Institute of Coding: Accreditation Standard

Theme 1 - University Learners - Work Package 1.1

Co-leads:

- Chris Sharp, IBM
- David Bowers, Open University

For more information visit instituteofcoding.org.

> DRAFT PROPOSAL 2.4
>
> This is an evolving document and should not be used to implement any programme or curricula.

1. Background

1.1 Context

The proposed standard must be:

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a. Fit for purpose for whole project especially themes 1, 2 and 3
b. Fit for all IoC partners
c. Fit for broad industry
d. Takes into account existing standards
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1.2. Requirements

An initial discussion in the online meeting on 9th April identified a number of requirements within the context above.

1. Some overarching targets are givens:

    a. FHEQ (Framework for Higher Education Qualifications) outcomes statement

        i. equivalents for Scotland/Wales/Northern Ireland?

    b. QAA (Quality Assurance Agency) subject benchmark statement

    c. (for degree apprenticeships) Institute for Apprentices (IfA) endorsement.

2. The standard needs to specify both technical and "soft" skills.

    a. The focus should be on work readiness rather than employability

3. Must meet the needs of, and be endorsed by, industry

    a. Should be able to recognise both industry-created and academic content.

    b. Should allow interoperability between HEIs and industry

    c. In particular, must support needs of SMEs

4. Must be flexible

    a. Given that there will be several curricula, a core standard with extensions may be appropriate.

        - The core might include such as coding, group work, lifecycle, soft skills.

    b. (For theme 2) – needs to support degree apprenticeships as well as degrees (L6 & L7).

    c. (for theme 3) – would be good if it were possible to specify chunks smaller than a complete degree – perhaps using some sort of "layering" or "component" model.

    d. Should link to other accreditations

        i. e.g., BCS, IET

        ii. Will be different from Tech Partnership Degrees (TPD) standards for degree apprenticeships.

Industry involvement in the development and adoption of the standard is crucial. This will require ongoing involvement of individuals from a wide range of employers from across the sector, constituting a broadly-based industrial panel.

1.3. Constraints

Development will require industrial participation in discussions and workshops.

If the standard is to be used for Degree Apprenticeships (DAs), then it needs to address a distinct space from those standards already in operation, primarily those developed/under development by Tech Partnership and ONS.

No standard is of value if it is neither accepted by the sector nor implementable. The eventual operation of the standard is outwith the discussion in this paper.

The IoC is not (yet) authorised to accredit anything – at best, it might offer a "kite mark" endorsement. Only professional bodies, such as BCS are currently able to accredit against a standard.

1.4. Opportunities

In developing the new standard, we could choose to work with existing accreditation bodies (BCS, TPD, GCHQ), and/or with other bodies such as SFIA who manage a user-defined skills framework for the sector.

In order to distinguish the IoC standard from other standards, such as those managed by TPD, we might align it to professional qualifications, such as CITP, or CIISP.

Early informal discussions with both BCS and SFIA indicate that they are willing – indeed, keen! – to collaborate with IoC

1.5. Discussion

The separation of the standard from the curricula (workstreams 1.2, 1.3 and themes 2/3) mean that the standard itself needs to be very flexible and adaptable. This is best achieved by abstraction.

There is a marked contrast between standards such as the BCS accreditation criteria and the TPD DA standards: the former has relatively few generic requirements that can be contextualised for a particular degree, whereas the latter is essentially a long conjunctive list of requirements. Indeed, in the latter, there is no application of MoSCow (must/should/could/won't) – all requirements and sub-requirements are given equal weight.

One of the key requirements is that the standard must meet industry needs. Although foundational knowledge and principles are important, the key focus is to be on what [graduates] will be able to do. That is, it will focus on skills and outcomes, rather than on curriculum and inputs.

And, crucially, the definition of skills and outputs needs to be recognised and accepted by industry.

It may be appropriate for the standard to suggest "staged" outputs – particularly in the context of degree apprenticeships – to ensure that those following a standard are "billable" early in their studies.

2. Rationale for a new accreditation standard

2.1 Aim

The Institute of Coding aims to, "create a new way to develop the digital skills you'll need at work and beyond."

The purpose of IoC workstream 1.1 is to codesign with industry a new standard for "digital" graduates.

As the latest, post-Shadbolt, venture seeking to address the "digital skills gap", the focus is on digital skills for the workplace, rather than on knowledge and learning for their own sake.

2.2. Digital skills for the workplace

The primary requirements of employers include –

- graduates must be billable (competent)
- graduates must be adaptable (underpinning knowledge for cognate skill areas)
- graduates must be effective problem solvers (which is fundamentally what university education is about)

Note that these are the fundamental drivers for the IoC, not some nebulous concept of "employability".

Furthermore, "employability" needs to be at the heart of the IoC standard – it is not something that can be retro-fitted to an academic curriculum based on an encyclopaedic Body of Knowledge.

2.3. Bodies of Knowledge

Academics and professional bodies have lots of experience of developing bodies of knowledge (BoKs).

Typically, they draw upon (their own) existing courses, frameworks from external bodies such as Turing Institute or the National Cyber Security Centre (NCSC). Significant reference points also include existing bodies of knowledge such as those published by ACM/IEEE. However, it should be noted that these tend to focus very much on academic content, rather than on practice.

Furthermore, BoKs tend to aim to be universal, inclusive, exhaustive, complete, exhausting etc. With the possible (but unlikely) exception of really focussed BoKs like CyBok, addressing the whole of a BoK within a single degree programme would probably be extremely challenging.

BoKs should be reference points, from which curricula are drawn, rather than templates for curricula.

2.4. Accreditation standards

An accreditation standard is a statement of what all (accredited) graduates should achieve.

For a degree, a standard must deliver the explicit outcomes included in both the Framework for Higher Education Qualifications (FHEQ) outcomes statement and the Quality Assurance Agency (QAA) subject benchmark statement.

In computing, the QAA SBS specifies a set of generic skills, and requires that the design of a curriculum should refer to the ACM BoK.

There is no direct 1-1 mapping from a BoK to a realistic Standard; any resulting "standard" would be a large, constraining, conjunctive "tick list" (like the Tech Partnership Degrees DTS degree apprenticeships.) If a BoK is used as a standard, then if a graduate fails to achieve any one item in the BoK, then they should fail their degree – which is neither realistic nor helpful, in the context of the IoC's aims.

Rather than focus purely on (yet another) BoK, it is proposed that the focus be changed from *knowledge* to **competence**.

