

Information Technology

Victorian Certificate of Education Study Design

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(Erratum as published in the *VCAA Bulletin*, July 2010, p. 5.)
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(Erratum as published in the *VCAA Bulletin*, July 2011, p. 5.)

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Latoya BARTON
The sunset (detail)
from a series of twenty-four
9.0 x 9.0 cm each, oil on board



Tarkan ERTURK
Visage (detail)
201.0 x 170.0 cm
synthetic polymer paint, on cotton duck



Liana RASCHILLA
Teapot from the *Crazy Alice* set
19.0 x 22.0 x 22.0 cm
earthenware, clear glaze, lustres



Nigel BROWN
Untitled physics (detail)
90.0 x 440.0 x 70.0 cm
composition board, steel, loudspeakers,
CD player, amplifier, glass



Kate WOOLLEY
Sarah (detail)
76.0 x 101.5 cm, oil on canvas



Chris ELLIS
Tranquility (detail)
35.0 x 22.5 cm
gelatin silver photograph



Christian HART
Within without (detail)
digital film, 6 minutes



Kristian LUCAS
Me, myself, I and you (detail)
56.0 x 102.0 cm
oil on canvas



Merryn ALLEN
Japanese illusions (detail)
centre back: 74.0 cm, waist (flat): 42.0 cm
polyester cotton



Ping (Irene) VINCENT
Boxes (detail)
colour photograph



James ATKINS
Light cascades (detail)
three works, 32.0 x 32.0 x 5.0 cm each
glass, fluorescent light, metal



Tim JOINER
14 seconds (detail)
digital film, 1.30 minutes



Lucy McNAMARA
Precariously (detail)
156.0 x 61.0 x 61.0 cm
painted wood, oil paint, egg shells, glue, stainless steel wire

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IMPORTANT INFORMATION

Accreditation period

Units 1–4: 2011–2014

The accreditation period commences on 1 January 2011.

Other sources of information

The *VCAA Bulletin VCE, VCAL and VET* is the only official source of changes to regulations and accredited studies. The *VCAA Bulletin VCE, VCAL and VET*, including supplements, also regularly includes advice on VCE studies. It is the responsibility of each VCE teacher to refer to each issue of the *VCAA Bulletin VCE, VCAL and VET*. The *VCAA Bulletin VCE, VCAL and VET* is sent in hard copy to all VCE providers. It is also available as an e-newsletter via free subscription on the Victorian Curriculum and Assessment Authority's website at www.vcaa.vic.edu.au

To assist teachers in assessing School-assessed Coursework in Units 3 and 4, the Victorian Curriculum and Assessment Authority publishes online an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment.

The current *VCE and VCAL Administrative Handbook* contains essential information on assessment processes and other procedures.

VCE providers

Throughout this study design the term 'school' is intended to include both schools and other VCE providers.

Photocopying

VCE schools only may photocopy parts of this study design for use by teachers.

Introduction

RATIONALE

VCE Information Technology focuses on the processing of data and the management of information and information systems.

The rapid pace of development in information and communications technology (ICT) is having a major influence on many aspects of society. Not only does ICT provide the capacity to change how tasks and activities are undertaken, but it also creates new opportunities in work, education, entertainment and society.

While it is important that students extend their use of ICT as a learning and personal tool, the study of VCE Information Technology encompasses information systems and how people interact with information technology to create structured information and to connect with others to exchange information. It encompasses the theoretical foundations of computation and techniques for writing programs and developing solutions. It also focuses on how the needs of individuals, organisations, communities and society are met through the combination of ICT and meaningful information.

VCE Information Technology equips students with appropriate knowledge and skills to use ICT responsibly and to make informed personal and workplace choices about developments in this exciting field. Students are encouraged to orient themselves towards the future, with an awareness of the technical and societal implications of ICT.

VCE Information Technology provides pathways to further studies in IT and to careers in ICT-based areas. It also prepares students for programs that require an IT-related subject or for a range of careers that require efficient and effective use of ICT.

AIMS

This study enables students to:

- apply, as an individual and as a team member, skills, techniques and strategies to creatively and methodically solve information problems
- understand how data can be represented in a computer, and how it can be structured and manipulated into meaningful information

- evaluate how the information needs of individuals, organisations, communities and society are and can be met by the use of ICT, taking into account legal, ethical, social and environmental tensions
- understand the principal hardware and software components and the architecture of information systems and networks
- understand how technologies, procedures, legislation and personal attitudes can serve to protect the integrity and security of data and information.

STRUCTURE

The study is made up of six units:

Unit 1: IT in action

Unit 2: IT pathways

Units 3 and 4: IT applications

Units 3 and 4: Software development

Note: Students may elect to undertake one or both of these Units 3 and 4 sequences.

Each unit deals with specific content contained in areas of study and is designed to enable students to achieve a set of outcomes for that unit. Each outcome is described in terms of key knowledge and key skills.

A glossary defining terms used across Units 1 to 4 in the VCE Information Technology study design is included on pages 12 to 15.

ENTRY

There are no prerequisites for entry to Units 1, 2 and 3. Students must undertake Unit 3 prior to undertaking Unit 4. Units 1 to 4 are designed to a standard equivalent to the final two years of secondary education.

DURATION

Each unit involves at least 50 hours of scheduled classroom instruction.

CHANGES TO THE STUDY DESIGN

During its period of accreditation minor changes to the study will be announced in the *VCAA Bulletin VCE, VCAL and VET*. The *VCAA Bulletin VCE, VCAL and VET* is the only source of changes to regulations and accredited studies and it is the responsibility of each VCE teacher to monitor changes or advice about VCE studies published in the *VCAA Bulletin VCE, VCAL and VET*.

MONITORING FOR QUALITY

As part of ongoing monitoring and quality assurance, the Victorian Curriculum and Assessment Authority will periodically undertake an audit of VCE Information Technology to ensure the study is being taught and assessed as accredited. The details of the audit procedures and requirements are published annually in the *VCE and VCAL Administrative Handbook*. Schools will be notified if they are required to submit material to be audited.

SAFETY

It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students undertaking the study. For this study this means an ergonomically sound work environment.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Students need access to the following resources to be able to demonstrate the required outcomes:

- computers
- printers
- web access
- a range of software tools, each supporting the solution to a different type of problem. Problem types and associated tools include:
 - formatting, storing, editing and retrieving data; for example, spreadsheet, a database management system, word processor
 - creating mathematical models; for example, spreadsheet, statistical package
 - creating multimedia information; for example, software to edit, retrieve, insert, delete data such as text, sound, static and moving image
 - creating graphical output; for example, drawing and graphics software, data visualisation software
 - creating programs; for example, tools that provide programming and scripting environments including editing, compilation, execution, debugging/testing
- alternative input and output devices; for example, light pen, scanner, digital camera, speakers, plotter, personal digital assistants (PDAs), mobile phones, gaming consoles.

EMPLOYABILITY SKILLS

This study offers a number of opportunities for students to develop employability skills. The ‘Advice for teachers’ section provides specific examples of how students can develop employability skills during learning activities and assessment tasks.

LEGISLATIVE COMPLIANCE

When collecting and using information, the provisions of privacy and copyright legislation, such as the Victorian *Information Privacy Act 2000* and *Health Records Act 2001*, and the federal *Privacy Act 1988* and *Copyright Act 1968*, must be met.

Assessment and reporting

SATISFACTORY COMPLETION

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's performance on assessment tasks designated for the unit. Designated assessment tasks are provided in the details for each unit. The Victorian Curriculum and Assessment Authority publishes online an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment for Units 3 and 4.

Teachers must develop courses that provide opportunities for students to demonstrate achievement of outcomes. Examples of learning activities are provided in the 'Advice for teachers' section.

Schools will report a result for each unit to the Victorian Curriculum and Assessment Authority as S (Satisfactory) or N (Not Satisfactory).

Completion of a unit will be reported on the Statement of Results issued by the Victorian Curriculum and Assessment Authority as S (Satisfactory) or N (Not Satisfactory). Schools may report additional information on levels of achievement.

AUTHENTICATION

Work related to the outcomes of each unit will be accepted only if the teacher can attest that, to the best of their knowledge, all unacknowledged work is the student's own. Teachers need to refer to the current *VCE and VCAL Administrative Handbook* for authentication procedures.

LEVELS OF ACHIEVEMENT

Units 1 and 2

Procedures for the assessment of levels of achievement in Units 1 and 2 are a matter for school decision. Assessment of levels of achievement for these units will not be reported to the Victorian Curriculum and Assessment Authority. Schools may choose to report levels of achievement using grades, descriptive statements or other indicators.

Units 3 and 4

The Victorian Curriculum and Assessment Authority will supervise the assessment of all students undertaking Units 3 and 4.

In VCE Information Technology students' level of achievement will be determined by School-assessed Coursework and an end-of-year examination. The Victorian Curriculum and Assessment Authority will report students' level of performance on each assessment component as a grade from A+ to E or UG (ungraded). To receive a study score, students must achieve two or more graded assessments and receive S for both Units 3 and 4. The study score is reported on a scale of 0–50; it is a measure of how well the student performed in relation to all others who took the study. Teachers should refer to the current *VCE and VCAL Administrative Handbook* for details on graded assessment and calculation of the study score. Percentage contributions to the study score in VCE Information Technology are as follows:

- Unit 3 School-assessed Coursework: 25 per cent
- Unit 4 School-assessed Coursework: 25 per cent
- End-of-year examination: 50 per cent.

Details of the assessment program are described in the sections on Units 3 and 4 in this study design.

Glossary

For the purposes of this study design and associated assessment the following definitions will apply.

Term	Definition
Authoring software	A category of software that enables users to create multimedia and web solutions without the need to write programming code. The software generates the code required to run the application created. Often used for developing web pages (for example, Adobe Dreamweaver), multimedia presentations (for example, Sunburst Hyperstudio, Ulead DVD MovieFactory, Microsoft PhotoStory, and Apple iMovie and Apple Final Cut Express for video productions) and games (for example, Game Creator 3D Gamemaker, Conitec 3D GameStudio, Conitec Atari Lite-C).
Cloud computing	A service provided by large Internet-based, specialised data centres that offers offsite storage, processing and computer resources to individuals and organisations. The services are shared, on-demand and usually simple to use. For example, Google's gmail uses cloud computing processing powers and storage facilities; Amazon's Elastic Compute Cloud offers computing resources without a development platform layer.
Data visualisation	A process of using software tools to select and access data from large repositories and present the data as effective graphics. Graphical presentations usually take the form of charts, graphs, spatial relationships, histograms, maps and network diagrams. Some data visualisation tools allow the presentations to be dynamic. Examples of data visualisation tools include programming languages, such as Python, spreadsheet software, database software, Google Docs (gadgets/motion charts), InfiView, Nexus (social graph browser).
Design brief	A statement that contains an outline of a situation, context, problem, need or an opportunity, any conditions that apply to a problem and the future needs. It provides a basis from which students can apply some or all of the stages of the problem-solving methodology when solving information problems.

