Architecture 11g Certified Implementation Specialist
Oracle	OCA	Oracle Application Server 10g Administrator
Oracle	OCP	Oracle Application Server 10g Administrator
Oracle	OCS	Oracle Business Intelligence Applications 7.9.6 for CRM Certified Implementation Specialist
Oracle	OCS	Oracle Business Intelligence Applications 7.9.6 for ERP Certified Implementation Specialist

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Awarded by	Certified Title	Certificates
Oracle	OCS	Oracle Business Intelligence Foundation 10.1.3 Certified Implementation Specialist
Oracle	OCS	Oracle CRM On Demand Certified Implementation Specialist
Oracle	OCA	Oracle Database 10g Administrator
Oracle	OCP	Oracle Database 10g Administrator
Oracle	OCM	Oracle Database 10g Administrator
Oracle	OCS	Oracle Database 10g: Managing Oracle on Linux Certified Expert
Oracle	OCS	Oracle Database 10g: Managing Oracle on Linux Certified. Experts
Oracle	OCS	Oracle Database 10g: RAC Administrator Certified Experts
Oracle	OCA	Oracle Database 11g Administrator
Oracle	OCP	Oracle Database 11g Administrator
Oracle	OCM	Oracle Database 11g Administrator
Oracle	OCS	Oracle Database 11g Certified Implementation Specialist
Oracle	OCS	Oracle Database 11g Performance Tuning Certified Expert
Oracle	OCS	Oracle Database 11g Security Options Certified Implementation Specialist
Oracle	OCS	Oracle Database SQL Certified Experts
Oracle	OCS	Oracle Database SQL Certified Experts
Oracle	OCP	Oracle E-Business Suite 11i Financials Certified Professional
Oracle	OCP	Oracle E-Business Suite 11i Financials Certified Professional
Oracle	OCP	Oracle E-Business Suite 11i Supply Chain Certified Professional
Oracle	OCP	Oracle E-Business Suite 11i Supply Chain Certified Professional
Oracle	OCS	Oracle E-Business Suite 12 Financial Management Certified Implementation Specialist: Oracle General Ledger
Oracle	OCS	Oracle E-Business Suite 12 Financial Management Certified Implementation Specialist: Oracle Payables
Oracle	OCS	Oracle E-Business Suite 12 Financial Management Certified Implementation Specialist: Oracle Receivables
Oracle	OCS	Oracle E-Business Suite 12 Supply Chain Certified Implementation Specialist: Oracle Inventory
Oracle	OCS	Oracle E-Business Suite 12 Supply Chain Certified Implementation Specialist: Oracle Order Management
Oracle	OCS	Oracle E-Business Suite 12 Supply Chain Certified Implementation Specialist: Oracle Purchasing
Oracle	OCP	Oracle E-Business Suite R12 Applications Database Administrator Certified Professional
Oracle	OCS	Oracle E-Business Suite R12 Financials Certified Expert
Oracle	OCS	Oracle E-Business Suite R12 Supply Chain Certified Expert
Oracle	OCS	Oracle E-Business Suite R12 System Administrator Certified Expert
Oracle	OCS	Oracle EBS R12 Advanced Supply Chain Planning Certified Expert

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Awarded by	Certified Title	Certificates
Oracle	OCS	Oracle ECM Implementation Specialist
Oracle	OCS	Oracle Enterprise Linux Certified Implementation Specialist
Oracle	OCS	Oracle Enterprise Manager 11g Implementation Specialist
Oracle	OCS	Oracle Enterprise Taxation Management Certified Implementation Specialist
Oracle	OCS	Oracle Essbase 11 Certified Implementation Specialist
Oracle	OCS	Oracle Exadata 11g Certified Implementation Specialist
Oracle	OCP	Oracle Forms Developer
Oracle	OCA	Oracle Forms Developer
Oracle	OCS	Oracle Golden Gate 10 Certified Implementation Specialist
Oracle	OCS	Oracle Hyperion Financial Management 11 Certified Implementation Specialist
Oracle	OCS	Oracle Hyperion Planning 11 Certified Implementation Specialist
Oracle	OCP	Oracle PL/SQL Developer
Oracle	OCA	Oracle PL/SQL Developer
Oracle	OCS	Oracle Policy Automation 10 Certified Implementation Specialist
Oracle	OCS	Oracle Service Oriented Architecture (SOA) Infrastructure Implementation Certified Expert
Oracle	OCS	Oracle SOA Architect Certified Expert - Retires September 30, 2010
Oracle	OCS	Oracle Special Accreditations - Oracle Communications Billing and Revenue Management
Oracle	OCS	Oracle VM for x86 Certified Implementation Specialist
Oracle	OCS	Oracle WebCenter 11g Implementation Specialist
Oracle	OCS	Oracle WebLogic Developer
Oracle	OCS	Oracle WebLogic Portal 10g Developer Certified Expert
Oracle	OCS	Oracle WebLogic Server 10g System Administrator
Oracle	OCA	Oracle9iAS Web Administrator
Oracle	OCS	PeopleSoft Enterprise 9 Financial Management, General Ledger Consultant Certified Expert
Oracle	OCS	PeopleSoft Enterprise 9 Human Capital Management, Human Resources Consultant Certified Expert
Oracle	OCS	PeopleTools Certified Expert
Oracle	OCS	Primavera P6 Enterprise Project Portfolio Management Certified Implementation Specialist
Oracle	OCP	Siebel 7.7 Certified Application Developer
Oracle	OCP	Siebel 7.7 Certified Consultant
Oracle	OCP	Siebel 7.7 Certified Data Warehouse Developer
Oracle	OCP	Siebel 7.7 Certified Server Architect Professional
Oracle	OCS	Siebel 8 Consultant Certified Expert
Pega	CCA	Certified CPM Architect
Pega	CLSA	Certified Lead System Architect
Pega	CMBB	Certified Methodology Black Belt
Pega	CSSA	Certified Senior System Architect