2.5. Competence

Competence is more than being able to get correct answers to problems, or write correct code, or complete any other kind of university exercise. It's more than just practice, in a "protected" university environment in which nobody can get hurt.

Competence is about being able to apply knowledge and skills successfully in new environments, **without** the safety net of it "just being a university exercise"

Competence is about being able to "fly solo", when it matters.

Competence is about what graduates can be let loose to do for clients...without close supervision.

2.6. The IoC standard – principles

SFIA is an industry focussed competence framework, maintained and updated by its users (primarily industry). We propose using SFIA as an abstraction layer – defining the standard in terms of competences in SFIA skills.

Bodies of Knowledge will then be used to decide what must be in a curriculum to deliver (focussed) competence.

The only place that most undergraduate students (without the benefit of a placement / internship etc.) will be able to demonstrate competence is likely to be in their final year (capstone) project. In that context, it is probable that there will be scope for the majority of students only to develop competence corresponding to **one** SFIA skill at (SFIA) Level 3 ("Apply").

3. High-level proposal

In order to address requirements (ii) and (iii), an appropriate model could be to use the SFIA framework as the abstraction framework, which will then support requirement (iv).

By working closely with BCS, we should ensure that the resulting standard will meet the accreditation requirements for CITP (requirement v). This would allow the "occupation" for any degree apprenticeships to be "IT professional", which is distinct from "digital and technology solutions professional" (i.(c)).

3.1. SFIA

3.1.1. (content from SFIA website)

SFIA [1], the Skills Framework for the Information Age, describes skills required by professionals in roles involving information and communications technology. Since [its formal inception in] 2000, SFIA has become the de facto global IT skills Framework, used in nearly 200 countries by organisations and individuals to characterise and manage their skills. The SFIA Framework remains relevant and useful because it is simple and generic and is updated through a consultation activity where its extensive global user base comes together to collaborate on initiating, drafting and reviewing updates to the Framework. SFIA gives individuals and organisations a common language to define skill, abilities and expertise in a consistent way. It provides a common reference model in a two-dimensional framework consisting of skills on one axis and seven levels of responsibility on the other. It describes professional skills at various levels of competence. It also describes generic levels of responsibility, in terms of Autonomy, Influence, Complexity, Business Skills, Knowledge and Security.

3.1.2. commentary

SFIA is updated by its user community – primarily employers. It is directly relevant to industry needs. From version 7 (2018), the update process will be

continual, and demand based – so, if users find a new skill has emerged, or is needed at a lower / higher level than is currently specified, it is possible to add to the framework.

The current release of SFIA version 7 describes 102 skills. A typical job – or occupation – will usually be covered by two or three skills, usually at the same or similar levels.

One key distinction between SFIA and the conjunctive lists of current DA standards is that the description of a skill gives exemplars that would demonstrate competence in that skill at a particular level. The exemplars are usually fairly generic, so that there is flexibility in how they might be interpreted in a particular environment. Furthermore, a given individual may not be performing all of the suggested activities – that does not mean they are not competent. SFIA is *not* a conjunctive checklist.

The generic skills, defined by level rather than skill, cover many of the competencies required for accreditations such as FHEQ and QAA, as well as for the professional accreditation offered by BCS. New graduates would typically work at SFIA levels 2 or 3 ("assist" or "apply"), but will usually have the underpinning knowledge to enable them to progress rapidly to higher levels. For graduates who have had relevant work experience, the starting level should certainly be level 3. Graduates' knowledge will also probably underpin at least some level 4 skill(s).

Experience at SFIA Level 5 is the normal benchmark required to attain Chartered status, which one would expect normally to be achieved a few years after graduation. This level might be appropriate for post-experience Master's programmes.

A final point – which could be very helpful – is that one of the activities in the current SFIA update is to map certifications, curricula and bodies of knowledge explicitly to the SFIA framework.

1. https://www.sfia-online.org/en/reference-guide

A SFIA-based standard

An initial proposal for an IoC standard might be:

> A graduate from an IoC honours degree should have demonstrated competence in **at least one** skill at **Level 3**, and should have the knowledge to underpin **at least one** SFIA skill at **Level 4**, and **at least 2** other relevant skills at level 3.
>
> They should be able to demonstrate **all** of the generic skills for **Level 3**.

For a graduate from a degree apprenticeship (where there is significant relevant work experience), this might be adapted to:

> A graduate from an IoC degree apprenticeship should be able to demonstrate competence in at least one SFIA skill at level 4, in one additional skill at level 3, and at have the knowledge to underpin least 2 more relevant skills at level 3.

They should be able to demonstrate all of the generic skills for level 4.

Note that the **numbers of skills**, and the definition of **which ones would be relevant**, are open to discussion.

For example, it might be that the target for competence should be Level 4, rather than three, but that may be unrealistic in the absence of significant workbased experience (such as a placement year, or WB learning integrated into a Degree Apprenticeship).

The "generic skills" for levels 3 are reproduced in Appendix 1, as are a selection of skill descriptors which might be relevant for data analytics and cyber-security curricula.

This model could be readily adapted for Master's level degrees and apprenticeships, and also for sub-degree chunks (e.g, for theme 3).

In addition, "layering" would be possible, so that, for example, level 1 of an IoC degree might be required to underpin skills at SFIA level 1 or 2. Alternatively, for Theme 3, and appropriate IoC accreditation might focus on a single SFIA skill at

level 3 or 4, or perhaps three or four skills at level 2 (depending on the domain requirements).

Commentary

The skills listed in Appendix 1 are, at this stage, exemplars – there is no intention that this should be the prescriptive list for the data analytics standard to be developed by IoC.

The principal advantages of adopting a standard based on SFIA include:

- Use of the SFIA framework provides an abstraction mechanism that can assure comparable standards across different curricula;
- The SFIA "generic" skills provide a core which seems to correspond both to IfA requirements, FHEQ and QAA benchmark statements and also to BCS CITP accreditation requirements.
- The abstraction mechanism allows those working on different curricula to select appropriate skills;
- SFIA is not prescriptive about how competence is developed - it allows providers to choose how to deliver that competence, and for competence to be developed by different providers within a single qualification;
- SFIA is widely recognised across industry – both in the UK and internationally.
- SFIA focusses on what it means to be competent – i.e., useful to an employer – rather than on curriculum input
- Given that the focus is on exemplars to demonstrate competence, so that different individuals (students/apprenticeships) may have strengths in different aspects of a skill, this approach avoids the "conjunctive shopping list" approach of other standards.
- BCS and IET are core partners in the SFIA Foundation.