Term	Definition
Design elements	Factors that contribute to the functionality and appearance of solutions. In this study the elements related to functionality are structure, usability and accessibility, including navigation and load time, appropriateness and relevance. Design elements related to appearance are proportion (visual hierarchy), orientation (direction/aspect), clarity and consistency, colour and contrast.
Design tools	Methods for representing the functionality and appearance of solutions. Tools to represent designs include data flow diagrams, entity-relationship diagrams, hierarchy charts, data dictionaries and data structure diagrams, object descriptions, flowcharts, pseudocode, input-process-output (IPO) charts, structure charts, annotated diagrams/mock-ups, storyboards, site maps, layout diagrams, use cases, context diagrams. The choice of tools is dependent on the nature of the solutions.
Efficiency	A measure of how little time, cost and/or effort is applied in order to achieve intended results. Measures of an efficient solution include the speed of processing, the functionality of the solution, the ease of use of the solution and the cost of information file manipulation. Measures of an efficient network include its productivity, processing time, operational costs and level of automation.
Effectiveness	A measure of how well something works, such as a solution, a file and information management strategy and a network, that is, the extent to which it achieves its intended results. Measures of an effective solution include completeness, readability, attractiveness, clarity, accuracy, accessibility, timeliness, communication of message, relevance and usability. Measures of an effective file and information management strategy include integrity of data, security, ease of retrieval and currency of files. Measures of effective networks include reliability and maintainability.
Information architecture	Ways in which information should be treated and organised within onscreen solutions. This includes the structuring or grouping of sets of information and determining navigation pathways. Effective and efficient information architecture enables users to intuitively and confidently locate information they require.
Information system	The combination of people, procedures, equipment and data that process data and information.
Legal obligations	Legal obligations that individuals and organisations have with respect to the ownership and privacy of information, and freedom of expression. For the purposes of this study the key provisions of the following acts are relevant: <i>Privacy Act 1988</i> , <i>Information Privacy Act 2000</i> , <i>Health Records Act 2001</i> , <i>Copyright Act 1968</i> , <i>Charter of Human Rights and Responsibilities Act 2006</i> (VIC) (sections 13, 14 and 15), and the <i>Spam Act 2003</i> (Part 1.3, Simplified outline).

Term	Definition
Open Systems Interconnection (OSI)	A seven-layer network protocol: physical (Layer 1), data link (Layer 2), network (Layer 3), transport (Layer 4), session (Layer 5), presentation (Layer 6), application (Layer 7). The emphasis in the study design is on Layer 1.
Physical security measures/devices	Equipment used to assist in the protection of information systems and the files produced, received and stored by individuals and organisations, including zoned security strategies, barrier techniques, biometrics. Also see Software security measures/devices.
Problem-solving methodology	A systematic way of solving information problems. This methodology is used throughout this study. See pages 16 to 18 for details.
Security threats	Actions, devices and events that threaten the integrity and security of data and information stored within, and communicated between, information systems. The threats can be accidental, such as losing a portable storage device containing files; deliberate, such as denial of service and worms; and events-based, such as a power surge.
Social online protocols	Accepted ways of behaving on websites that support communication. Protocols usually relate to identity, the nature of information exchanged, language used in communications and the rights of members. Examples of breaches of social online protocols include fraudulent identity, cyberbullying, harassment, posting of inappropriate information and use of inappropriate language.
Software requirements specifications (SRS)	A comprehensive description of the intended purpose and environment for purpose-designed software solutions. It documents the key tasks associated with the analysing stage of the problem-solving methodology. The software requirements specifications (SRS) fully describes the functional requirements (what it is required to do) and non-functional requirements of the solution (solution attributes) such as user-friendliness, response rates, robustness, portability, reliability and maintainability, the conditions affecting the solution (constraints) and the parameters of the solution (scope). Software requirements specifications fulfils the purposes of breaking down the problem into component parts, providing input to the designing stage and serving as a reference point for further stages of the problem-solving methodology.
Software security measures/devices	Software and procedures used to assist in the protection of information systems and files produced, received and stored by individuals and organisations, including user names and passwords, access logs and audit trails, access restrictions, encryption and security protocols such as Transport Layer Security (TLS) and Secure Sockets Layer (SSL), firewalls and system protection.
Solution	A method of producing required information through the application of technology (hardware and software) and techniques.

Term	Definition
Testing techniques	Ways of ensuring a solution operates as intended. Testing is normally performed immediately after the development of a solution.
Visualising thinking tools	Software tools that allow students to clarify thoughts and to identify patterns and form relationships between sets of data and information. They are tools that support abstract reasoning. Examples include graphic and word processing software, concept/mind mapping software, simulation software, graphic organisers, wikis, database software and spreadsheet software.
Wired and wireless communications technology	Types of transmission media, including wired (fibre optic, twisted-pair) and wireless (microwave, satellite, radio and infrared).

Units 1–4: Problem-solving methodology

Integral to the VCE Information Technology study design is a methodology for systematically creating solutions to information problems. As applied in this study design the methodology comprises four stages: analysis, design, development and evaluation. For each of these stages there is a typical set of activities, as shown in Figure 1. Specific details of the scope of the problem-solving methodology are provided in the overview to each unit and in the introduction to relevant areas of study.

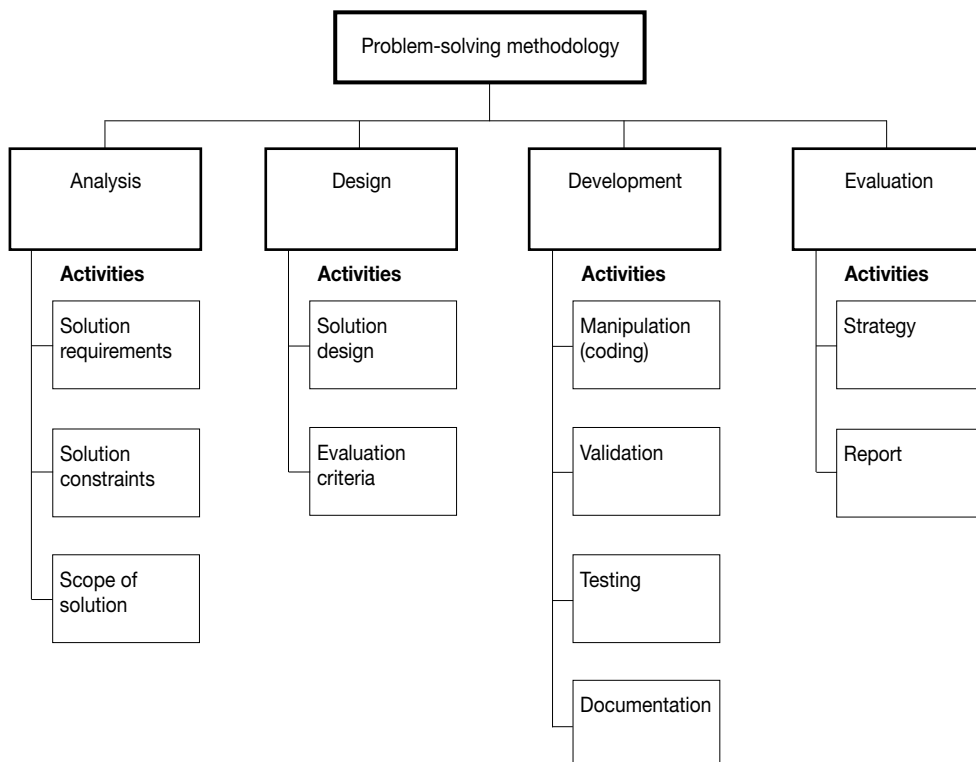


Figure 1: A problem-solving methodology for creating solutions to information problems

Analysis involves:

- Determining the solution requirements. What information does the solution have to provide? What data is needed to produce the information? What functions does the solution have to provide? These requirements can be classified as being functional, namely what the solution is required to do, and non-functional, which describes the attributes the solution should possess, such as user-friendliness, reliability, portability, robustness, maintainability. Tools to assist in determining the solution requirements include context diagrams, data flow diagrams and use cases.
- Identifying the constraints on the solution. What conditions need to be considered when designing a solution? Typical constraints include cost, speed of processing, requirements of users, legal requirements, security, compatibility, level of expertise, capacity, availability of equipment.
- Determining the scope of the solution. What can the solution do? What can't the solution do? What are the benefits of the solution to the user? The scope states the boundaries or parameters of the solution. Benefits can be stated in terms of their efficiency and effectiveness.

Analysis typically answers the 'what questions' – what will solve a problem, given particular circumstances? What benefits will the solution bring to the user?

Design involves:

- Planning how the solution will function, and the appearance of the resulting information. The solution design typically involves identifying what specific data is required and how the data will be named, structured, validated and manipulated. Typical design tools for this purpose include data dictionaries and data structure diagrams, input-process-output (IPO) charts, flowcharts, pseudocode, object descriptions. Solution design also involves, where appropriate, showing how the various components of a solution relate to one another, for example web pages, style sheets, scripts; queries, forms, reports; modules, procedures, functions. Typical design tools used to show relationships include storyboards, site maps, entity-relationship diagrams, data flow diagrams, structure charts, hierarchy charts, context diagrams, use cases. Planning the solution also involves determining the appearance of information generated from a solution. This typically involves identifying the position of text, images and graphics, font sizes, colours and text enhancements. Design tools used for this purpose include layout diagrams, annotated diagrams/mocks up.
- Determining the evaluation criteria. What measures will be used to judge whether or not the solution requirements have been met? These criteria should relate to the solution requirements identified in the analysis stage.

Development involves:

- Electronically manipulating (or coding) data to 'build' or create the solution following initial designs. Where appropriate, internal documentation is also written, which documents the functioning of the solution.
- Validation to check for the reasonableness of data being input. Validation can be both manual and electronic. Proofreading is a manual technique and it occurs when data is entered directly into the solution and remains fixed, such as in a web page. When the validation process has been built into the solution (electronic technique), then its effectiveness is determined through the testing activity.
- Testing whether the solution does what it was intended to do. This activity typically involves:
 - establishing what tests will be conducted
 - determining what test data, if any, will be used
 - determining expected results
 - conducting the test

- recording the actual results
- correcting any identified errors.
- Writing documentation to support the use of the solution.

Evaluation involves:

- Determining a strategy for finding out the extent to which the solution meets the required needs. Typically this would include specifying a timeline, outlining what data will be collected and by what methods and techniques, and how the data relates to the criteria, which were developed in the designing stage.
- Reporting on the extent to which the solution meets the requirements of the user. It usually takes place after the solution has been used by the user/client and is based on the criteria developed in the designing stage.

Relevant problem-solving stages for each unit

Following is a summary of the stages of the problem-solving methodology employed in each unit.

Unit	Problem-solving methodology
Unit 1	Design, Development
Unit 2	Analysis, Design, Development, Evaluation
IT applications, Unit 3	Analysis, Design, Development
IT applications, Unit 4	Analysis, Design, Development, Evaluation
Software development, Unit 3	Analysis, Design, Development
Software development, Unit 4	Design, Development, Evaluation

Unit 1: IT in action

This unit focuses on how individuals and organisations use, and can be affected by, information and communications technology (ICT) in their daily lives. In Areas of Study 1 and 3, students acquire and apply a range of knowledge and skills to manipulate different data types such as numeric, text, sound and images (still and moving) to create solutions that can be used to persuade, educate, inform and entertain. In Area of Study 3, students also explore how their lives are affected by ICT, and consider strategies for managing how ICT is applied. In Area of Study 2, students examine how networked information systems allow data to be exchanged locally and within a global environment, and explore how mobile devices, such as phones, are used within these networks.