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Awarded by	Certified Title	Certificates
Pega	CSA	Certified System Architect
PMI		* Accredited Degree Programs is available by PMI
PMI	CAPM	Certified Associate in Project Management
PMI	PMI-RMP	PMI Risk Management Professional
PMI	PMI-SP	PMI Scheduling Professional
PMI	PgMP	Program Management Professional
PMI	PMP	Project Management Professional
Postgres		Postgres Associate Certification
Postgres		Postgres Master Certification
Postgres		Postgres Professional Certification
PRINCE2		PRINCE2 Registered Foundation
PRINCE2		PRINCE2 Registered Practitioner
QAI	CASQ	Certified Associate in Software Quality
QAI	CAST	Certified Associate in Software Testing
QAI	CMSQ	Certified Manager of Software Quality
QAI	CMST	Certified Manager of Software Testing
QAI	CQSPE	Certified Quantitative Software Process Engineer
QAI	CSBA	Certified Software Business Analyst
QAI	CSPE	Certified Software Process Engineer
QAI	CSPM	Certified Software Project Manager
QAI	CSQA	Certified Software Quality Analyst
QAI	CSTE	Certified Software Tester
Red Hat	JBCAA	JBoss Certified Application Administrator
Red Hat		JBoss Certified Application Administrator (JBCAA™)
Red Hat	RHCE	Red Hat Certificates of Expertise
Red Hat	RHCA	Red Hat Certified Architect
Red Hat	RHCDS	Red Hat Certified Datacenter Specialist
Red Hat	RHCE	Red Hat Certified Engineer
Red Hat	RHCSS	Red Hat Certified Security Specialist
Red Hat	RHCSA	Red Hat Certified System Administrator
Red Hat	RHCVA	Red Hat Certified Virtualization Administrator
Riverbed	RCSA	Riverbed Certified Solutions Associate
Riverbed	RCSP	Riverbed Certified Solutions Professional
RSA	CSE	RSA Access Manager Certified Systems Engineer
RSA	RSA/CSE	RSA Certified Systems Engineer
RSA	CSE	RSA DLP Suite Certified Systems Engineer
RSA	CSE	RSA enVision Certified Systems Engineer
RSA	CA	RSA SecurID Certified Administrator
RSA	CSE	RSA SecurID Certified Systems Engineer
SAP		Change Control Management Expert - SAP E2E Solution Operations
SAP		E2E Solution Operations Expert - SAP E2E Solution Operations
SAP		Process Integration & Automation Optimization Expert - SAP E2E Solution Operations
SAP		Root Cause Analysis Expert - SAP E2E Solution