Final comments

The generic skills cover virtually all of the explicit requirements in the QAA subject benchmark statement (SBS), FHEQ and also those specified by IfA for apprenticeships.

Requiring underpinning knowledge for additional SFIA skills completes FHEQ/ QAA requirements.

Crucially:

Competence in 1 skill => billable

Underpinning knowledge for additional skills => adaptability

Generic skills => employability

Non-specificity of standard => flexibility

Generic Skills

From SFIA Version 7

Responsibility Characteristics - required for all graduates

> **Level 3**

Autonomy

Works under general direction. Uses discretion in identifying and responding to complex issues and assignments. Receives specific direction, accepts guidance and has work reviewed at agreed milestones. Determines when issues should be escalated to a higher level.

Influence

Interacts with and influences colleagues. Has working level contact with customers, suppliers and partners. May supervise others or make decisions which impact the work assigned to individuals or phases of projects. Understands and collaborates on the analysis of user/customer needs and represents this in their work.

Complexity

Performs a range of work, sometimes complex and non-routine, in a variety of environments. Applies methodical approach to issue definition and resolution. Knowledge

Has a sound generic, domain and specialist knowledge necessary to perform effectively in the organisation typically gained from recognised bodies of knowledge and organisational information. Demonstrates effective application

of knowledge. Has an appreciation of the wider business context. Takes action to develop own knowledge.

Business skills

Demonstrates effective communication skills.

Plans, schedules and monitors own work (and that of others where applicable) competently within limited deadlines and according to relevant legislation, standards and procedures.

Contributes fully to the work of teams. Appreciates how own role relates to other roles and to the business of the employer or client.

Demonstrates an analytical and systematic approach to issue resolution. Takes the initiative in identifying and negotiating appropriate personal development opportunities.

Understands how own role impacts security and demonstrates routine security practice and knowledge required for own work.

SFIA skills that could be relevant for any curriculum

Portfolio, programme and project support PROF The provision of support and guidance on portfolio, programme and project management processes, procedures, tools and techniques. Support includes definition of portfolios, programmes, and projects; advice on the development, production and maintenance of business cases; time, resource, cost and exception plans, and the use of related software tools. Tracking and reporting of programme/project progress and performance are also covered, as is the capability to facilitate all aspects of portfolio/ programme/ project meetings, workshops and documentation.

> **Level 4**

Takes responsibility for the provision of support services to projects. Uses and recommends project control solutions for planning, scheduling and tracking projects. Sets up and provides detailed guidance on project management

software, procedures, processes, tools and techniques. Supports programme or project control boards, project assurance teams and quality review meetings. Provides basic guidance on individual project proposals. May be involved in aspects of supporting a programme by providing a cross programme view on risk, change, quality, finance or configuration management.

> **Level 3**

Uses recommended portfolio, programme and project control solutions for planning, scheduling and tracking. Sets up project files, compiles and distributes reports. Provides administrative services to project boards, project assurance teams and quality review meetings. Provides guidance on project management software, procedures, processes, tools and techniques.

Project management PRMG

The management of projects, typically (but not exclusively) involving the development and implementation of business processes to meet identified business needs, acquiring and utilising the necessary resources and skills, within agreed parameters of cost, timescales, and quality. The adoption and adaptation of project management methodologies based on the context of the project and selecting appropriately from predictive (plan-driven) approaches or adaptive (iterative/agile) approaches.

> **Level 4**

Defines, documents and carries out small projects or sub-projects (typically less than six months, with limited budget, limited interdependency with other projects, and no significant strategic impact), alone or with a small team, actively participating in all phases. Identifies, assesses and manages risks to the success of the project. Applies appropriate project management methods and tools whether predictive (plan-driven) approaches or adaptive (iterative/agile) approaches. Agrees project approach with stakeholders, and prepares realistic plans (including quality, risk and communications plans) and tracks activities against the project schedule, managing stakeholder involvement as appropriate. Monitors costs, timescales and resources used, and takes action where these deviate from agreed tolerances. Ensures that own projects are formally closed

and, where appropriate, subsequently reviewed, and that lessons learned are recorded.

Data Analytic Skills

SFIA skills that could be relevant for Data Analytics

Analytics INAN

The application of mathematics, statistics, predictive modeling and machine-learning techniques to discover meaningful patterns and knowledge in recorded data. Analysis of data with high volumes, velocities and variety (numbers, symbols, text, sound and image). Development of forward-looking, predictive, real-time, model-based insights to create value and drive effective decision-making. The identification, validation and exploitation of internal and external data sets generated from a diverse range of processes.

Level 3

Undertakes analytical activities and delivers analysis outputs, in accordance with customer needs and conforming to agreed standards..

Data management DATM

The management of practices and processes to ensure the security, quality, integrity, safety and availability of all forms of data and data structures that make up the organisation's information. The management of data and information in all its forms and the analysis of information structure (including logical analysis of taxonomies, data and metadata). The development of innovative ways of managing the information assets of the organisation.

Level 3

Applies ethical and robust techniques in the transformation of data from one format/medium to another, in line with organisational policies and procedures and being sensitive to risks around the use of information.

Methods and tools METL

The definition, tailoring, implementation, assessment, measurement, automation and improvement of methods and tools to support planning, development, testing, operation, management and maintenance of systems. Ensuring methods and tools are adopted and used effectively throughout the organisation.

> **Level 3**

Provides support on the use of existing methods and tools. Configures methods and tools within a known context. Creates and updates the documentation of methods and tools.

Database design DBDS

The specification, design and maintenance of mechanisms for storage of and access to data in support of business information needs. Design of the physical data layer, addressing enterprise data resource needs and local stored data structures. Definition of physical or virtual data warehouse structures required to support business intelligence and data analytics services.

> **Level 3**

Develops appropriate physical database or data warehouse design elements, within set policies, to meet business change or development project data requirements. Interprets installation standards to meet project needs and produces database or data warehouse component specifications.

Database administration DBAD

The installation, configuration, upgrade, administration, monitoring and maintenance of databases. Providing support for operational databases in production use and for internal or interim purposes such as iterative developments and testing. Improving the performance of databases and the tools and processes for database administration (including automation).

Level 3

Uses database management system software and tools to collect agreed performance statistics. Carries out agreed database maintenance and administration tasks.

Cybersecurity Skills

Information security SCTY

The selection, design, justification, implementation and operation of controls and management strategies to maintain the security, confidentiality, integrity, availability, accountability and relevant compliance of information systems with legislation, regulation and relevant standards.