When creating solutions, students need an understanding of the problem-solving methodology, as detailed on pages 16 to 18. In this unit the emphasis is on the problem-solving stages of design and development.

Software tools

Students study the following software tools in this unit:

Area of Study 1	Spreadsheet software
Area of Study 3	Spreadsheet software, web authoring software, visualising thinking tool/s, tool for planning a project

AREA OF STUDY 1

From data to information

In this area of study students develop and apply knowledge and skills in using spreadsheet software to manipulate numeric data. Students select relevant data and apply functions and techniques to manipulate the data to produce information in graphic form, which is displayed onscreen. Examples of graphical representations are column graphs, scatter diagrams and bubble charts.

Spreadsheet knowledge and skills acquired in this area of study are applied in Area of Study 3.

When working with given data sets, students apply the design and development stages of the problem-solving methodology. As students will not be engaged in the analysis stage, they must be provided with details of relevant requirements of the solution, such as what information the solution has to provide and the constraints on the solution. Details of this methodology are on pages 16 to 18.

Outcome 1

On completion of this unit the student should be able to select data from data sets, design solutions and use a range of spreadsheet functions to develop solutions that meet specific purposes.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

This knowledge includes:

- stages of the problem-solving methodology
- purposes for creating solutions, for example to inform, to entertain, to educate, to persuade
- data types, including integer, floating point numbers, character, string
- techniques for identifying relevant data
- purpose and functions of graphic representations
- applications and capabilities of spreadsheet software
- design elements that influence the appearance and effectiveness of graphic representations
- design tools for representing the functionality and appearance of solutions, including graphic representations
- spreadsheet software functions and techniques for efficiently and effectively manipulating and validating data
- formats and conventions applied to solutions in order to improve their effectiveness in meeting specific purposes
- techniques for testing solutions.

Key skills

These skills include the ability to:

- identify data required for particular purposes
- select graphic representations appropriate to the purposes of creating solutions
- select and apply appropriate design tools to represent solution designs, including the presentation of information
- use spreadsheet software, and select and apply functions, formats, conventions, data validation and testing techniques to efficiently manipulate data and produce effective graphic representations
- explain why the solutions, including graphic representations, are suited to the purposes.

AREA OF STUDY 2**Networks**

In this area of study students investigate how networked information systems allow data and information to be exchanged locally and within a global environment. Students develop an understanding of the technology and procedures, and the roles and responsibilities of people required to connect and maintain computers so that ideas, files, information, programs and resources can be shared. Students consider the advantages and disadvantages of using such networks, and explore how mobile devices are used within networks. Students develop an understanding of the ways in which the security of exchanged and stored data and information can be compromised.

Outcome 2

On completion of this unit the student should be able to recommend a networked information system for a specific use and explain possible security threats to this networked information system.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

This knowledge includes:

- ways in which people, procedures, equipment and data combine to form networked information systems
- capabilities of Wide Area Networks (WANs) and Local Area Networks (LANs)
- advantages and disadvantages for individuals and organisations of using networks in a global environment
- functions and characteristics of key hardware and software components of networks required for communicating and storing data and information
- characteristics of wired and wireless network protocols
- strengths and limitations of wireless and wired communications technology, measured in terms of data transfer rate, cost and reliability
- types, capabilities and limitations of mobile devices connected to networks
- roles and responsibilities of professional people who develop and support networks, including procedures to control the operation of networks
- security threats to data and information communicated and stored within networks.

Key skills

These skills include the ability to:

- identify types of networks and state reasons for their use
- evaluate the capabilities of different networks and communications technology
- explain the limitations and strengths of networks to support the communication and storage of data and information using mobile devices
- explain ways in which network professionals develop and maintain networks
- select and recommend networks suitable for specific uses
- explain how actions, devices and events can threaten the security of data and information communicated and stored within networks.

AREA OF STUDY 3**ICT in a global society**

In this area of study students develop an understanding about how the applications of particular information and communications technology (ICT) can cause tensions and conflicts between different stakeholders. This area of study involves consideration of contemporary issues within a selected context.

Working in teams, which can be virtual, students use web authoring software to create a website that presents an overview of an issue associated with one context. With evidence acquired from both primary and secondary sources, students present on their website the viewpoints of different stakeholders, the team's opinion regarding the issue and their strategies for encouraging individuals to influence how

ICT is applied in particular situations. Students use visualising thinking tools and techniques to assist in formulating team opinions. They use spreadsheet software to manipulate acquired primary data and generate graphical representations to include on their website using the skills acquired in Area of Study 1. Students can supplement these graphical representations with related sound and images, such as recorded and video interviews.

Project plans are developed using ICT to record tasks to be completed and team member responsibilities. During the development of the website, progress is monitored and recorded. Students do not have to use dedicated project management software.

Students apply the design and development stages of the problem-solving methodology when creating a website. Details of this methodology are on pages 16 to 18.

Outcome 3

On completion of this unit the student should be able to contribute collaboratively to the design and development of a website that presents an analysis of a contemporary ICT issue and substantiates the team's point of view.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 3.

Key knowledge

This knowledge includes:

- applications of ICT in a range of contexts
- a detailed study in one of the following contexts: computer gaming, social networking, robotics, e-commerce and cloud computing, that focuses on:
 - the nature of a contemporary issue associated with the context
 - legal, social, environmental and ethical reasons for the issue arising
 - types and capabilities of technology associated with the context
 - types of key stakeholders, such as individuals, organisations and governments, and their responsibilities
 - positive and negative opinions of each stakeholder on the issue
- strategies for influencing how ICT is used for particular purposes
- sources of, and methods and techniques for acquiring, primary and secondary data and information
- methods of referencing primary and secondary sources
- visualising thinking tools and techniques for supporting reasoning and decision making when analysing issues and ethical dilemmas
- stages of the problem-solving methodology
- design elements that influence the functionality and appearance of websites that include graphical representations
- design tools and techniques for representing solutions
- spreadsheet and web authoring software functions and techniques for manipulating and validating data, and testing solutions, taking into account legal obligations and ethical considerations
- formats and conventions applied to information in order to improve effectiveness for intended users
- strategies (tools and techniques) for coordinating the tasks, people, resources and time required to create solutions.

Key skills

These skills include the ability to:

- select and apply appropriate methods and techniques to acquire and reference data and information from primary and secondary sources
- use ICT to document and monitor project plans when creating team solutions
- analyse the causes and effects of the ICT issues using visualising thinking tools
- synthesise information about the selected ICT issues and strategies for influencing how ICT is used for particular purposes
- select and apply appropriate design tools to represent solutions
- use spreadsheet and web authoring software and select and apply functions, design elements, formats and conventions, data validation and testing techniques to manipulate data and produce solutions.

ASSESSMENT

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit.

The key knowledge and key skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and key skills do not constitute a checklist and such an approach is not necessary or desirable for determining the achievement of outcomes. The elements of key knowledge and key skills should not be assessed separately.

Assessment tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe. Teachers should select a variety of assessment tasks for their assessment program to reflect the key knowledge and key skills being assessed and to provide for different learning styles.

For this unit students are required to demonstrate achievement of three outcomes. As a set these outcomes encompass all areas of study.

Demonstration of achievement of Outcomes 1, 2 and 3 must be based on the student's performance on a selection of assessment tasks. Where teachers allow students to choose between tasks they must ensure that the tasks they set are of comparable scope and demand.

Assessment tasks for this unit are selected from the following:

- using ICT tools and techniques, produce a solution in response to an identified need
- visual presentations such as multimedia presentations
- oral presentations supported by a visual presentation
- a written report using ICT
- a test.

Unit 2: IT pathways

This unit focuses on how individuals and organisations use ICT to meet a range of purposes. Students apply a range of knowledge and skills to create solutions, including those that have been produced using a programming or scripting language, to meet users' needs. In this unit, students apply all stages of the problem-solving methodology when creating solutions. Details of this methodology are on pages 16 to 18.

In Area of Study 1 students analyse data from large repositories and manipulate selected data to create visualisations. In Area of Study 2 students develop skills in using programming or scripting language software and they investigate careers that involve the use of these skills. Working in teams is an important and effective strategy for solving problems, and this strategy is applied in Area of Study 3 when students solve problems for clients in the community.

Software tools

Students study the following tools in this unit:

Area of Study 1	One or more of the following: A programming language, database software, spreadsheet software, data visualisation software
Area of Study 2	A programming or scripting language; tool for creating an electronic journal
Area of Study 3	Any software tool can be used to create a solution; tool for planning a project

AREA OF STUDY 1

Data analysis and visualisation

In this area of study students develop knowledge and skills in using software tools to access and select authentic data from large data repositories, and in presenting the key aspects of the data in an appropriate visual form. Effective visual forms reduce the effort required by readers to interpret information and are clear, usable, relevant and attractive. Appropriate visual forms include graphs, charts, spatial relationships, maps, histograms and network diagrams (nodes and edges). Sources of large data repositories include the Bureau of Meteorology, World Development Indicators, Australian Bureau of Statistic, United Nations, CSIRO, OECD. Interactivity and the inclusion of dynamic data are key features of some visualisations. When developing these visualisations, students use one or more of the following tools: a programming language, database software, spreadsheet software, data visualisation software.

In response to design briefs students apply all stages of the problem-solving methodology. Details of this methodology are on pages 16 to 18.

Outcome 1

On completion of this unit the student should be able to apply the problem-solving methodology and use appropriate software tools to create data visualisations that meet users' needs.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

This knowledge includes:

- stages of the problem-solving methodology
- types of information problems and users' needs that can be met through presenting information in visual forms
- problem-solving activities related to analysing information problems
- types of data visualisations
- sources of authentic data
- data types and data structures relevant to selected software tools
- purposes of data visualisations
- suitability of different types of visualisations that meet users' needs
- design tools for representing data visualisations
- needs of users that can influence the type and presentation of visualisations
- criteria and techniques for evaluating visualisations
- characteristics of file formats and their ability to be converted to other formats
- functions of appropriate software tools to select required data and to manipulate data when developing visualisations
- formats and conventions applied to visualisations in order to improve their effectiveness for intended users.

Key skills

These skills include the ability to:

- analyse information problems
- select appropriate sources of data and identify relevant data
- determine the suitability of different data types and structures for creating visualisations
- select types of visualisations that are appropriate to the data
- select and apply appropriate tools to represent the design of the visualisations
- apply software functions to locate and acquire data that will be input and manipulated
- use appropriate software tools, and select and apply a range of suitable functions to efficiently develop different types of effective data visualisations
- select appropriate techniques and apply criteria to determine the extent to which data visualisations meet users' needs.

AREA OF STUDY 2

Programming and pathways

In this area of study students develop knowledge and skills in using programming or scripting language software. Flexibility exists regarding the language studied as there is no approved programming list for this area of study. If a programming language is selected in Area of Study 1, it can be used in this area of study.

Students develop knowledge and skills in describing data types and data structures, and applying data representation methods. They develop knowledge and skills about methods and techniques for completing a series of small discrete tasks that use features of a programming or scripting language. Students are not required to create complete solutions to information problems; rather they focus on applying knowledge and skills related to activities within the design and development stages of the problem-solving methodology. Details of this methodology are on pages 16 to 18.

Students keep an electronic record of the new knowledge and skills applied in each task, and reflect on their learning progress by evaluating the extent to which the knowledge and skills are applied.