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Awarded by	Certified Title	Certificates
		Operations
SAP		SAP Certified - Associate Business Foundation & Integration with SAP ERP 6.0 EHP5
SAP		SAP Certified (Delta Certification) Solution Consultant SAP NetWeaver '04s SAP BI
SAP		SAP Certified (Delta Certification) Solution Consultant SAP NetWeaver 2004s Business Intelligence (for 3.0 Cons.)
SAP		SAP Certified Application Associate - Business Planning and Consolidation with SAP BPC 7.0
SAP		SAP Certified Application Associate - Business Process Expert
SAP		SAP Certified Application Associate - CRM Fundamentals with SAP CRM 2007 (CRM 6.0)
SAP		SAP Certified Application Associate - CRM Fundamentals with SAP CRM 7.0
SAP		SAP Certified Application Associate - Crystal Reports 2008
SAP		SAP Certified Application Associate - Financial Accounting with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Financial Accounting with SAP ERP 6.0 EHP5
SAP		SAP Certified Application Associate - Financials with SAP Business All-in-One Solution
SAP		SAP Certified Application Associate - Human Capital Management with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Logistics with SAP Business All-in-One Solution
SAP		SAP Certified Application Associate - Management Accounting (CO) with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Order Fulfillment with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Order Fulfillment with SAP ERP 6.0 EHP5
SAP		SAP Certified Application Associate - Planning & Manufacturing with SAP ERP 6.0
SAP		SAP Certified Application Associate - Procurement with SAP ERP 6.0
SAP		SAP Certified Application Associate - Procurement with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Procurement with SAP ERP 6.0 EHP5
SAP		SAP Certified Application Associate - Production - Planning & Manufacturing with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Production - Planning & Manufacturing with SAP ERP 6.0 EHP5
SAP		SAP Certified Application Associate - Project Management with SAP ERP 6.0

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Awarded by	Certified Title	Certificates
SAP		SAP Certified Application Associate - Project System with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Associate - Retail with SAP ERP 6.0
SAP		SAP Certified Application Associate - Sales Order Management with SAP ERP 6.0
SAP		SAP Certified Application Associate - SAP Business One 8.8
SAP		SAP Certified Application Associate - SAP BusinessObjects Data Integrator XI R2
SAP		SAP Certified Application Associate - SAP BusinessObjects Enterprise XI 3.x
SAP		SAP Certified Application Associate - SAP BusinessObjects Planning and Consolidation 7.5
SAP		SAP Certified Application Associate - SAP BusinessObjects Web Intelligence XI 3.x
SAP		SAP Certified Application Associate - SAP NetWeaver Master Data Management (MDM 5.5)
SAP		SAP Certified Application Associate - Supplier Relationship Management with SAP SRM 7.0
SAP		SAP Certified Application Associate - Supply Chain Planning and Execution with SAP for Oil & Gas with SCM 7.0 EHP1
SAP		SAP Certified Application Associate- Business Intelligence with SAP NetWeaver 7.0
SAP		SAP Certified Application Professional - Business Consolidation with SAP ERP 6.0
SAP		SAP Certified Application Professional - Business Process Expert
SAP		SAP Certified Application Professional - Enterprise Data Warehousing with SAP NetWeaver Business Warehouse (BW 7.0)
SAP		SAP Certified Application Professional - Financial Accounting (FI) with SAP ERP 6.0
SAP		SAP Certified Application Professional - Financial Accounting with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - Financial Accounting with SAP ERP 6.0 EHP5
SAP		SAP Certified Application Professional - HCM Talent Management with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - HCM Workforce Process Management with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - Logistics Execution & Warehouse Mgmt. with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - Management Accounting (CO) with SAP ERP 6.0
SAP		SAP Certified Application Professional - Marketing with SAP CRM 7.0

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Awarded by	Certified Title	Certificates
SAP		SAP Certified Application Professional - Order Fulfillment with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - Procurement with SAP ERP 6.0
SAP		SAP Certified Application Professional - Procurement with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - Production - Planning & Manufacturing with SAP ERP 6.0 EHP4
SAP		SAP Certified Application Professional - Reporting and Analysis with SAP NetWeaver Business Warehouse (BW 7.0)
SAP		SAP Certified Application Professional - Sales with SAP CRM 7.0
SAP		SAP Certified Application Professional - Service with SAP CRM 7.0
SAP		SAP Certified Application Professional - Supplier Relationship Management with SAP SRM 7.0
SAP		SAP Certified Application Professional - Supplier Relationship Mgt. with SAP SRM 2005 (SRM 5.0)
SAP		SAP Certified Application Professional - Talent Management with SAP ERP 6.0
SAP		SAP Certified Associate - Support Consultant for Incident Management with SAP Business All-in-One
SAP		SAP Certified Associate - Transactional Banking in Banking Services 6.0
SAP		SAP Certified Associate - Transactional Banking in Banking Services from SAP 7.0
SAP		SAP Certified Associate Enterprise Architect
SAP		SAP Certified Associate Project Manager
SAP		SAP Certified Associate Support Engineer
SAP		SAP Certified Associate Technology Architect
SAP		SAP Certified Business Associate with SAP ERP 6.0
SAP		SAP Certified Development Associate - ABAP with SAP NetWeaver 7.0
SAP		SAP Certified Development Associate - Process Integration with SAP NetWeaver (PI 7.1)
SAP		SAP Certified Development Associate with SAP Business One Release 8.8
SAP		SAP Certified Development Consultant SAP Business One 2007
SAP		SAP Certified Development Consultant SAP NetWeaver 2004 - Application Development Focus ABAP
SAP		SAP Certified Development Consultant SAP Netweaver 2004s - SAP NetWeaver Portal
SAP		SAP Certified Development Consultant SAP NetWeaver 7.0 - Exchange Infrastructure
SAP		SAP Certified Development Consultant SAP NetWeaver 7.0 - Mobile Infrastructure
SAP		SAP Certified Development Professional - ABAP with SAP NetWeaver 7.0