Level 3

Communicates information security risks and issues to business managers and others. Performs basic risk assessments for small information systems. Contributes to vulnerability assessments. Applies and maintains specific security controls as required by organisational policy and local risk assessments. Investigates suspected attacks. Responds to security breaches in line with security policy and records the incidents and action taken.

Information governance IRMG

The overall governance of how all types of information, structured and unstructured, whether produced internally or externally, are used to support decision-making, business processes and digital services. Encompasses development and promotion of the strategy and policies covering the design of information structures and taxonomies, the setting of policies for the sourcing and maintenance of the data content, and the development of policies, procedures, working practices and training to promote compliance with legislation regulating all aspects of holding, use and disclosure of data.

Level 4

Ensures implementation of information and records management policies and standard practice. Ensures effective controls are in place for internal delegation, audit and control relating to information and records management. Assesses and manages risks around the use of information. Provides reports on the

consolidated status of information controls to inform effective decision making. Recommends remediation actions as required. Ensures that information is presented effectively.

Penetration testing PENT

The assessment of organisational vulnerabilities through the design and execution of penetration tests that demonstrate how an adversary can either subvert the organisation's security goals or achieve specific adversarial objectives. Penetration testing may be a stand-alone activity or an aspect of acceptance testing prior to an approval to operate. The identification of deeper insights into the business risks of various vulnerabilities.

> **Level 4**

Maintains current knowledge of malware attacks, and other cyber security threats. Creates test cases using in-depth technical analysis of risks and typical vulnerabilities. Produces test scripts, materials and test packs to test new and existing software or services. Specifies requirements for environment, data, resources and tools. Interprets, executes and documents complex test scripts using agreed methods and standards. Records and analyses actions and results. Reviews test results and modifies tests if necessary. Provides reports on progress, anomalies, risks and issues associated with the overall project. Reports on system quality and collects metrics on test cases. Provides specialist advice to support others.

Digital forensics DGFS

The collection, processing, preserving, analysis, and presentation of forensic evidence based on the totality of findings including computer-related evidence in support of security vulnerability mitigation and/or criminal, fraud, counterintelligence, or law enforcement investigations.

> **Level 4**

Contributes to digital forensic investigations. Processes and analyses evidence in line with policy, standards and guidelines and supports production of forensics findings and reports.

Business risk management BURM

The planning and implementation of organisation-wide processes and procedures for the management of risk to the success or integrity of the business, especially those arising from the use of information technology, reduction or non-availability of energy supply or inappropriate disposal of materials, hardware or data.

> **Level 4**

Investigates and reports on hazards and potential risk events within a specific function or business area.

Data management DATM

The management of practices and processes to ensure the security, quality, integrity, safety and availability of all forms of data and data structures that make up the organisation's information. The management of data and information in all its forms and the analysis of information structure (including logical analysis of taxonomies, data and metadata). The development of innovative ways of managing the information assets of the organisation.

> **Level 4**

Takes responsibility for the accessibility, retrievability, security, quality, retention and ethical handling of specific subsets of data. Assesses the integrity of data from multiple sources. Provides advice on the transformation of data/ information from one format or medium to another. Maintains and implements information handling procedures. Enables the availability, integrity and searchability of information through the application of formal data and metadata structures and protection measures. Manipulates specific data from information services, to satisfy defined information needs.

Hypothetical instantiation - Web App Developer

This is a worked example of a hypothetical instatiation of an IOC degree for a Web App Developer, showing the mapping of SFIA skills and model curriculum.

Curriculum

Year 1

Semester 1	Semester 2	Summer
PROG101 [1]	WEBD102 [4]	
...	COMP102 [5]	
NWSC101 [2]	PROF102 [6]	
BSYS101 [3]	CLIN102 [7]	Internship [8]

Year 2

Semester 1	Semester 2	Summer
SPMG201 [9]	ARCH202 [13]	
UCDD201 [10]	NWSC202 [14]	
DMAD201 [11]	WEBP202 [15]	
PROJ201 [12]	CLIN202 [16]	Internship [8]

Year 3

Semester 1	Semester 2	Summer
CSVC301 [17]	MOBS302 [21]	
RQMS301 [18]	LEAN302 [22]	
SYSI301 [19]	PROJ302 [23]	
PROJ301 [20]	...	

1. Introductory Programming
2. Network & Security Fundamentals
3. Business Systems & Drivers
4. Developing Web Content
5. Computational Thinking
6. Communications and Professional Practice
7. Web Content Clinic
8. Summer Internship
9. Service & Project Management
10. User Centred Design & Development
11. Data Modelling & Design
12. Yr 2 Group Project
13. Systems Architecture
14. Network & Web Security
15. Web Programming
16. Web Development Clinic
17. Cloud Based Services
18. Requirements Management
19. Systems Integration & Testing
20. Yr 3 Group Project
21. Mobile & Cross-Platform Services
22. Business Agility

ARCH202 : Systems Architecture

> **15 credits**

to be turned into a module description

client - server architectures

web services, http, smtp

APIs

messaging formats - html, json, xml

soap vs rest / restful

Skills Contributions

- [ARCH](#)
- [PROG](#)
- [RELM](#)
- [REQM](#)
- [SCTY](#)
- [SINT](#)

BSYS101: Business Systems & Drivers

All organisations need to remain relevant to deliver value to their markets, customers or public and this means a process of keeping abreast of how to continually deliver products and services that are at least as good as they can get elsewhere, if not better.

Computer systems are essential components of a business's armoury, and help to deliver their produts and services to the market. Understanding what a computer system needs to do means being aware of the commercial drivers for that system - being *commercially aware*.

Being commercially aware means understanding what your organisation exists to do, and the context it operates within. It means having a good understanding of your organisation, how it works, who its customers are, how it adds value to them and what influences your success and the overall performance of the organisation.

Every organisation is subject to internal and external factors that mean reacting to change and developing strategies to respond to them are a key activity for managers. This course will help you to address the ongoing process of adapting and responding to the external environment while adjusting to what happens inside your organisation. You will consider how in today's complex organisations it is not acceptable to "do your own thing" without understanding the consequences elsewhere. It is not simply a matter of understanding your role, but how you fit into the big picture. Commercial awareness is not simply about acquiring a body of knowledge but rather a continuous dynamic process of recognising what affects your business now, and how it could be affected in the future. This means understanding customers and stakeholders, the work of colleagues, partners and competitors and how your role relates to them.

This module will explore how common commercial computer systems, particularly web-based services, can contribute to the various commercial drivers experienced by a company.