An understanding of the technical knowledge and skills associated with using programming or scripting languages is further developed through examining ICT career pathways, which focus on:

- entry requirements to specific ICT jobs
- the main roles and tasks involved in ICT jobs.

Outcome 2

On completion of this unit the student should be able to design, and develop using a programming or scripting language, limited solutions, record the learning progress electronically, and explain possible career pathways that require the use of programming or scripting skills.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

This knowledge includes:

- stages of the problem-solving methodology
- data types and methods of representing and storing text, sound and images
- methods of representing solution designs
- techniques for manipulating data and information
- naming conventions for files and objects
- testing and debugging techniques, including construction of test data
- characteristics of logically constructed electronic journals
- roles and responsibilities of people who develop and support ICT solutions within organisations
- ICT career opportunities and pathways.

Key skills

These skills include the ability to

- represent design specifications using appropriate methods
- apply techniques for manipulating data and information using a programming or scripting language
- apply testing techniques using test data

- record in an electronic journal the new knowledge and skills applicable to each programming or scripting task, and evaluate how well they were applied
- investigate ICT careers and pathways that require the use of programming or scripting languages.

AREA OF STUDY 3

Tools, techniques and procedures

In this area of study students apply all stages of the problem-solving methodology to create solutions to information problems. Details of this methodology are on pages 16 to 18. No restrictions are placed on the software tool used to create these solutions for clients.

By working in teams, which can be virtual, to solve information problems for known clients, students develop an understanding of how constraints imposed by clients (users) affect the techniques and procedures applied when creating solutions. Individual team members prepare designs for the solutions and collectively they consider the designs and select one, based on agreed criteria, and make adjustments, if appropriate. These designs are considered by the clients, who provide feedback to the teams. Any modifications suggested by the clients are incorporated into the designs. Each student in a team can then individually follow the final design and develop the entire solution, or each student can contribute to the completion of the team's solutions. This involves using techniques and procedures to efficiently and effectively process and manage data, information and files. Team members record and monitor progress through shared electronic files. Students do not have to use dedicated project management software.

A client-based approach provides the opportunity for students to develop and apply, in real situations, knowledge and understanding about criteria for evaluating the efficiency of processing and the effectiveness of solutions, as identified in the solution designs.

Outcome 3

On completion of this unit the student should be able to work collaboratively and apply the problem-solving methodology to create an ICT solution, taking into account client feedback.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 3.

Key knowledge

This knowledge includes:

- role of clients in shaping how ICT is used to create solutions and strategies for acquiring feedback from clients
- functions of key hardware and software components of information systems used to solve problems
- stages of the problem-solving methodology
- problem-solving activities related to analysing information problems, in particular the identification of constraints on solutions
- design elements that influence the functionality and appearance of solutions
- design tools for representing solutions
- criteria for evaluating the efficiency and effectiveness of solutions
- formats and conventions applied to the presentation of information in order to improve effectiveness for intended clients

- techniques for manipulating data and information, and testing solutions
- procedures and techniques for effectively managing the naming and classification of files, folders and directories, and the security of backups and file transfers
- strategies for evaluating whether solutions meet their purpose
- strategies (tools and techniques) for coordinating the tasks, people, resources and time required to create solutions.

Key skills

These skills include the ability to:

- analyse information problems
- prepare and follow plans that coordinate the tasks, people, resources and time required to develop solutions
- select and apply appropriate tools and techniques to design solutions
- liaise with the clients in order to obtain feedback on the preferred designs, and make adjustments, where necessary
- select and apply suitable equipment, tools, functions, formats and conventions to create solutions
- apply techniques and procedures to securely and effectively handle files
- devise and implement an evaluation strategy.

ASSESSMENT

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit.

The key knowledge and key skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and key skills do not constitute a checklist and such an approach is not necessary or desirable for determining the achievement of outcomes. The elements of key knowledge and key skills should not be assessed separately.

Assessment tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe. Teachers should select a variety of assessment tasks for their assessment program to reflect the key knowledge and key skills being assessed and to provide for different learning styles.

For this unit students are required to demonstrate achievement of three outcomes. As a set these outcomes encompass all areas of study.

Demonstration of achievement of Outcomes 1, 2 and 3 must be based on the student's performance on a selection of assessment tasks. Where teachers allow students to choose between tasks they must ensure that the tasks they set are of comparable scope and demand.

Assessment tasks for this unit are selected from the following:

- using ICT tools and techniques, produce a solution in response to an identified need
- visual presentations such as multimedia presentations
- oral presentations supported by a visual presentation
- an electronic learning journal, such as a blog, to record learning progress
- a written report using ICT
- a test.

Unit 3: IT applications

The focus of Unit 3 is the World Wide Web and how it supports the information needs of individuals, communities and organisations. In Area of Study 1, students investigate the design and technical underpinnings of different types of websites that support the varying needs of online communities. Students use web authoring software to create prototype websites for particular online communities, taking into account both technical and non-technical constraints.

Area of Study 2 focuses on the use of a relational database management system (RDBMS). Students examine techniques used by organisations to acquire data via websites and consider the relationship between how the data is acquired and the structure of an RDBMS. At the practical level, students acquire and apply knowledge and skills in the use of an RDBMS. In Unit 4 when solving information problems students can either use spreadsheet software or continue to use an RDBMS.

Students apply the analysis, design and development stages of the problem-solving methodology when creating solutions. Details of this methodology are on pages 16 to 18.

Software tools

Students study the following tools in this unit:

Area of Study 1	Web authoring software
Area of Study 2	A relational database management system (RDBMS)

Note: A list of minimum software capabilities or equivalents suitable for web authoring software and an RDBMS will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

AREA OF STUDY 1

Online communities

In this area of study students investigate types of online communities and their needs, and the types, purposes and functionality of specific types of websites that support information exchange, including wikis, blogs, forums and social networking sites. A list of approved types of websites serving the purpose of supporting information exchange will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

In this area of study there is an emphasis on the analysis, design and development stages of the problem-solving methodology. Details of the methodology are located on pages 16 to 18. When analysing the needs of online communities students consider the technical requirements for hosting the site, any relevant legal and other non-technical matters, access rights (open or closed), the size of membership and the different needs of individual online community members.

Students use design tools to represent the websites, and develop these websites using web authoring software. Prototype websites are sufficient – students are not expected to develop operational websites that support the exchange of information for online communities. The prototype should represent the functionality, partial navigation options and user interface; however, every feature is not expected to be fully functional. Sufficient testing must have occurred to ensure that major elements are tested and working as expected. In addition to the mandated use of web authoring software, students may use other software such as image editing software. A list of minimum software capabilities or equivalents suitable for web authoring software will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

When creating a prototype website, students respond to a design brief that contains information about a particular online community. Content material for the prototype website will be supplied by the teacher and the students are expected to select from this material, information relevant to their website. Supplied material could include text, images, video and sound files, and students may use a range of software tools to manipulate the data.

Outcome 1

On completion of this unit the student should be able to apply stages of the problem-solving methodology to create a prototype website that meets an online community's needs, and explain the technical requirements to support the hosting of this website.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

This knowledge includes:

- types, purposes and functionality of websites that support information exchange within online communities
- types of networks and the functions of their key hardware and software components
- capabilities of wired and wireless communications technology to support local and remote communications
- hardware and software requirements for setting up websites on servers, including operating system, web server software, protocols, security and proxy servers
- stages of the problem-solving methodology
- types and purposes of online communities including social, work-based, project/interest-based that support the purposes of collaboration, knowledge sharing and collective identity
- needs of online community members that affect the nature of their websites, including access requirements (open or closed)
- non-technical constraints on website solutions, including privacy, copyright and human rights requirements and social online protocols
- design elements that influence the functionality and appearance of websites
- design tools for representing website solutions
- functions of web authoring software used to manipulate data

- manual and electronic validation techniques
- formats and conventions applied to websites in order to improve their effectiveness for intended users
- methods and techniques for testing that the solutions perform as intended.

Key skills

These skills include the ability to:

- identify types of websites suitable for different online communities
- analyse online communities in order to identify solution requirements and technical and non-technical constraints
- select and apply appropriate design tools to represent the functionality and appearance of prototype websites
- use web authoring software and select and apply suitable functions, methods, formats, conventions, techniques and design elements to develop prototype websites that operate as intended
- justify websites that suit the needs of different online communities
- explain the technical requirements of the networks hosting the websites.

AREA OF STUDY 2

Organisations and data management

In this area of study students develop knowledge about how organisations acquire data via websites. They also develop knowledge and skills in using a relational database management system (RDBMS) to manipulate data typically acquired through websites. Students review websites to ascertain the types of data being acquired, including text, numeric and images (still and moving), and to identify how the data is acquired. Students examine how organisations fulfil their legal requirements of protecting the rights of data providers and why organisations want the data organised in particular ways. This provides a lead-in to the fundamentals of an RDBMS, namely fields and field types, and the relationships between data sets. Students develop knowledge and skills in describing data types and data structures, and in applying functions, techniques, formats and conventions to manipulate and validate data, and to present suitable information.

A list of minimum software capabilities or equivalents suitable for a relational database management system (RDBMS) will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

In this area of study there is an emphasis on the design and development stages of the problem-solving methodology. Details of the methodology are located on pages 16 to 18.

Outcome 2

On completion of this unit the student should be able to design, and develop using a relational database management system, a solution to an information problem, and discuss why and how data is acquired via websites.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

This knowledge includes:

- reasons why organisations acquire data via websites, including 24-hour customer access, improved efficiencies through direct data entry by customers, improvements in effectiveness and access to global market economies
- reasons why individuals and organisations supply data via websites, including purchasing of goods and services, voting, social networking and exchanging information
- techniques used by organisations to acquire data on websites and reasons for their choice
- techniques used by organisations to protect the rights of individuals and organisations supplying data, including security protocols and stating policies regarding privacy, shipping and returns
- stages of the problem-solving methodology
- purposes and structure of an RDBMS
- naming conventions to support efficient use of an RDBMS
- data types, including text (string), number, date/time, Boolean (true/false)
- data formats used for display, including fixed decimal places, various date formats, 12 hour/24 hour time, true/false, yes/no
- a methodology for creating an RDBMS structure: identifying tables and fields; normalising tables, defining data types and field sizes, identifying primary key and foreign key fields
- ways in which normalisation can ensure the integrity of data in an RDBMS
- design tools for describing data types, and the value of entity relationship (ER) diagrams for representing the structure of an RDBMS
- design tools for representing solutions
- functions and techniques within an RDBMS to efficiently and effectively manipulate and validate data
- functions and techniques to retrieve required information through searching, sorting, filtering and querying data sets
- methods and techniques for testing that the solutions perform as intended.

Key skills

These skills include the ability to:

- explain reasons why data is acquired and supplied via websites
- propose techniques for acquiring data via websites and for protecting the rights of data providers
- select and apply design tools and techniques for describing data types and representing the functionality of solutions
- use RDBMS functions and techniques to manipulate and validate data
- apply functions and techniques to construct queries that efficiently retrieve required information
- select and apply testing methods and techniques to confirm whether the solutions operate as intended.

ASSESSMENT

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit. The Victorian Curriculum and Assessment Authority publishes online an assessment handbook for this study that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and key skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and key skills do not constitute a checklist and such an approach is not necessary or desirable for determining the achievement of outcomes. The elements of key knowledge and key skills should not be assessed separately.