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Awarded by	Certified Title	Certificates
SAP		SAP Certified Implementation Consultant Delta SAP Business One Release 2007
SAP		SAP Certified Implementation Consultant SAP Business One 2007
SAP		SAP Certified Professional Enterprise Architect
SAP		SAP Certified Solution Consultant - SAP Solution Manager 4.0 Implementation Tools
SAP		SAP Certified Solution Consultant Financials - Financial Accounting with SAP ERP 2005
SAP		SAP Certified Solution Consultant Financials - Management Accounting with SAP ERP 2005
SAP		SAP Certified Solution Consultant Human Resources - Management & Administration with mySAP ERP 2005
SAP		SAP Certified Solution Consultant SAP NetWeaver 2004s - Knowledge Management and Collaboration
SAP		SAP Certified Solution Consultant SAP PLM - Asset Life-Cycle Management - Plant Maintenance (2005)
SAP		SAP Certified Solution Consultant SAP PLM - Program and Project Management (2005)
SAP		SAP Certified Solution Consultant SAP PLM - Quality Management (2005)
SAP		SAP Certified Solution Consultant SCM - Advanced Planning with SAP SCM 2005
SAP		SAP Certified Solution Consultant SCM - Planning & Manufacturing with SAP ERP 2005
SAP		SAP Certified Solution Consultant SCM - Procurement with mySAP ERP 2005
SAP		SAP Certified Support Associate - Incident Management with SAP BusinessObjects
SAP		SAP Certified Support Consultant SAP Business One 2007
SAP		SAP Certified Tech. Associate - System Admin (Oracle DB) with SAP NW 7.0
SAP		SAP Certified Technology Associate - Process Integration with SAP NetWeaver (PI 7.1)
SAP		SAP Certified Technology Associate - System Administration (DB2) with SAP NetWeaver 7.0
SAP		SAP Certified Technology Associate - System Administration (MAX DB) with SAP NetWeaver 7.0
SAP		SAP Certified Technology Associate - System Administration (MS SQL DB) with SAP NetWeaver 7.0
SAP		SAP Certified Technology Consultant SAP NetWeaver - SAP Security (2004)
SAP		SAP Certified Technology Consultant SAP NetWeaver 04 - OS/DB Migration for SAP Systems
SAP		SAP Certified Technology Consultant SAP NetWeaver 2004 - Enterprise Portal, Knowledge Management &

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Awarded by	Certified Title	Certificates
		Collaboration
SAP		SAP Certified Technology Consultant SAP NetWeaver 2004s - Portal
SAP		SAP Certified Technology Professional - Platform Technology with SAP NetWeaver 7.0
SAP		SAP Certified Technology Professional - Security with SAP NetWeaver 7.0
SCP	Directive 8570	Department of Defense - Directive 8570
SCP	SCNA	Security Certified Network Architect
SCP	SCNP	Security Certified Network Professional
SCP	SCNS	Security Certified Network Specialist
SCS	COMIT	Certification in Outsourcing Management for IT
SCS	CITPM	Certified IT Project Management
SCS	CITPM(Associate)	Certified IT Project Manager (Associate)
SCS	CITPM(Senior)	Certified IT Project Manager (Senior)
SCS	CMSQ	Certified Manager of Software Quality
SCS	CSQA	Certified Software Quality Analyst
SCS	ITBCM	IT Business Continuity Management
SEI		SEI-Certified PSP Developer
Sourcefire	SnortCP	Snort Certified Professional
Sourcefire	SFCE	Sourcefire Certified Expert
Sourcefire	SFCP	Sourcefire Certified Professional
SpringSource		SpringSource Certified Enterprise Integration Specialist
SpringSource		SpringSource Certified Spring Professional
SpringSource		SpringSource Certified Spring Web Application Developer
The Institute of Certified Records Managers	CRM	Certified Records Managers
The International Software Quality Institute	CPRE	Certified Professional for Requirements Engineering
The International Software Quality Institute		ECQA Certified Innovation Manager.
The International Software Quality Institute		iNTCCM Certified Professional for Configuration Management
The International Software Quality Institute		iSAQB Certified Professional for Software Architecture
The International Software Quality Institute		iSQI Certified Professional for Project Management
The International Software Quality Institute		ISSECO Certified Professional for Secure Software Engineering
The International Software Quality Institute		ISTQB Certified Tester -Foundation Level
The International Software Quality Institute		ISTQB Certified Tester-Advanced Level