Skills Contributions

- REQM

Source

developed from Open University short course BG020: Commercial Awareness

CLIN102: Web Content Clinic

> **15 credits**

The web content clinic is part of the web development clinic run by the school. As a first year member of the clinic, your role will be to populate and update websites that have been developed for clients.

You will not simply be typing ready-prepared material – you will be creating the content from information provided by the client, ensuring that it is in a form that is appropriate for the intended audience. As you work in the clinic, you will be gaining valuable experience, which you should log in your e-portfolio.

Skills Contributions

- HCEV
- INCA
- PROF
- REQM
- EXPERIENCE
- LEADERSHIP

CLIN202: Web Development Clinic

15 credits

For this module, you will contribute to the activities of the web clinic operated by the school. You will be working on real projects for real, paying customers – so you will be expected to work professionally, building weil-founded solutions. As you work in the clinic, you will be gaining valuable experience, which you should log in your e—portfolio.

Skills Contributions

- SCTY
- SINT
- HCEV
- INCA
- PROF
- PROG
- RELM
- REQM
- EXPERIENCE
- LEADERSHIP

COMP102: Computational Thinking

15 credits

Firstly, you will be introduced to the concept of computational thinking. In particular, you will consider the question 'What is it to compute?'. A number of key concepts are defined – such as computational problem, algorithm and abstraction – and their application is illustrated. You will be given examples of computational problems and their solutions in a wide variety of fields, ranging from physics and biology to economics and sports. You will also start using the Python programming language.

Secondly, you will be introduced to tools and techniques for:

- creating abstractions that represent a problem

- devising algorithms that solve a problem efficiently.

A range of standard data structures and algorithms for sorting, searching and optimisation will be covered and illustrated with practical examples. You will also encounter notions such as Big-O notation, induction and recursion.

Finally, you will further develop your understanding of sets, functions, logic and proofs. In particular, some of the ideas – that you will have been introduced to informally – will now be presented using formal mathematical notation. This will be in the context of concrete applications, such as databases. At this point, you'll also learn about the limitations of computational problem solving (non-computability and computational complexity) and recent developments in computing, such as quantum computing.

Skills Contributions

- DTAN

- PROG

Origin

based on Open University Module M269: Algorithms, Data Structures and Computability.

CSVC301: Cloud Based Services

15 credits

This module introduces the cloud model and the types of resources (processing power, databases, general storage and networking) that can be provided by a typical cloud infrastructure. Different levels of cloud model are investigated, such as Infrastructure as a Service (**IaaS**), Platform as a Service (**PaaS**) and Software as a Service (**SaaS**), and contrasted with the web services model.

The module briefly reviews consumer cloud offerings, such as Dropbox and Google Drive for storing assets, before moving on to more sophisticated commercial offerings of cloud infrastructure, such as OpenStack and Amazon Web Services (AWS). Virtualisation and the use of hypervisors are outlined with a focus on the common facilities of the dominant mainstream platforms, including monitoring resource usage, load balancing and automatic scaling of resources to meet demand.

As well as technical aspects, the module considers the business case for cloud in different contexts (start-up, corporate, projects, collaborations) and different approaches to distributing cloud infrastructure (private, public and collaborative) as well as considering security and legal implications for each approach.

A range of cloud operations are demonstrated and included in a set of practical activities to provide hands-on experiences. These activities include:

- using a cloud dashboard to create resource constraint descriptions in which to run virtual machines and other components
- creating security rules to control access to cloud resources
- launching, accessing, monitoring and destroying cloud resources
- scripting and testing an auto-scaling scenario so that an application which comes under a high load is automatically replicated with the load shared between the existing and new resources
- use of a programmatic REST API to perform cloud operations.

Skills Contributions

- ARCH
- PROG
- RELM
- SCTY
- SINT

DMAD201: Data Modelling & Design

| **15 credits**

In this module, you'll learn about relational databases, including modelling the data required and implementing a data solution to meet needs and requirements.

The module will cover:

- business data requirements – databases and information systems
- modelling data requirements – conceptual and logical representations of a system
- realising the data model – from logical to physical, and implementation in SQL
- data manipulation using SQL
- data management – data quality and correctness, models and reality
- data in context – business and legal issues, performance and clarity, non-SQL technologies.

Skills Contributions

- DTAN
- REQM
- SINT

INTN: Summer Internship

The summer internship is an opportunity for you to gain some real-world experience, and to put into practice some of the skills you have developed in your first two years of study.

It is particularly important that you complete this internship before your final year if you did not have an opportunity for an internship between years 1 and 2.

It doesn't matter which area of the curriculum you apply – or, indeed, if you are exposed to new material which you have not yet covered. The important thing is to make the most of the opportunities you are offered, and to accumulate evidence of your developing competence in whichever tasks you are set.

You should take care to record evidence of your achievements in your e-portfolio. Over the course of your studies, you need to develop evidence to demonstrate your competence in one of the core SFIA skills:

- Information Security SCTY
- Programming/software development PROG
- Requirements definition and management REQM
- Systems integration and build SINT
- Release and deployment RELM

As well as evidence of your practical experience, you will also need evidence of your leadership skills, as specified in the SFIA framework.

Skills Contributions

- PROF
- PROG
- RELM
- REQM

- SCTY
- SINT
- EXPERIENCE
- LEADERSHIP

LEAN302 : Business Agility

15 credits

This module is based on a series of case studies which will explore how enterprises:

- choose how to exploit cloud technologies (private, public and hybrid);

- select development approaches that are appropriate for their needs and environment (lean, agile, iterative, waterfall etc.)

- identify the most appropriate technologies and environments to support their needs

- find an appropriate balance between insourcing and outsourcing

- choose between different vendors, and ensure that contracts and agreements are fit for purpose

For your assessment, you will select a major software development undertaken by a particular company, research published information on how successful that development was, and review how well the company followed the principles discussed in the module.

Skills Contributions

- ARCH
- RELM
- REQM
- SINT

MOBS302 : Mobile & Cross-Platform Services

> **15 credits**

This module explores the current state of the mobile market and the prospects for mobile technology as well as its combined use with cloud technology. The module commences by investigating a range of challenges facing developers of mobile apps, including dealing with the multiplicity of:

- users' devices (tablets, mobile phones etc.)
- framework technologies (Java, Microsoft, Android, iOS)
- communication technologies (Web services, HTTP, and TCP sockets).

The module examines a range of considerations in developing a mobile application including deployment and upgrading, user interface design, performance and memory management as well as connectivity, back-end storage and security. It also includes a case study element, exploration of toolkits for developing applications and the practical development of a mobile application which is subsequently extended to exploit cloud facilities.