Assessment of levels of achievement

The student's level of achievement in Unit 3 will be determined by School-assessed Coursework and an end-of-year examination.

Contribution to final assessment

School-assessed Coursework for Unit 3 will contribute 25 per cent.

The level of achievement for Units 3 and 4 is also assessed by an end-of-year examination, which will contribute 50 per cent.

School-assessed Coursework

Teachers will provide to the Victorian Curriculum and Assessment Authority a score representing an assessment of the student's level of achievement.

The score must be based on the teacher's rating of performance of each student on the tasks set out in the following table and in accordance with the assessment handbook published online by the Victorian Curriculum and Assessment Authority. The assessment handbook also includes advice on the assessment tasks and performance descriptors for assessment.

Assessment tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe. Where teachers provide a range of options for the same assessment task, they should ensure that the options are of comparable scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and key skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Apply stages of the problem-solving methodology to create a prototype website that meets an online community's needs, and explain the technical requirements to support the hosting of this website.	40	In response to a design brief and given data: <ul style="list-style-type: none"> create a prototype website capable of supporting the information needs of an online community.
	10	And One of the following that justifies the selected website and explains the technical requirements of the host network: <ul style="list-style-type: none"> a written report a short-answer test.
Outcome 2 Design, and develop using a relational database management system, a solution to an information problem, and discuss why and how data is acquired via websites.	40	In response to a design brief that includes an analysis of an information problem: <ul style="list-style-type: none"> the design and development of a solution.
	10	And One of the following that discusses why and how data is acquired via websites: <ul style="list-style-type: none"> a written report a test.
Total marks	100	

*School-assessed Coursework for Unit 3 contributes 25 per cent.

Unit 4: IT applications

In this unit students focus on how ICT is used by organisations to solve ongoing information problems and on the strategies used to protect the integrity and security of data and information. In Area of Study 1 either a relational database management system (RDBMS) or spreadsheet software is selected and used to create solutions to information problems. In addition, students use web authoring or multimedia authoring software to produce onscreen user documentation. When creating solutions to ongoing information problems, students apply all stages of the problem-solving methodology. Details of this methodology are on pages 16 to 18.

In Area of Study 2, students explore how organisations manage the storage, communication and disposal of data and information in order to minimise threats to the integrity and security of data and information, and to optimise efficient information handling.

Software tools

Students study the following tools in this unit:

Area of Study 1	A relational database management system (RDBMS) or spreadsheet software Web authoring or multimedia authoring software
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Note: A list of minimum software capabilities or equivalents suitable for an RDBMS, spreadsheet software, web authoring software and multimedia authoring software will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

AREA OF STUDY 1

Organisations and information needs

In this area of study students develop and apply knowledge and skills for solving ongoing information problems encountered in organisations. This involves developing knowledge about decision making in organisations and how information systems enable information to be produced to assist decision making. An RDBMS or spreadsheet software is selected for use. Through the application of all of the stages of the problem-solving methodology and the selected software, students create solutions to solve problems. Solutions of this nature have the capacity to process new sets of data for recurring problems. To support the ongoing use of these solutions, students produce user documentation using either web authoring or multimedia authoring software.

A list of minimum software capabilities or equivalents suitable for an RDBMS, spreadsheet software, web authoring and multimedia authoring software will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

In this area of study students apply all stages of the problem-solving methodology. Details of this methodology are on pages 16 to 18.

Outcome 1

On completion of this unit the student should be able to use selected software to solve an ongoing information problem, and evaluate the efficiency and effectiveness of the solution in meeting the information needs of an organisation.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

This knowledge includes:

- types of goals of organisations and information systems
- role of components of information systems
- characteristics of strategic, tactical and operational decisions made in organisations
- stages of the problem-solving methodology
- problem-solving activities relating to the analysis of ongoing information problems
- design tools for representing the functionality and appearance of solutions
- criteria for evaluating the efficiency and effectiveness of solutions to ongoing information problems
- functions, techniques and procedures for efficiently and effectively manipulating data using an RDBMS or spreadsheet software, including the application of formats and conventions, the validation of data and the management of files
- techniques for testing solutions and user acceptance
- strategies for evaluating the extent to which solutions meet organisations' needs
- content and types of onscreen user documentation, including quick start guide, tutorial, content sensitive help and manual
- characteristics of efficient and effective user interfaces and information architecture
- functions, techniques and procedures for efficiently and effectively manipulating data using web authoring or multimedia authoring software.

Key skills

These skills include the ability to:

- identify how information systems enable the creation of information needed by organisations
- analyse current practices in order to identify the requirements, constraints and scope of solutions
- select and apply appropriate design tools to represent solutions
- determine criteria to evaluate the quality of solutions
- use an RDBMS or spreadsheet software and apply suitable functions, formats, conventions and data validation techniques to develop solutions
- use web authoring or multimedia authoring software to create onscreen user documentation
- select and apply testing methods and techniques to confirm whether the solutions operate as intended
- propose strategies and apply criteria to evaluate the extent to which solutions and user documentation meet the information needs of organisations.

AREA OF STUDY 2

Information management

This area of study focuses on information management and its importance to organisations. Students investigate the strategies used by organisations to store, communicate and dispose of their data and information. They examine the nature of threats to this data and information, whether accidental, deliberate or technical and use evaluation criteria to consider the subsequent consequences for ineffective information management strategies. Students recommend information management strategies to protect the integrity and security of data and information, taking into account key legal obligations of organisations and any ethical dilemmas faced by organisations and individuals regarding security of information. The key legislation is outlined in the Glossary on page 13 and includes the *Privacy Act 1988*, *Information Privacy Act 2000*, *Health Records Act 2001*, *Copyright Act 1968*, *Charter of Human Rights and Responsibilities Act 2006* (VIC) (sections 13, 14 and 15) and the *Spam Act 2003* (Part 1.3, Simplified outline).

Outcome 2

On completion of this unit the student should be able to evaluate the effectiveness of strategies used by organisations to manage the storage, communication and disposal of data and information, and recommend improvements to current practices.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

This knowledge includes:

- reasons why data and information are important to organisations
- key legislation that affects how organisations control the storage, communication and disposal of their data and information
- threats to the integrity and security of data and information stored, communicated and disposed of by organisations
- procedures and equipment for preventing unauthorised access to data and information and for minimising the loss of data accessed by authorised and unauthorised users
- the advantages and disadvantages of using cloud computing for storing, communicating and disposing of data and information
- ethical dilemmas arising from information management strategies used by organisations
- strategies for resolving legal, ethical and social tensions between stakeholders arising from information management strategies
- possible consequences for organisations of the violation of, or failure to follow, security measures
- disaster recovery strategies and the testing of these strategies
- criteria for evaluating the effectiveness of information management strategies.

Key skills

These skills include the ability to:

- explain why particular information management strategies are used by organisations to monitor and control their data and information
- discuss the nature of particular threats to the integrity and security of data and information
- discuss possible consequences of ineffective information management strategies

- propose strategies to minimise tensions between stakeholders
- propose and apply criteria to evaluate the effectiveness of information management strategies
- recommend information management strategies to improve current practices.

ASSESSMENT

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit. The Victorian Curriculum and Assessment Authority publishes online an assessment handbook for this study that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and key skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and key skills do not constitute a checklist and such an approach is not necessary or desirable for determining the achievement of outcomes. The elements of key knowledge and key skills should not be assessed separately.

Assessment of levels of achievement

The student's level of achievement for Unit 4 will be determined by School-assessed Coursework and an end-of-year examination.

Contribution to final assessment

School-assessed Coursework for Unit 4 will contribute 25 per cent.

The level of achievement for Units 3 and 4 is also assessed by an end-of-year examination, which will contribute 50 per cent.

School-assessed Coursework

Teachers will provide to the Victorian Curriculum and Assessment Authority a score representing an assessment of the student's level of achievement.

The score must be based on the teacher's rating of performance of each student on the tasks set out in the following table and in accordance with the assessment handbook published online by the Victorian Curriculum and Assessment Authority. The assessment handbook also includes advice on the assessment tasks and performance descriptors for assessment.

Assessment tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe. Where teachers provide a range of options for the same assessment task, they should ensure that the options are of comparable scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and key skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
<p>Outcome 1 Use selected software to solve an ongoing information problem, and evaluate the efficiency and effectiveness of the solution in meeting the information needs of an organisation.</p>	50	A solution in response to a design brief, including user documentation.
	10	<p>And A report that evaluates the extent to which the solution meets the needs of the organisation, in one of the following:</p> <ul style="list-style-type: none"> • a written report • an annotated visual report.
<p>Outcome 2 Evaluate the effectiveness of strategies used by organisations to manage the storage, communication and disposal of data and information, and recommend improvements to current practices.</p>	40	<p>One of the following:</p> <ul style="list-style-type: none"> • a written report • a test • an annotated visual report.
Total marks	100	

*School-assessed Coursework for Unit 4 contributes 25 per cent.

End-of-year examination

Description

The examination will be set by a panel appointed by the Victorian Curriculum and Assessment Authority. All the key knowledge and key skills that underpin the outcomes in Units 3 and 4 are examinable.

Conditions

The examination will be completed under the following conditions:

- Duration: two hours.
- Date: end-of-year, on a date to be published annually by the Victorian Curriculum and Assessment Authority.
- Victorian Curriculum and Assessment Authority examination rules will apply. Details of these rules are published annually in the *VCE and VCAL Administrative Handbook*.
- The examination will be marked by assessors appointed by the Victorian Curriculum and Assessment Authority.

Contribution to final assessment

The examination will contribute 50 per cent.

Further advice

The Victorian Curriculum and Assessment Authority publishes specifications for all VCE examinations on the Victorian Curriculum and Assessment Authority website. Examination specifications include details about the sections of the examination, their weighting, the question format/s and any other essential information. The specifications are published in the first year of implementation of the revised Units 3 and 4 sequence together with any sample material.

Unit 3: Software development

Unit 3 focuses on programming as a strategy for solving problems for specific users in a networked environment. Students develop knowledge and skills in the use of a programming language. The programming language selected will be studied for both Units 3 and 4. When programming in Unit 3, students are expected to have an overview of the problem-solving methodology and a detailed understanding of the stages of analysis, design and development. Details of this methodology are on pages 16 to 18.

Area of Study 1 focuses on the analysis stage of the problem-solving methodology, which involves students developing and applying knowledge and skills in determining the requirements of solutions, identifying relevant factors that should be taken into account when designing the solutions, and in scoping the solutions. In Area of Study 2 students engage in designing the detailed specifications of how solutions will be developed and undertake the development stage by using the selected programming language to create planned solutions.

Software tools

Students study the following tools in this unit:

Area of Study 1	Unified Modelling Language to create use cases
Area of Study 2	An approved programming language

Note: A list of suitable languages and programming requirements will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

AREA OF STUDY 1

Analysing information problems

In this area of study students develop knowledge and skills related to the problem-solving stage of analysis. Typically, as a precursor to the analysis stage, project plans are created and students examine the key tasks associated with project planning (students are not required to use project management software). When analysing, students determine the requirements, the constraints and the scope of the solutions. The networked environment and security are key considerations when determining the requirements of solutions. As a means of understanding the networked environment, students examine the Open Systems Interconnections (OSI) model, with an emphasis on Layer 1. Students document the findings of the analysis in the form of software requirements specifications (SRS).