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Awarded by	Certified Title	Certificates
The International Software Quality Institute		TTCN-3® Certificate
UMTP		Certified Modeler L1
UMTP		Certified Modeler L2
UMTP		Certified Modeler L3
UMTP		Certified Modeler L4
VMware		VMware Certified Advanced Professional (VCAP)
VMware		VMware Certified Design Expert (VCDX)
VMware		VMware Certified Professional (VCP)
Zend	ZCE	Zend Framework Certification
Zend	ZCE	Zend PHP 5

Appendix D-1 Gap Analysis Overall Summary

Job Category \ Competency Level	Software Engineering/ Software Development	Quality Assurance	Project Management (ICT)	IT Architecture	Service Management and Operation	Information Security	Multimedia
Master							
Specialist							
Practitioner							
	= largely equivalent						
	= somewhat relevant						
	= significantly different						

Appendix E-1 – Survey Questionnaire Template for Employers

HKCS Research Questionnaire

Section 1: Respondent Background

1.1 General business (business nature) of company:

- | | |
|--|---|
| ☐ Accounting | ☐ Information Technology |
| ☐ Admin / HR | ☐ Insurance |
| ☐ Banking / Finance | ☐ Legal / Compliance |
| ☐ Beauty Care / Health | ☐ Manufacturing |
| ☐ Building / Construction | ☐ Marketing / Public Relations |
| ☐ Civil Services | ☐ Media / Advertising |
| ☐ Design | ☐ Medical Services |
| ☐ Education | ☐ Merchandising / Purchasing |
| ☐ Engineering | ☐ Property / Real Estate |
| ☐ Entertainment | ☐ Sales / Customer Services |
| ☐ Hospitality / F&B | ☐ Transportation / Logistics |
| ☐ Others | |
- (Please specify: _____)

1.2 How many employees in total (for operation based in Hong Kong Only)?

- | | | |
|-------------------------------------|---------------------------------|-----------------------------------|
| ☐ Under 50 | ☐ 51-200 | ☐ 201-1000 |
| ☐ above 1000 | | |

1.3 How many full-time IT staffs are there (for operation based in Hong Kong Only)?

- | | | |
|-----------------------------------|-------------------------------|--------------------------------|
| ☐ Under 5 | ☐ 6-10 | ☐ 11-20 |
| ☐ above 20 | | |

1.4 Do you have in-house IT training for IT staff (for operation based in Hong Kong Only)?

- ☐ Yes ☐ No

1.5 If you have in-house training, do your staffs need to achieve outside certification?

- ☐ Yes ☐ No

1.6 Is it possible for your staff to waive internal training after they achieve recognized certification?

- ☐ Yes ☐ No

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1.7 What does the content of your in-house training base on?

- ☐ Certification as skeleton
- ☐ In-house tailor made solution
- ☐ Others

Please specify: _____

1.8 What is the percentage of your budget of internal training on IT when comparing to overall training budget?

- ☐ Below 20%
- ☐ 21%-50%
- ☐ 51%-70%
- ☐ 76%-100%

Section 2: Department Structure

2.1 Mission critical IT systems are so important for a corporation that it requires at least 99% up time. What is the percentage of the mission critical IT systems in your company? (Based on investment value)

- ☐ Below 10%
- ☐ 11%-20%
- ☐ 21%-40%
- ☐ 41%-60%
- ☐ Over 60%

2.2 How would your company avoid failure of mission critical IT systems? Which one is the most important? (Please rank)

- ☐ To have the right person who has relevant competencies and experiences
- ☐ To have more resources
- ☐ To have appropriate technological support
- ☐ Others

(Please specify: _____)

2.3 Is the IT support mainly from Internal Teams or External Parties?

- ☐ mainly from Internal Teams
- ☐ mainly from External Parties

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2.4 Why does your company prefer IT Support from Internal Teams?

Reason(s):

☐ Better control on quality of service

☐ Faster response time

☐ More simple Administration Process

☐ Higher control on compliance of internal policies

☐ Others

(Please specify: _____)

2.5 What is the percentage of outsource IT budget in your company?

- ☐ Below 20% ☐ 21%-40%
- ☐ 41%-60% ☐ 61%-80%
- ☐ Over 80%

2.6 Why does your company prefer to outsource projects to External Parties?

Reason(s):

☐ More Flexible

☐ Lower personnel cost

☐ Higher economies of scale

☐ Possible to rely on external expertise

☐ Others

(Please specify: _____)

Section 3: Criteria of Employment

3.1 Do you agree with the definitions of Practitioner, Specialist and Master?

- ☐ Yes ☐ No

Comment: _____

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3.2 Please rank the importance of the following factors when you employ IT staff?
(4- Most Important, 3- Important, 2- Less Important, 1- Least Important)

Master Level	Rank
Academic Qualification	
Professional Certification	
Working Experience	
Interview Performance	

Please specify if you think there are other important factors.