Skills Contributions

- ARCH
- PROG
- SINT
- RELM

NWSC101 : Network & Security Fundamentals

15 credits

The module introduces key concepts in networking and cyber security, It incorporates two online courses provided by Cisco:

- networking essentials
- cybersecurity essentials

Skills Contributions

- ARCH
- SCTY

NWSC202 : Network & Web Security

| 15 credits

This module builds on the networking and security concepts introduced in NWSC101, and explores some of the security issues that are most relevant to web services and their associated protocols.

You will learn to identify common web vulnerabilities, such as injection (for sql, javascript and html) and appropriate countermeasures and resilient approaches that should be adopted to minimise these risks.

Skills Contributions

- ARCH
- RELM
- REQM
- SCTY
- SINT

PROF102: Communications & Professional Practices

15 credits

This module introduces you to the foundations that underpin being an effective profesiional.

Developing a website or any other computer softwware is rarely an activity that is carried out alone. So, you will explore what it means to be a member of a team, and the various roles that you might fill.

Effective communication, both verbal and written, is crucial wihin teams, and is also very important between developers and customers. You will look at how to choose the most appropriate communication medium and how best to express yourself through that medium.

Professionalism in IT is more than just having a useful collection of technical skills. This module will introduce you to the range of legal, social and ethical issues that contribute to being a Computing professional.

You will look at the legal framework in which IT systems are development, and consider the social impact that such systems may have. IT can also raise many ethical questions which you, as a professional, will need to address. Finally, but by no means least, IT systems need to be sustainable, with manageable impacts on resources, and particularly on the climate.

To succeed in this degree, you will need to build a professional portfolio, containing evidence of your experience and developing competence. You will relate your experience to SFIA, the Skills Framework for the Information Age, which will be introduced in this module, together with appropriate tools for building your portfolio.

Skills Contributions

- PROF
- REQM
- LEADERSHIP

PROG101: Introductory Programming

30 credits

Coding is at the heart of almost every computer application.

In this module, you will develop your coding skills using the Python programming language - not because it is necessarily the most widely used language, or because it is the one you will continue to use through your career. You will be using Python because it allows you to develop skills with all of the coding constructs that underpin the vast majority of programming languages.

You'll be introduced to a range of problem solving strategies, which you'll practise as you solve a number of coding challenges.

The assessment of this module will be based on a programming project.

Skills Contributions

- PROG

PROJ201: Group Project

15 credits

For this module, you will join a team of students from years two and three to complete some real-world tasks.
Your role will be to build components for a project. The third-year students will be responsible for coordinating and managing the project – you will have that opportunity next year, so this is your chance to watch and learn, as well as gaining experience working in a team.

In particular, you will have the opportunity to gain experience using the industry-standard cide repositiry, github, and to learn how it can be used to enable collaborative devolopment, sharing and commenting on code as you develop it.

Each group for this module will be monitored by the module leader, and will also have access to a mentor from industry.

The experience you gain should be recorded in your professional portfolio: it will count towards the experience you require for a "competency" badge.

Skills Contributions

- PROF

- REQM

- EXPERIENCE

- LEADERSHIP

PROJ301: Group Project

15 credits

You will gain experience in multiple aspects of software project management, including requirements reviews, component integration and testing, Your focus will be on the execution of the overall project, rather than on development of individual components. However, you will also have the opportunity to contribute to the project specification, approach and priorities.

In this module, you will be leading and managing, jointly with one or two other third year students, a group of year 2 students to deliver an industry-sponsored project.

You will share the responsibility to manage the team's use of industry-standard cide repositiry, GitHub, and to ensure that it supports collaborative devolopment. Groups who can not demonstrate effective use of GitHub are likely to score poorly on this module.

You will also share responsibility for liaising with the module leader, and with your group's industrial mentor.

The experience you gain should be recorded in your professional portfolio: it will count towards the experience you require for a "competency" badge.

Skills Contributions

- PROF
- REQM
- EXPERIENCE
- LEADERSHIP

PROJ302: Final Project

30 credits

This module is the capstone professional project for your degree programme. You will need to develop and deliver one or more artefact(s) for a real customer external to the University. You should aim to build on the experience you gained during one of your summer internships.

You will need to follow the complete lifecycle for each artefact, using whichever approach you think appropriate (e.g., agile, iterative etc.). You must also follow all relevant professional and ethical guidelines.

As this is a real-life project, you should expect to encounter difficulties and challenges, which you should document appropriately, and discuss in your project report.

You should be careful not to take on too much; but you must ensure that the experience you gain – including any failures – demonstrates your competence at level 3 in at least one of the five key SFIA skills for the degree:

- Information Security SCTY

- Programming/software development PROG

- Requirements definition and management REQM

- Systems integration and build SINT

- Release and deployment RELM Be aware that your customer will contribute to your assessment on this module.

Skills Contributions

- ARCH

- DTAN

- HCEV

- PROF
- PROG
- RELM
- REQM
- SCTY
- SINT
- EXPERIENCE
- LEADERSHIP

RQMS301: Requirements Management

15 credits

Comparing traditional approaches with agile processes and practices, you will learn about well-known software development processes, their phases, activities and techniques. This will help you to develop a critical understanding of the diversity of contexts of organisations, problems, and development teams, which will allow you to use your own judgment in a real situation.

By studying this module you will:

- be able to understand the business domain for a problem requiring a software solution or a change to an existing solution
- acquire the tools and knowledge to analyse and design such a solution or change
- understand how any chosen software architecture will impact on the satisfaction of all users requirements and expectations
- be able to apply and reuse design expertise from a set of design patterns
- develop the skills for testing outputs of all activities throughout the development process.

You will be equipped to apply your knowledge to the design of a wide range of software systems; from small systems in a single organisation (which still need to interact with a range of other services online) to those working in large-scale distributed environments based on coalitions of systems.

TBD

Skills Contributions

- DTAN
- HCEV

- PROG

- RELM

- REQM

- SINT

SPMG201: Service & Project Management

| **15 credits**

This module is arranged in two parts: *Service Management* and *Project Management*.

Service Management

In the first part of the module, you'll look at how service management helps to ensure that users and customers receive from IT systems services that they value. Referencing the widely used service management framework, ITIL®, you'll start by exploring what's needed to operate existing services effectively, then look at how to identify where, when and why there might be scope for improving services. You'll go on to consider some of the strategic drivers for providing services to customers, and how to understand their value. You'll look also at the wide range of things that need to be addressed when designing a service, and then rolling it out into use. The part concludes by looking at how all these aspects of service management interact in the context of the ITIL Service Lifecycle.