Outcome 1

On completion of this unit the student should be able to analyse an information problem in order to produce software requirements specifications for a solution that operates within a networked environment.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

This knowledge includes:

- stages of the problem-solving methodology
- key tasks associated with planning software projects, including identifying, scheduling and monitoring tasks, resources, people and time
- a brief overview of the concept of the OSI model for network protocols
- purposes and functions of the physical layer (Layer 1) of the OSI and the relationship of the physical layer to the Transmission Control Protocol/Internet Protocol model
- appropriateness of interviews, surveys and observation as methods of collecting data to determine needs and requirements
- features of functional and non-functional solution requirements
- constraints that influence solutions
- the functions, technical underpinnings and sources of worms, Trojans and spyware that intentionally threaten the security of networks
- factors that determine the scope of solutions
- tools and techniques for depicting the interfaces between solutions, users and the network, including use cases, via the Unified Modelling Language
- features of context diagrams and data flow diagrams that allow data flows to be depicted
- composition of an SRS and purposes of documenting an analysis in this form.

Key skills

These skills include the ability to:

- identify the key tasks involved in planning software projects
- propose a range of methods to collect data for analysis
- describe the physical layer of networked environments within which the solutions will operate
- analyse data and information in order to determine the solution requirements, constraints including vulnerability to security threats, and scope
- apply tools and techniques to assist in analysing information problems
- write an SRS to document the requirements, constraints and scope.

AREA OF STUDY 2**Design and development**

In this area of study students develop knowledge and skills related to the design and development stages of the problem-solving methodology. When designing, students develop knowledge and skills in describing data types and data structures. They express software designs using data dictionaries and data structure diagrams, object descriptions and pseudocode. In addition, students propose criteria to evaluate the efficiency and effectiveness of the solutions they develop, based on their designs.

The development stage involves transforming design specifications into solutions by undertaking the problem-solving activities of coding, testing and documenting. Students develop knowledge and skills in the use of an approved programming language, which is used to develop prototype solutions to small information problems. The solutions can focus on limited features of the programming language. The focus of a prototype solution allows testing the logic of processes in readiness for a larger software project. Students do not have to design and develop a complete software solution, as the focus in this area of study is on program logic. There is no emphasis on user interface design or validation in this area of study.

Testing techniques are applied to ensure solutions operate as intended and students develop knowledge and skills in writing internal documentation into their code.

Students develop solutions in response to given software requirements specifications and do not have to undertake the analysis stage.

A list of suitable languages and programming requirements will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

Outcome 2

On completion of this unit the student should be able to represent a software design and apply a range of functions and techniques using a programming language to develop a prototype solution to meet a specific need.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

This knowledge includes:

- stages of the problem-solving methodology
- characteristics of data types: integer, floating point number, Boolean, character, string
- types of data structures, including one-dimensional arrays, records and files
- methods of expressing software designs using data dictionaries and data structure diagrams, object descriptions and pseudocode
- formatting and structural characteristics of efficient and effective input and output
- needs of users and how these influence the design of solutions
- criteria for evaluating the efficiency and effectiveness of solutions
- a programming language as a method for developing solutions that meet specific needs
- processing features of programming languages, including instructions, procedures, methods, functions and control structures
- purposes and characteristics of internal documentation
- techniques for checking that coded solutions meet design specifications, including construction of test data.

Key skills

These skills include the ability to:

- interpret software requirements specifications by representing prototype solutions in the form of pseudocode
- use a range of data types and data structures
- design prototype solutions that take into account the needs of users

- identify evaluation criteria appropriate to the solution requirements
- use appropriate processing features of programming languages
- document the functioning of solutions through the use of internal documentation
- select and apply suitable test data and testing techniques
- document the code to indicate the logic of programs.

ASSESSMENT

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit. The Victorian Curriculum and Assessment Authority publishes online an assessment handbook for this study that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and key skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and key skills do not constitute a checklist and such an approach is not necessary or desirable for determining the achievement of outcomes. The elements of key knowledge and key skills should not be assessed separately.

Assessment of levels of achievement

The student's level of achievement in Unit 3 will be determined by School-assessed Coursework and an end-of-year examination.

Contribution to final assessment

School-assessed Coursework for Unit 3 will contribute 25 per cent.

The level of achievement for Units 3 and 4 is also assessed by an end-of-year examination, which will contribute 50 per cent.

School-assessed Coursework

Teachers will provide to the Victorian Curriculum and Assessment Authority a score representing an assessment of the student's level of achievement.

The score must be based on the teacher's rating of performance of each student on the tasks set out in the following table and in accordance with the assessment handbook published online by the Victorian Curriculum and Assessment Authority. The assessment handbook also includes advice on the assessment tasks and performance descriptors for assessment.

Assessment tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe. Where teachers provide a range of options for the same assessment task, they should ensure that the options are of comparable scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and key skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Analyse an information problem in order to produce software requirements specifications for a solution that operates within a networked environment.	40	In response to a design brief, produce documentation of the analysis of an information problem in the form of software requirements specifications.
Outcome 2 Represent a software design and apply a range of functions and techniques using a programming language to develop a prototype solution to meet a specific need.	60	In response to software requirements specifications create a prototype solution to meet a specific need.
Total marks	100	

*School-assessed Coursework for Unit 3 contributes 25 per cent.

Unit 4: Software development

This unit focuses on how the information needs of individuals, organisations and society are and can be met through the creation of purpose-designed solutions in a networked environment. Students continue to study the programming language selected in Unit 3.

In this unit students are required to engage in the design, development and evaluation stages of the problem-solving methodology. Details of this methodology are on pages 16 to 18.

Area of Study 1 focuses on the design and development stages of the problem-solving methodology when solving problems suitable for use with mobile devices. Area of Study 2 focuses on the final stage of the methodology, evaluation.

Software tools

Students study the following tools in this unit:

Area of Study 1	An approved programming language Appropriate tool for creating user documentation
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Note: A list of suitable languages and programming requirements will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

AREA OF STUDY 1

Purpose-designed solutions

In this area of study students apply a range of tools and techniques to produce purpose-designed solutions suitable for use on mobile computing devices. Suitable mobile devices include personal digital assistants (PDAs), mobile phones, laptops and gaming consoles. Students do not need to be able to physically implement the solution on a mobile device; however, they must be able to test the functions of the software in a convenient environment in order to demonstrate that the solution requirements have been met. Within this area of study students solve problems by applying the design and development stages of the problem-solving methodology; with greater emphasis given to development. Students expand their range of programming skills and develop knowledge and skills related to file management in order to improve processing efficiency. As part of this stage, students develop knowledge and skills in preparing user documentation using appropriate software, and consider strategies for preventing security violations of stored and communicated information. Students examine their legal obligations as programmers.

Students continue to use the programming language studied in Unit 3, and the programming requirements will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin VCE, VCAL and VET*.

Outcome 1

On completion of this unit the student should be able to apply stages of the problem-solving methodology to produce a solution for use on a mobile device, which takes into account technical and legal requirements.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

This knowledge includes:

- stages of the problem-solving methodology
- types and characteristics of mobile computing devices, including PDAs, mobile phones, laptops, gaming consoles
- procedures and techniques for handling and managing files, including security, archiving, backing up and disposing of files
- methods of organising files to suit particular software needs, including serial and random access
- ways in which file size, storage medium and organisation of files affect access of data
- characteristics of efficient and effective user interfaces
- factors affecting solution design, including user interface, user needs, processing efficiency, development time, technical specifications of mobile devices
- naming conventions for solution elements
- methods and techniques of expressing software designs
- forms and uses of data structures to organise and manipulate data, including two-dimensional arrays, stacks and queues
- the syntax of a programming language
- validation techniques, including existence checking, range checking and type checking
- techniques for searching, including binary search, and techniques for sorting, including bubble sort and quick sort
- techniques for checking that coded solutions meet design specifications, including construction of test data.
- purposes and characteristics of internal documentation
- forms and types of user documentation, including printed, online Internet site (forms) and quick start guide, tutorial, content sensitive help and manual (types)
- applications and purposes of utilities in a programming environment
- legal obligations of programmers
- security measures designed to protect the integrity and security of data and information.

Key skills

These skills include the ability to:

- interpret solution requirements in order to design and develop solutions
- express solution designs using appropriate design methods and techniques
- write solutions and internal documentation

- select and apply testing techniques to confirm that solutions operate as intended
- use software to write appropriate user documentation
- propose measures for protecting the security of information stored within, and communicated between, mobile computing devices and networks
- explain how solutions have taken into account legal obligations of programmers.

AREA OF STUDY 2

Evaluating purpose-designed solutions

In this area of study students focus on the final stage of the problem-solving methodology, evaluation, which entails formulating strategies for measuring both the quality of solutions and the networked environments within which they operate. Evaluation of solutions typically takes place after the solutions have been operating for a short time. This evaluation involves applying criteria to measure the efficiency and effectiveness of solutions, and determining the techniques for acquiring the evaluation data. Evaluation of networked environments involves selecting criteria and techniques for measuring levels of security and user acceptance, the suitability of training and system support documentation for users, the impact of conflicts between stakeholders and the suitability of actions for resolving ethical dilemmas.

Outcome 2

On completion of this unit the student should be able to recommend and justify strategies for evaluating the effectiveness and efficiency of solutions that operate in a networked environment.

To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

This knowledge includes:

- technical underpinnings of intranets, the Internet and virtual private networks
- characteristics of wired and wireless networks
- techniques for measuring the reliability and maintainability of networks, including audits, error logs and software tracking tools
- criteria and techniques for testing the security of networked environments
- characteristics of efficient and effective solutions
- strategies and techniques for acquiring evaluation data about the quality of solutions
- criteria and techniques for testing acceptance by users of solutions
- types of training for the users of solutions, and techniques for measuring the suitability of training programs
- types of system support documentation offered to users and criteria for determining their appropriateness for users
- practices that cause conflict between stakeholders who use, or are affected by, solutions that operate within networked environments
- suitability of setting codes of ethics, imposing sanctions, education programs and the use of decision-support frameworks as strategies for managing ethical dilemmas.

Key skills

These skills include the ability to:

- describe, using technical language, the networked environments within which solutions operate
- propose criteria and recommend techniques for testing the security of networks
- recommend criteria and techniques for measuring the efficiency and effectiveness of solutions
- justify the suitability of recommended strategies for evaluating solutions
- recommend criteria and techniques for measuring the extent to which the needs of users of solutions are met
- justify the appropriateness of recommended strategies for evaluating the extent to which users' needs are met
- justify the suitability of strategies for managing ethical dilemmas.

ASSESSMENT

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit. The Victorian Curriculum and Assessment Authority publishes online an assessment handbook for this study that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and key skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and key skills do not constitute a checklist and such an approach is not necessary or desirable for determining the achievement of outcomes. The elements of key knowledge and key skills should not be assessed separately.

Assessment of levels of achievement

The student's level of achievement for Unit 4 will be determined by School-assessed Coursework and an end-of-year examination.

Contribution to final assessment

School-assessed Coursework for Unit 4 will contribute 25 per cent.

The level of achievement for Units 3 and 4 is also assessed by an end-of-year examination, which will contribute 50 per cent.

School-assessed Coursework

Teachers will provide to the Victorian Curriculum and Assessment Authority a score representing an assessment of the student's level of achievement.