Specialist Level	Rank
Academic Qualification	
Professional Certification	
Working Experience	
Interview Performance	

Please specify if you think there are other important factors.

Practitioner Level	Rank
Academic Qualification	
Professional Certification	
Working Experience	
Interview Performance	

Please specify if you think there are other important factors.

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- 3.3 If Professional Certification is important (rank “3” or “4”) in the company, go to **Part 3.3A**.
If Professional Certification is not important (rank “1” or “2”) in the company, go to **Part 3.3B**.

Part 3.3A
• Why do you think professional certification is an important factor for hiring IT people? ☐ Competencies of certificate holders are clearly revealed ☐ There is an obvious difference in performance between certificate holders and non-holders ☐ Align with IT industry benchmark ☐ Others (Please specify: _____) • What are the important factors to consider IT staff promotion? _____

Part 3.3B
• Why do you think professional certification is NOT an important factor for hiring IT people? ☐ Competencies of certificate holders are not revealed practically ☐ No/Little notable difference in performance between certificate holders and non-holders ☐ Working experience is far more important ☐ Academic qualification is far more important ☐ Others (Please specify: _____) • What are the important factors to consider IT staff promotion? _____

Research Report on “Development of a Certification Roadmap for IT Professional Certification” Project

3.4 Do you think there will be any change in the importance of Professional Certification in the future? Why?

☐ Yes, there will be changes in the future.

Reason(s):

- ☐ Unsatisfactory outcome
- ☐ Review in progress
- ☐ Adjustable according to market information
- ☐ Others

(Please specify: _____)

☐ No, I don't think there will be any change.

Reason(s):

- ☐ Satisfactory outcome
- ☐ Current importance already suits company's need
- ☐ Complicated administrative procedures
- ☐ Others

(Please specify: _____)

3.5 Does an employee have higher pay if he/she possesses a relevant professional certificate?

☐ Yes ☐ No

3.6 (*Inter-convertibility of Professional Certification with Academic Qualification and Working Experience*)

3.6.1 If a post requires a degree holder, are you going to consider a non-degree holder who possesses a relevant Professional Certification?

☐ Yes ☐ No

3.6.2 If a post requires 3 years of related working experience, are you going to consider a candidate, who possesses a relevant Professional Certification, with only 1 year of working experience?

☐ Yes ☐ No

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Section 4: Knowledge on Different Certifications

For Question 4.1 and 4.2, please mark “Y” for Yes and “N” for No

Job Categories Questions	Software Engineering	Information Security	Multi-media	Project Management (ICT)	Quality Assurance	IT Architecture	Service Management and Operation
4.1 Do you think that the professional certificates in the market can facilitate the IT staff hiring process?							
4.2 Do the current professional certificates fit the market needs?							

4.3 Which certificate(s) do you think are representative? Are they “must have” or “nice to have”?

Name of certificate	“must have” OR “nice to have”

(Provide interviewees a list of certificates and ask the following questions)

4.4 Would you consider the certificates that you have not mentioned in Q4.3?

☐ Yes (go to Q4.6) ☐ No (go to Q4.5)

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4.5 Why would you NOT consider the certificates?

- ☐ I am not familiar about the certificates/issue bodies.
- ☐ The certificates are not representable.
- ☐ The scope of the certificates is not suitable for my company.
- ☐ Others

(Please specify: _____)

4.6 When a job candidate presents a certificate that you are not familiar with, what will you do?

- ☐ Study the certificate content to see whether it is relevant and suitable
- ☐ Validate the genuineness of this certification by own self (recruiter) through formal / informal channels
- ☐ Ask more details from the candidates
- ☐ Ignore this certificate as it is not popular
- ☐ Others

(Please specify: _____)

4.7 For your job category, as there are so many certificates in the market, do you think there is enough information or guideline for selection of certificate holders?

- ☐ Yes ☐ No

Comment: _____

4.8 Do you feel confused when selecting relevant certificates?

- ☐ Yes ☐ No

Comment: _____

4.9 Is there any way to help you when selecting relevant certificates?

(Please rank the choices)

- ☐ An independent body can help to rank the certificates.
- ☐ Peer reference.
- ☐ Recent job advertisement in the market.
- ☐ Others

(Please specify: _____)

Section 5: Degree of consent about the mapping proposed

5.1 Can the definition of the 3 levels help you in the hiring process or career planning?

☐ Yes (go to Q5.3) ☐ No (go to Q5.2)

5.2 Why the definition of the 3 levels is NOT helpful?

Comment: _____

5.3 From your point of view, how many years of experience are required to become a Practitioner, a Specialist and a Master?