Project Management

This second part of the module will introduce you to project management, with an emphasis on managing software projects. You'll cover project management techniques and topics – such as project planning and activity planning, and managing risk and allocating resources. You'll also focus on the techniques that are most relevant to software project management, including:

- choosing an appropriate software development approach

- estimating how much development effort will be required

- exploring the tools and techniques for monitoring the progress of projects.

Skills Contributions

- PROF

SYSI301: Systems Integration & Testing

15 credits

It doesn't matter how carefully you have developed and tested a component of a system, it is still essential that the system of which it is a part is tested as a whole. For example, does the system still do everything that it is supposed to do, even if your new component isn't supposed to affect the existing functions? And are you sure that the latest build - which now contains *your* new component - actually still has all the latest versions of all the other components?

System integration and testing must themselves be discipline, not just ad-hoc processes, if they are to be effective.

In this module, you will explore the processes for developing and managing test processes and procedures, and how test-driven development can be used to minimise disruptions due to faulty code.

And you will examine how the use of a formal version control repository can minimise the risk of losing updates during a build.

Skills Contributions

- ARCH
- DTAN
- PROG
- RELM
- SINT

UCDD201: User Centred Design & Development

| 15 credits

Why are some interactive products so popular? How do you create products that everybody wants? One of the fundamental things you will learn in this module is the importance of user-centred design.

You will learn the value of moving away from your desk and 'stepping out into the world' to involve potential users in your early design ideas for interactive products. It is all too easy to assume that others think, feel and behave in the same way as we, the designer or developer, do. It is essential to take into account the diversity among users and their different perspectives and getting their feedback will help you to avoid any errors and misunderstandings that you may not have thought of. Involving users in the process is vital to creating great products and makes good business sense: after all, who wants to buy a bad product?

This module has three parts, which explore the key issues in user-centred design.

Part 1 - Requirements

Who are the users and what do they want? As part of the process of defining the requirements for an interactive product we need to know the user's characteristics but we also need to be aware of the user's context – both in terms of their physical environment and in terms of the activities they are engaged in. This block studies a range of requirement gathering approaches including talking to users, observational methods including the use of technology probes, and more. You will also learn to use tools and techniques such as developing personas and scenarios, which will help you share information with the stakeholders (the team, the users, the customer) and communicate effectively about the requirements for an interactive product.

Part 2 – Design

Designing is about balancing the requirements. It involves thinking through the underlying idea for the interactive product and the more concrete, physical aspects. This block tackles all these things. You will learn to use reflective tools to help you work out and communicate the main idea for a design, including what users will be able to do with it, and how they will experience it. We discuss a range of interface types, from more traditional screen-based forms of interaction to mobile, wearable, haptic and other interface types and you will learn and use a range of prototyping methods and tools.

Part 3 – Evaluation

Evaluating an interactive product is essential to ensure that it meets the requirements or to identify ways in which it can be improved so that it does meet the requirements. This block presents the knowledge and techniques necessary to evaluate, including ethical considerations when evaluating with users; techniques and tips for observing users, and asking experts and users; and how to decide when to carry out field studies and when to use lab studies. You will learn how to present your findings and to reflect on the need for iteration of parts of the design life cycle.

Skills Contributions

- HCEV
- INCA
- PROG
- REQM
- SINT

Origin

based on the Open University Module TM356: Interaction Design

WEBD102: Developing Web Content

15 credits

Whether they are static or dynamic, web pages are a combination of two things: content and layout.

This module covers the basic technologies on which the Web is founded. Aspects covered include: historic development of the Web; 'architecture' and basic client server architecture; protocols such as HTTP; content markup (HTML, CSS, XML) and issues of accessibility and usability; standards and standardisation organisations (W3C, Internet working group); and security (firewalls, HTTPS, certificates).

You will also explore how best to transform text provided by a client into text for use on a web page. This may involve little more than editing to correct errors; or it may involve a significant change in style. So, you will learn how to transform boring, unstructure text into an interesting web page.

Skills Contributions

- HCEV
- INCA
- REQM

Origin

based on block 1 of the Open University Module TT284: Web Technologies

WEBP202: Web Programming

15 credits

Part 1 Web architectures

The first part of this module focuses on how the components of the client-server architecture can deliver dynamic content to web pages. This part covers web application architectures, including cloud technology; server (Apache, Tomcat) and client side components (web browsers, databases) and programming languages (JavaScript, PHP and SQL).

Part 2 Mobile content

Part 2 examines the trend toward more portable content and content customisation and also explores mobile content and applications. It considers aspects such as Web 2, content manipulation and approaches to delivering content to mobile devices. You will also undertake the development of a simple mobile application.

Part 3 Developing applications

The final part explores how applications are planned, designed and developed by IT professionals, examining application design, development environments and tools as well as application deployment and maintenance.

Skills Contributions

- DTAN
- HCEV
- INCA

- PROG
- RELM
- SCTY

Origin

based on blocks 2-4 of the Open University Module TT284: Web Technologies

SFIA Skills

Level 3/4 targets

- Information Security SCTY

- Programming/software development PROG

- Requirements definition and management REQM

- Systems integration and build SINT

- Release and deployment RELM

Level 2 underpinning

- Portfolio, programme and project support PROF

- Data modelling and design DTAN

- Information content authoring INCA

- User experience design HCEV

- Solution architecture ARCH

Responsibility Characteristics

- Leadership skills & experience

- Influence / business skills

- Job experience

- Complexity/Autonomy/Business skills

Responsibility Characteristics: Leadership Skills

Influence

Interacts with and influences colleagues. Has working level contact with customers, suppliers and partners. May supervise others or make decisions which impact the work assigned to individuals or phases of projects. Understands and collaborates on the analysis of user/customer needs and represents this in their work.

Business Skills

- Demonstrates effective communication skills.

- Plans, schedules and monitors own work (and that of others where applicable) competently within limited deadlines and according to relevant legislation, standards and procedures.

- Contributes fully to the work of teams. Appreciates how own role relates to other roles and to the business of the employer or client.

Responsibility Characteristics: Work Experience

Autonomy

Works under general direction. Uses discretion in identifying and responding to complex issues and assignments. Receives specific direction, accepts guidance and has work reviewed at agreed milestones. Determines when issues should be escalated to a higher level.

Complexity

Performs a range of work, sometimes complex and non-routine, in a variety of environments. Applies methodical approach to issue definition and resolution.