The score must be based on the teacher's rating of performance of each student on the tasks set out in the following table and in accordance with the assessment handbook published online by the Victorian Curriculum and Assessment Authority. The assessment handbook also includes advice on the assessment tasks and performance descriptors for assessment.

Assessment tasks must be a part of the regular teaching and learning program and must not unduly add to the workload associated with that program. They must be completed mainly in class and within a limited timeframe. Where teachers provide a range of options for the same assessment task, they should ensure that the options are of comparable scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and key skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Apply stages of the problem-solving methodology to produce a solution for use on a mobile device, which takes into account technical and legal requirements.	45	A solution (including internal documentation) in response to a design brief.
	15	And User documentation and an explanation of how security and legal matters are managed when creating solutions in one of the following: <ul style="list-style-type: none"> • a written report • a test.
Outcome 2 Recommend and justify strategies for evaluating the effectiveness and efficiency of solutions that operate in a networked environment.	40	One of the following: <ul style="list-style-type: none"> • a written report • a test.
Total marks	100	

*School-assessed Coursework for Unit 4 contributes 25 per cent.

End-of-year examination

Description

The examination will be set by a panel appointed by the Victorian Curriculum and Assessment Authority. All the key knowledge and key skills that underpin the outcomes in Units 3 and 4 are examinable.

Conditions

The examination will be completed under the following conditions:

- Duration: two hours.
- Date: end-of-year, on a date to be published annually by the Victorian Curriculum and Assessment Authority.
- Victorian Curriculum and Assessment Authority examination rules will apply. Details of these rules are published annually in the *VCE and VCAL Administrative Handbook*.
- The examination will be marked by assessors appointed by the Victorian Curriculum and Assessment Authority.

Contribution to final assessment

The examination will contribute 50 per cent.

Further advice

The Victorian Curriculum and Assessment Authority publishes specifications for all VCE examinations on the Victorian Curriculum and Assessment Authority website. Examination specifications include details about the sections of the examination, their weighting, the question format/s and any other essential information. The specifications are published in the first year of implementation of the revised Units 3 and 4 sequence together with any sample material.

Advice for teachers

The Victorian Essential Learning Standards (VELS) is the curriculum framework for the compulsory years of schooling in Victoria. Links between the VCE Information Technology study and the VELS are shown below.

VCE Information Technology provides students with opportunities to develop employability skills. The links between the forms of assessment in the study design and employability skills are provided in the table on page 51.

VICTORIAN ESSENTIAL LEARNING STANDARDS (VELS)

VCE Information Technology (IT) is a study which builds on knowledge and skills developed primarily in the VELS interdisciplinary domain of Information and Communications Technology (ICT). While the focus of VELS ICT is on using ICT to assist in transforming learning and enriching the learning environment, students build on some of the underpinning knowledge and skills of the domain when studying VCE IT. The study also has links with the Thinking Processes domain. The following table identifies key elements of the standards in the relevant domains that have a connection to VCE IT.

Domain	Dimension	Connections to standards or learning focus
Information and Communications Technology	ICT for visualising thinking	Use a range of ICT tools and data types to visualise their thinking strategies. Use appropriate ICT tools and techniques efficiently and effectively. Discriminate between ICT tools based on their suitability to solve problems.
	ICT for creating	Appraise different strategies for organising and managing resources in problem solving and creating information products. Apply a range of techniques, equipment and procedures efficiently and effectively. Consider ethical and legal issues. Apply/use appropriate strategies to protect their files. Create products that demonstrate a clear sense of purpose and audience. Compare, evaluate and justify solutions.
	ICT for communicating	Exchange ideas through online forums and websites. Apply techniques to locate more precise information from websites. Conduct general and specialised searches. Follow accepted protocols in communicating with peers, experts and others.
Thinking Processes	Reasoning, processing and inquiry	Discriminate in the way they use a variety of sources.

EMPLOYABILITY SKILLS

Units 1 to 4 of the VCE Information Technology study provide students with the opportunity to engage in a range of learning activities. In addition to demonstrating their understanding and mastery of the content and skills specific to the study, students may also develop employability skills through their learning activities.

The nationally agreed employability skills* are: Communication; Planning and organising; Teamwork; Problem solving; Self-management; Initiative and enterprise; Technology; and Learning.

Each employability skill contains a number of facets that have a broad coverage of all employment contexts and are designed to describe all employees. The table below links those facets that may be understood and applied in a school or non-employment related setting, to the types of assessment commonly undertaken within the VCE study.

IT applications

Assessment task	Employability skills: selected facets
Production of information solutions	<p>Communication (reading independently; writing to the needs of the audience; sharing information)</p> <p>Initiative and enterprise (generating a range of options; initiating innovative solutions; being creative)</p> <p>Learning (managing own learning; being open to new ideas and techniques)</p> <p>Planning and organising (collecting, analysing and organising information; managing time and priorities)</p> <p>Problem solving (developing creative, innovative solutions; applying a range of strategies to problem solving; showing independence and initiative in identifying problems and solving them; using mathematics to solve problems)</p> <p>Self management (taking responsibility; articulating own ideas and visions)</p> <p>Technology (using IT to organise data; being willing to learn new IT skills; having the OHS knowledge to apply technology)</p>
Written analysis and evaluation reports	<p>Communication (reading independently; writing to the needs of the audience; sharing information)</p> <p>Initiative and enterprise (generating a range of options; initiating innovative solutions; being creative)</p> <p>Learning (managing own learning; being open to new ideas and techniques)</p> <p>Planning and organising (planning the use of resources including time management; collecting, analysing and organising information)</p>
Annotated visual presentation	<p>Communication (reading independently; writing to the needs of the audience; sharing information)</p> <p>Learning (managing own learning; being open to new ideas and techniques)</p> <p>Planning and organising (collecting, analysing and organising information)</p> <p>Technology (using IT to organise data)</p>
Onscreen user documentation	<p>Initiative and enterprise (generating a range of options; initiating innovative solutions; being creative)</p> <p>Planning and organising (planning the use of resources including time management)</p> <p>Problem solving (developing practical solutions; testing assumptions taking the context of data and circumstances into account)</p>

*The employability skills are derived from the Employability Skills Framework (*Employability Skills for the Future*, 2002), developed by the Australian Chamber of Commerce and Industry and the Business Council of Australia, and published by the (former) Commonwealth Department of Education, Science and Training.

Assessment task	Employability skills: selected facets
Test	<p>Communication (reading independently; writing to the needs of the audience, sharing information)</p> <p>Initiative and enterprise (generating a range of options; initiating innovative solutions; being creative)</p> <p>Learning (managing own learning; being open to new ideas and techniques)</p> <p>Planning and organising (planning the use of resources including time management; collecting, analysing and organising information)</p>

DEVELOPING A COURSE

A course outlines the nature and sequence of teaching and learning necessary for students to demonstrate achievement of the set of outcomes for a unit. The areas of study broadly describe the learning context and the knowledge required for the demonstration of each outcome. Outcomes are introduced by summary statements and are followed by the key knowledge and key skills which relate to the outcomes.

Teachers must develop courses that include appropriate learning activities to enable students to acquire the key knowledge and key skills associated with each outcome statement in each unit.

For Units 1 and 2, teachers must select assessment tasks from the list provided. Tasks should provide a variety and the mix of tasks should reflect the fact that different types of tasks suit different knowledge and skills and different learning styles. Tasks do not have to be lengthy to make a decision about student demonstration of achievement of an outcome.

In Units 3 and 4, assessment is more structured. For most outcomes, or aspects of an outcome, there are assessment tasks and these are prescribed. The contribution that each outcome makes to the total score for School-assessed Coursework is also stipulated.

Flexibility in course design

In most units factors such as software tools, contexts and types of mobile devices can be varied according to the availability of resources, teacher and student preferences, and teacher and student expertise. The learning activities may be varied in type and pace to allow for individual differences in learning styles, expertise with equipment, personal interest and experience. While the areas of study in a unit are numbered, this does not necessarily dictate the order in which they should be taught. In some units the order is not important and it may be appropriate for students to simultaneously engage in learning activities related to two or more areas of study. However, in some units there is a developmental relationship between areas of study that suggests a logical sequence.

Preparing design briefs

A key focus of the VCE Information Technology study design is solving information problems using ICT and following a methodology, as explained on pages 16 to 18. This warrants students responding to a design brief, which outlines a problem, context, need or an opportunity.

The following outcomes require students to respond to a design brief when applying the problem-solving methodology (PSM):

Unit 2, Outcome 1

IT applications, Unit 3, Outcome 1

IT applications, Unit 3, Outcome 2

IT applications, Unit 4, Outcome 1

Software development, Unit 3, Outcome 1

Software development, Unit 4, Outcome 1

The content of the design brief must afford students the opportunity to demonstrate the outcome. This means that it should contain sufficient information for students to be able to carry out the relevant stages of the PSM, but not contain too much information so that students are denied the opportunity to demonstrate their knowledge and skills about each PSM stage.

When writing a design brief:

- Use the outcome statement as the overall guide. Ask, ‘is there sufficient information for the student to demonstrate the outcome?’ For example, if the outcome requires students to analyse an information problem, ensure that the design brief contains relevant information about current practices; however, avoid providing such information in a manner that is too similar to what is required of the student.
- Use the key skills as a guide to determining the extent of the design brief. Ask ‘does the content of the design brief allow all of the relevant key skills to be demonstrated?’
- Refer to the key knowledge to determine the scope of the knowledge that needs to be demonstrated. Again, language used in the key knowledge can form the basis for content in the design brief.
- Refer to the activities related to each PSM for prompts about the type of information that needs to be provided in order for students to carry out these activities.
- Incorporate diagrams, where appropriate, such as an organisation chart, which can communicate the size and structure of an organisation; a graph or table, which can provide vital information about an organisation’s performance, and hence needs; a data flow diagram, which outlines the flow of data through an information system.

If using diagrams, avoid including those that are in the form of what the student is expected to produce in their solution. This denies a point of discrimination in performance, as students are ‘copying’ the model provided.

- Refer to the performance descriptors at the highest level in the assessment handbook. These indicate evidence expected in student responses, so make sure that the design brief has sufficient scope to allow for these performances.

Ensure that a background to the problem is provided. It can be posed as a story or a scenario. This should engage students and show the relevance of the problem. Depending on the requirements of the outcome, information may be needed in order for students to undertake an analysis. This would include stating the current practice, any weaknesses in this practice, the expectations of the solution and any constraints on the solution.

LEARNING ACTIVITIES

Implementation advice and example learning activities for each unit are provided on pages 54 to 85. Teachers should consider these activities in conjunction with the key knowledge and key skills identified for each outcome within the study.

SUITABLE RESOURCES

Courses must be developed within the framework of the study design: the areas of study which comprise outcome statements, and key knowledge and key skills.

A list of suitable resources for this study has been compiled and is available via the Information Technology study page on the Victorian Curriculum and Assessment Authority website: www.vcaa.vic.edu.au/vce/studies/index.html

UNIT 1: IT IN ACTION

For Area of Study 1, students develop skills in the use of spreadsheet software with a particular focus on manipulating numeric data to produce information in graphic form. Students should be exposed to a range of design tools, in particular those that can be used to present graphic information.