Level	Years of relevant experience required						
	Software Engineering	Information Security	Multi-media	Project Management (ICT)	Quality Assurance	IT Architecture	Service Management and Operation
Practitioner							
Specialist							
Master							

5.4 Through a general observation, there is a gap in the current certifications, do you agree with the findings?

☐ Yes ☐ No

5.5 For the difference between competencies covered in certificates and those are in actual demand, what is the best way to fill the gap?

- ☐ No need to fill the gap
- ☐ Scope expand on such certificates to cover the missing content
- ☐ Supplementary certificate, endorsed by an independent party, to cover the missing content
- ☐ Combine some existing certificates, collectively endorsed by an independent party, to provide a complete coverage
- ☐ Others
(Please specify: _____)

5.6 Is there any urgency to have a certificate to fill the gap? How urgent is it?

- ☐ Within 12 months
- ☐ 1 – 2 years
- ☐ 3 – 5 years
- ☐ Others

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(Please specify: _____)

5.7 Currently the certification is not able to fill the gap, what does your company do to deal with it?

- ☐ Provide in-house training
- ☐ Outsource the relevant project to company with experiences
- ☐ Do more research when dealing with that particular knowledge
- ☐ Others

(Please specify: _____)

5.8 In regard of IT staff promotion of Master level, other than Academic Qualification, Professional Certification and Relevant Working Experience, do you think there are other critical factors?

- ☐ Managerial skills
- ☐ Planning and Control skills
- ☐ Coordination skills
- ☐ People management skills
- ☐ Accounting knowledge
- ☐ Leadership
- ☐ Work performance
- ☐ Others

(Please specify: _____)

~ THE END ~

Appendix E-2 – Survey Questionnaire Template for Professional Organisations

HKCS Research Questionnaire

Section 1: Professional Body’s Background

1.9 How many members in Hong Kong?

- ☐ Under 100 ☐ 100-500 ☐ 501-1000
☐ above 1000

1.10 Who can be members? How many types of members

- ☐ By examination or panel interview
☐ By academic qualifications
☐ By recommendation under stringent criteria
☐ Cross institutions recognition & admittance
☐ Freely joined

1.11 Does your organization award professional certifications for IT professionals?

- ☐ Yes ☐ No

1.12 If yes 1.3, please specify the certifications:

1.12.1 How are these professional certifications awarded?

- ☐ By exam
☐ By years of working experience
☐ By panel interview
☐ By recommendation
☐ Others: _____

1.13 Does your organization recognize professional certifications by other professional bodies, i.e. some certifications by other professional bodies are considered as equivalent to your own certifications? Any cross recognition mechanism?

- ☐ Yes ☐ No

1.14 If yes to 1.5, please specify the certifications:

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1.15 Does your organization offer training programs alone or collaborate with training institutions for IT professionals in Hong Kong?

☐ Yes ☐ No

1.16 Does your organization certify other organizations to perform training programs for IT professionals in Hong Kong?

☐ Yes ☐ No

Section 2: 3 Levels of Competencies

3.2 Do you agree with the definitions of Practitioner, Specialist and Master?

☐ Yes ☐ No

Comment: _____

2.2 Should Master level competencies include general managerial competencies?

☐ Yes ☐ No

If No, why? _____

2.3 Do you think Professional Certifications in the IT industry will become more or less important in future? Why?

☐ No change.

☐ More important.

Reason(s):

☐ More employers require these certifications for recruitment or promotion of employees

☐ More and more professional bodies award professional certifications

☐ Others

(Please specify: _____)

☐ Less important.

Reason(s):

☐ Too many certifications in the market, leading to confusion

☐ Too many people can achieve these certifications, reducing their significance

☐ Others

(Please specify: _____)

Section 3: Generic Job Categories

3.1 Do you agree with the 7 generic job categories for IT industry?

☐ Yes ☐ No

If No, why? _____

Any suggestions _____

For Question 3.2 to 3.4, please mark “Y” for Yes and “N” for No

Job Categories Questions	Software Engineering	Information Security	Multi-media	Project Management (ICT)	Quality Assurance	IT Architecture	Service Management and Operation
3.2 Do you think that the no. of professional certificates are sufficient for these job categories?							
3.3 Do the current professional certificates fit the market needs?							
3.4 Is there enough information or guideline for an IT professional to select the right certifications?							