Business Skills

- Demonstrates an analytical and systematic approach to issue resolution.

- Takes the initiative in identifying and negotiating appropriate personal development opportunities.

- Understands how own role impacts security and demonstrates routine security practice and knowledge required for own work.

Solution Architecture ARCH

Level 4

Contributes to the development of solution architectures in specific business, infrastructure or functional areas. Identifies and evaluates alternative architectures and the trade-offs in cost, performance and scalability. Produces specifications of cloud-based or on-premises components, tiers and interfaces, for translation into detailed designs using selected services and products. Supports a change programme or project through the preparation of technical plans and application of design principles that comply with enterprise and solution architecture standards (including security).

Level 3

Not defined by SFIA

Level 2

Not defined by SFIA

Data Modelling & Design DTAN

Level 3

Applies data analysis, design, modelling, and quality assurance techniques, based upon a detailed understanding of business processes, to establish, modify or maintain data structures and associated components (entity descriptions, relationship descriptions, attribute definitions). Advises database designers and other application development team members on the details of data structures and associated components.

Level 2

Applies data analysis, design, and modelling techniques to establish, modify or maintain a data structure and its associated components (entity descriptions, relationship descriptions, attribute definitions).

User Experience Deisgn HCEV

Level 3

Applies tools and methods to design and develop users' digital and off-line tasks, interactions and interfaces to meet agreed usability and accessibility requirements for selected system, product or service components. Creates workable prototypes. Assists, as part of a team, on overall user experience design. Assists in the evaluation of design options and trade-offs. Consistently applies visual design and branding guidelines.

Level 2

not defined by SFIA

Information Content Authoring INCA

Level 3

Liaises with clients and representatives of the intended audience(s) to clarify detailed requirements. Designs, creates, controls and evaluates moderately-complex subject matter ensuring the needs of the audience(s) are met in a manner appropriate to the medium(s) in use. Makes informed decisions about the best way to present information to the audience(s), taking into consideration how information may be presented, identified, and searched for. Produces information artefacts that are accurate, current, relevant and easily understood by the intended audience(s). Applies moderation and editing processes to content supplied by others.

Level 2

Develops an understanding of content development and authoring activities, such as information gathering, creating draft content, identifying appropriate illustrations, and proper treatment of copyright and considering the publication medium(s). Works with colleagues and clients to understand audience needs and to assimilate source material. Creates draft materials that present information clearly, concisely and accurately in appropriate plain language, which meets the requirements of the audience(s) as clearly, simply and quickly as possible. Applies guidelines and standards to moderate content from others, escalating where appropriate.

Portfolio, Programme and Project Support PROF

Level 4

Uses recommended portfolio, programme and project control solutions for planning, scheduling and tracking. Sets up project files, compiles and distributes reports. Provides administrative services to project boards, project assurance teams and quality review meetings. Provides guidance on project management software, procedures, processes, tools and techniques.

Level 3

Assists with the compilation of portfolio, programme and project management reports. Maintains programme and project files from supplied actual and forecast data.

Programming/Software Development
PROG

Level 4

Designs, codes, verifies, tests, documents, amends and refactors complex programs/scripts and integration software services. Contributes to selection of the software development approach for projects, selecting appropriately from predictive (plan-driven) approaches or adaptive (iterative/agile) approaches. Applies agreed standards and tools, to achieve well-engineered outcomes. Participates in reviews of own work and leads reviews of colleagues' work.

Level 3

Designs, codes, verifies, tests, documents, amends and refactors moderately complex programs/scripts. Applies agreed standards and tools, to achieve a well-engineered result. Collaborates in reviews of work with others as appropriate.

Release & Deployment Management
RELM

Level 4

Assesses and analyses release components. Provides input to scheduling. Carries out the builds and tests in coordination with testers and component specialists maintaining and administering the tools and methods – manual or automatic - and ensuring, where possible, information exchange with configuration management. Ensures release processes and procedures are maintained.

Level 3

Uses the tools and techniques for specific areas of release and deployment activities. Administers the recording of activities, logging of results and documents technical activity undertaken. May carry out early life support activities such as providing support advice to initial users.

Requirements Definition & Management REQM

Level 4

Contributes to selection of the requirements approach for projects, selecting appropriately from predictive (plan-driven) approaches or adaptive (iterative/ agile) approaches. Defines and manages scoping, requirements definition and prioritisation activities for initiatives of medium size and complexity. Facilitates input from stakeholders, provides constructive challenge and enables effective prioritisation of requirements. Reviews requirements for errors and omissions. Establishes the requirements base-lines, obtains formal agreement to requirements, and ensures traceability to source. Investigates, manages, and applies authorised requests for changes to base-lined requirements, in line with change management policy.

Level 3

Defines and manages scoping, requirements definition and prioritisation activities for small-scale changes and assists with more complex change initiatives. Follows agreed standards, applying appropriate techniques to elicit and document detailed requirements. Provides constructive challenge to stakeholders as required. Prioritises requirements and documents traceability to source. Reviews requirements for errors and omissions. Provides input to the requirements base-line. Investigates, manages and applies authorised requests for changes to base-lined requirements, in line with change management policy.

Information Security SCTY

Level 4

Explains the purpose of and provides advice and guidance on the application and operation of elementary physical, procedural and technical security controls. Performs security risk, vulnerability assessments, and business impact analysis for medium complexity information systems. Investigates suspected attacks and manages security incidents. Uses forensics where appropriate.

Level 3

Communicates information security risks and issues to business managers and others. Performs basic risk assessments for small information systems. Contributes to vulnerability assessments. Applies and maintains specific security controls as required by organisational policy and local risk assessments. Investigates suspected attacks. Responds to security breaches in line with security policy and records the incidents and action taken.

Systems Integration and Build SINT

Level 4

Provides technical expertise to enable the configuration of software, other system components and equipment for systems testing. Collaborates with technical teams to develop and agree system integration plans and report on progress. Defines complex/new integration builds. Ensures that integration test environments are correctly configured. Designs, performs and reports results of tests of the integration build. Identifies and documents system integration components for recording in the configuration management system. Recommends and implements improvements to processes and tools.

Level 3

Defines the software modules needed for an integration build and produces a build definition for each generation of the software. Accepts completed software modules, ensuring that they meet defined criteria. Produces software builds from software source code for loading onto target hardware. Configures the hardware and software environment as required by the system being integrated. Produces integration test specifications, conducts tests and records and reports on outcomes. Diagnoses faults and records and reports on the results of tests. Produces system integration reports.