3.5 Does your organization offer advice to IT professionals in their selection of relevant certificates?

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☐ Yes ☐ No

If Yes, how? _____

Section 4: Gaps in Certifications

5.9 Do the definitions of the 3 competency levels help you in offering professional certifications?

☐ Yes ☐ No

If No, why? _____

5.10 As a general observation, are there any gap(s) in the existing professional certifications?

☐ Yes ☐ No

If Yes, what gaps? _____

6.10.1 Is there any urgency to fill the gap with a new certification? How urgent is it?

☐ Within 12 months

☐ 1 – 2 years

☐ 3 – 5 years

☐ Others

(Please specify: _____)

~ THE END ~

Appendix E-3 – Survey Questionnaire Template for Academia

HKCS Research Questionnaire

Section 1: Academia or training institute’s Background

1.17 How many students in your institute? (including both full time and part time)

Full time:

- ☐ Under 1000 ☐ 1000-5000 ☐ 5000 -10000
☐ above 10000

Part time:

- ☐ Under 1000 ☐ 1000-5000 ☐ 5000 -10000
☐ above 10000

1.18 How many students study IT-related programmes in your institute?

Full time: _____

Part time: _____

Following questions are focusing on IT disciplines.

1.19 What are the major target group of students

- ☐ Mature students
☐ Heading to degree level
☐ Sub-degree, tertiary, diploma, degree level
☐ Secondary
☐ Others _____

1.20 What is the major curriculum?

- ☐ For skill based training
☐ For knowledge based Training
☐ For award bearing academic courses
☐ For professional certification training
☐ Others _____

Section 2: 3 Levels of Competencies

3.3 Do you agree with the definitions of Practitioner, Specialist and Master?

☐ Yes ☐ No

Comment: _____

2.2 Should Master level competencies include general managerial competencies?

☐ Yes ☐ No

If No, why? _____

2.3 Do you think Professional Certifications in the IT industry will become more or less important in future? Why?

☐ No change.

☐ More important.

Reason(s):

☐ More employers require these certifications for recruitment or promotion of employees

☐ More and more professional bodies award professional certifications

☐ Others

(Please specify: _____)

☐ Less important.

Reason(s):

☐ Too many certifications in the market, leading to confusion

☐ Too many people can achieve these certifications, reducing their significance

☐ Others

(Please specify: _____)

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Section 3: Generic Job Categories

3.1 Do you agree with the 7 generic job categories for IT industry?

☐ Yes ☐ No

If No, why? _____

Any suggestions _____

For Question 3.2 to 3.4, please mark “Y” for Yes and “N” for No

Job Categories Questions	Software Engineering	Information Security	Multi-media	Project Management (ICT)	Quality Assurance	IT Architecture	Service Management and Operation
3.2 Do you think that the no. of professional certificates are sufficient for these job categories?							
3.3 Do the current professional certificates fit the market needs?							
3.4 Is there enough information or guideline for an IT professional to select the right certifications?							

Section 4: Gaps in Certifications

5.11 Do the definitions of the 3 competency levels help you in offering designing courses for education and training?

☐ Yes ☐ No

If No, why? _____

5.12 As a general observation, are there any gap(s) in the existing professional certifications?

☐ Yes ☐ No

If Yes, what gaps? _____

6.12.1 Is there any urgency to fill the gap with a new certification? How urgent is it?

☐ Within 12 months

☐ 1 – 2 years

☐ 3 – 5 years

☐ Others

(Please specify: _____)

Section 5: Academic award vs Professional Certification

5.1 View from respondent regarding academic award vs professional certification to embrace required competency(ies) (with rationale)

☐ Academic award is more important. Reason: _____

☐ Professional certification is more important. Reason: _____

☐ Equally important. Reason: _____

☐ Academic award is equivalent to professional certification. Getting either one is okay.

☐ Others _____

5.2 How to differentiate Academic award and Professional award (Open question)

5.3 In case a student (who is below under graduate) seeks your advice how to proceed for career advancement, which way(s) would you suggest?

☐ Try to obtain both academic award and professional certification simultaneously

☐ Professional certification is more important. To obtain professional certification first
Reason: _____

☐ To obtain academic award first.

Reason: _____

☐ Academic award is equivalent to professional certification. Getting either one is okay.

☐ Others _____

5.4 Do you think there is enough guidance or reference available to facilitate or able to attract students or individuals to join in the IT industry as their career.

If not, what suggestions to improve?

5.5 Do you think the 7 x 3 matrix helpful to serve the purpose stated in 5.4

5.6 Do you think qualifications framework of Hong Kong is helpful for academia in course development?

Yes, in what ways? _____

No, why? _____

5.7 What other things academia and training institutes are able or should do to provide adequate professionals for the IT industry? (Open question)

5.8 What measures should HK do (all stakeholders) to improve the competitiveness of IT industry of Hong Kong? (Open question)

~ THE END ~