In Area of Study 2 students need to apply their knowledge of networks in order to recommend a network to suit a particular purpose. This could, for example, involve recommending a network for their own home or responding to small scenarios or lengthier case studies. If the latter is the case, then the use of visual stimulus and network diagrams are effective ways of communicating details about networks and network needs.

For Area of Study 3 where students create a website using web authoring software, they also use visualising thinking tools to assist in sorting, reflecting on and making connections between different facts and opinions. The team should plan the project using appropriate project planning tools. They are not expected to use specific project management software, but using a spreadsheet to list tasks, responsibilities and the order and timing of events would be appropriate.

Sequencing of areas of study

Area of Study 1 should be addressed prior to, or concurrently with, Area of Study 3. There are knowledge and skills associated with Area of Study 1 that are required when undertaking Area of Study 3 (spreadsheet knowledge and skills).

Sources of data

In Area of Study 1, data sets must be provided by the teacher; however, the teacher is not required to manufacture them, as data can be sourced from online repositories such as the Australian Bureau of Statistics, the World Health Organization, World Development Indicators, Melbourne Water, the Bureau of Meteorology or other similar bodies. As students are required to select relevant data from these data sets they must be supplied with redundant or superfluous data within the sets. Students need to consider data types, and what data types would best produce the graphic form required. They then apply spreadsheet software functions and techniques to develop solutions in a graphic form for an identified need.

In Area of Study 3, students must acquire data for manipulation by spreadsheet software from a primary source using methods such as interviews or surveys. The resulting information must be in graphic form; however, students can supplement this information with recorded interviews, video clips and/or images of the people if being interviewed. Students must also acquire information from secondary sources to ascertain the opinions of stakeholders and assist in formulating the opinions of student teams.

Example activities

AREA OF STUDY 1: From data to information

Outcome 1

Select data from data sets, design solutions and use a range of spreadsheet functions to develop solutions that meet specific purposes.

Examples of learning activities

produce a folio of spreadsheet activities covering a range of skills and showing the appropriate use of graphical representations

investigate data sources such as the World Health Organization (WHO) and the data they provide, including identification of data types used

investigate and use Google docs, or similar, to produce motion graphs

compare a range of graphical representations, identifying their purpose, the design elements used and the formats and conventions applied

create a spreadsheet that shows the usage of water for a family over the last 12 months; compare to government recommended levels

graphically compare the average grades for a subject's cohort for the last decade

create graphic representations of enrolment data for the past five years

Detailed example**ENROLMENT TRENDS**

The Science Coordinator at Woodlands College is concerned at the low numbers of girls who are enrolled in science subjects at the school. He wants to encourage more girls to take up these subjects and has requested a budget to mount a campaign to achieve this objective. Funds are very tight at the school and the principal is not convinced that a gender problem exists. The Science Coordinator needs to persuade the principal of the real situation, using effective information presented graphically.

Tasks:

- From the following data, students select what is needed for manipulation. The coordinator wants to use five years of data.
- Students decide the type of graphic representation and prepare a design of how the solution will be developed and its appearance.
- Students use spreadsheet functions to create graphics that will assist the Science Coordinator in persuading the principal that a gender problem exists with enrolments, and that funding is needed to mount an enrolment campaign.
- Students explain why the solution meets the coordinator's needs.

Key: M = male, F = female
Number, e.g. 1 = Unit 1; 2 = Unit 2 etc.

VCE Physics, Units 1 and 2

Year	M1	F1	M2	F2
04	15	5	16	4
05	18	3	18	4
06	17	6	15	6
07	15	3	15	3
08	19	6	19	5
09	16	5	15	5
10	15	8	15	8

VCE Physics, Units 3 and 4

Year	M3	F3	M4	F4
04	12	4	12	4
05	13	3	12	3
06	10	2	10	2
07	14	3	13	3
08	11	4	11	4
09	10	2	10	2
10	13	3	13	3

VCE Chemistry, Units 1 and 2

Year	M1	F1	M2	F2
04	20	5	20	5
05	21	4	19	4
06	19	6	17	6
07	15	5	15	5
08	17	8	17	7
09	16	8	16	8
10	19	6	18	6

VCE Chemistry, Units 3 and 4

Year	M3	F3	M4	F4
04	13	5	12	5
05	11	5	11	4
06	14	3	14	3
07	12	4	12	3
08	12	5	12	5
09	11	4	10	4
10	14	3	14	3

VCE Biology, Units 1 and 2

Year	M1	F1	M2	F2
04	30	20	30	20
05	27	17	27	18
06	28	19	28	19
07	30	18	29	17
08	26	20	25	20
09	28	19	28	19
10	29	20	28	19

VCE Biology, Units 3 and 4

Year	M3	F3	M4	F4
04	20	12	20	12
05	22	15	22	15
06	28	19	28	17
07	30	18	30	18
08	26	20	25	20
09	28	19	28	19
10	29	20	27	20

AREA OF STUDY 2: Networks**Outcome 2**

Recommend a networked information system for a specific use and explain possible security threats to this networked information system.

Examples of learning activities

draw a network diagram from provided stimulus material

produce a presentation on a range of security threats including hacking, phishing, viruses, Trojans and denial of service

annotate a diagram of a networked information system with the roles and functions of its components

use a visualising thinking tool to identify the strengths and weaknesses of wireless and wired communications technology for a particular setting

organise the demonstration of a range of mobile devices by a local service provider

invite representatives from post compulsory institutions to an IT careers forum on the roles and responsibilities of the people associated with networks

recommend a network for a home

Detailed example**A HOME NETWORK**

The Tran household, comprising five members, is tired of their current computer set up at home. They have one computer which is located in their family room, two laptops and one printer. The house is connected to broadband, with the modem being located with the computer. Usually the laptops are used in bedrooms and each time someone wants to use the Internet or print their work they need to come to the family room. Printing is usually done from a flash drive.

This practice is annoying several family members as they are university students wanting ready access to the Internet for study purposes and for posting photos on a shared website.

The current arrangements worked for the family a few years ago, as the parents wanted to be able to supervise Internet usage, but this is no longer the case. The family wants to keep the printer and main

computer in the family room, which is located at the back of the house, adjacent to two of the three bedrooms, and they want to be able to network their IT resources.

Tasks

- Students are to prepare a table that lists for the Tran family the advantages and disadvantages of a wireless network, paying particular attention to the reliability of these networks, their cost and speed of transferring data.
- Students recommend a networked information system for the family and list the equipment that would be needed to support the operation of network in their house.
- Students detail potential threats to the security of the information stored and communicated via their network.

AREA OF STUDY 3: ICT in a global society**Outcome 3**

Contribute collaboratively to the design and development of a website that presents an analysis of a contemporary ICT issue and substantiates the team's point of view.

Examples of learning activities

- collect a range of film snippets that portray contemporary ICT issues
- produce a website for a local not-for-profit action group, e.g. 'Save the platypus of Jumbuck creek'
- develop a survey about playing computer games, collate results, and produce a graphic representation of the data collected
- conduct a formal debate on a contemporary ICT issue
- create a code of conduct for participating in a social network
- compare three websites identifying and describing the design elements and the formats and conventions used
- analyse given scenarios to identify and list the tasks, people, resources and time required to complete the project

working as part of a team, analyse a contemporary ICT issue and substantiate a point of view for inclusion on a website

Detailed example**ICT ISSUE**

Students are to access a range of websites on the Internet that require them to give personal information, e.g. e-Bay, Coles-On-Line, Commonwealth Netbank, Hotmail, Facebook. Personal information includes their postal and/or email address. (Suitable sites include shareware sites that provide download facilities, retailers, and sites that offer online clubs such as the ABC.)

Whenever personal information is collected, there are certain Federal and State Privacy laws that govern the collection, storage, communication and disposal of that information. However, some organisations may find that these laws restrict business and are costly.

Tasks

Students form a team to produce a website that presents the views of a range of stakeholders about an ICT issue, and expresses the viewpoint of the team. Information is to be gathered from primary and secondary sources. Students are required to:

- Form a team of three to four members.
- Identify a contemporary issue associated with one of the following areas: computer gaming, social networking, robotics, e-commerce and cloud computing.
- Prepare a plan that identifies the tasks, timelines and indicators for monitoring progress.
- Access information from a variety of sources, including interviewing at least one person. Students can record this interview and post it on their website.
- Use visualising thinking tools to refine, filter and make connections between opinions and facts about the issue.
- Plan the design of a website that presents views about an ICT issue, from different stakeholders and from their team, and identify strategies for influencing how people use ICT.
- Use spreadsheet software to create a graph based on the data acquired from the interview.
- Use web authoring software to develop a website.

UNIT 2: IT PATHWAYS

In Area of Study 1, students create graphic representations through the use of visualisation tools, including charts, graphs, spatial relationships, histograms, maps and network diagrams. Often these tools allow the data to be dynamic, such as motion charts within Google docs. The software tool used may be influenced by what IT subjects are offered in a school at Units 3 and 4. For example, if only IT applications is offered it may be appropriate for students to study database and spreadsheet software; if Software development is being offered, then using a programming language to create data visualisations is a good choice.

In Area of Study 2, students can continue to use the programming language they used in Area of Study 1. It is important to note that students do not have to create complex, complete solutions to information problems – partial solutions, focusing on specific programming features, are appropriate.

When recording in their electronic journals entries need not be lengthy, and students may use their blogs as a method of storing and communicating records of their progress.

Area of Study 3 is a group-based real world problem-solving project. The teacher or student can select the software tool and it is not restricted to those tools studied in Areas of Study 1 and 2. Students can use a programming language for all three areas of study; conversely, a different tool can be used for each area of study. There is no requirement for students to use project management software but they must be able to identify tasks, sequence them, estimate timing, and monitor their progress through shared files.

Teachers can require all teams of students to solve an information problem for the same client, or teams can select their client. A client can be an individual or a not-for-profit or profit-based organisation. A client can be another teacher in the school or a person who does volunteer work for a club or charity. It is important that the client states their needs and is available to provide feedback during the creation of the solution and after its completion.

Sequencing of areas of study

The sequencing of Areas of Study 1 and 2 is flexible; however, it is logical to approach Area of Study 3 after Areas of Study 1 and 2.

Sources of data

In Area of Study 1, students must select data from large repositories of data, unlike Unit 1, Area of Study 1, where they are provided with data. It is suggested that learning activities should focus on accessing and selecting authentic data from large online repositories.

Example activities

AREA OF STUDY 1: Data analysis and visualisation

Outcome 1

Apply the problem-solving methodology and use appropriate software tools to create data visualisations that meet users' needs.

Examples of learning activities

investigate sources of data; discuss the data that each provides and its format

identify five different user groups and explain how their needs would influence the type of data visualisation created

design appropriate data visualisations for three user groups using the same data set

develop a set of criteria that can be used to evaluate the set of data visualisations provided

experiment with web-based examples and demonstrations of visualising thinking tools, such as those found at www.infiview.com; www.visualcomplexity.com; and www.readwriteweb.com

create an effective graphic using data visualisation tools for a specific user

Detailed example

DYNAMIC DATA

There are a range of tools that can be used to manipulate data and present information in the form of dynamic graphics. A well-known exponent of using data visualisations to support his presentations is Hans Rosling. Students are to view two of his presentations on YouTube and complete the following tasks and questions.

Presentation 1: Myths About the Developing World at www.youtube.com

Presentation 2: New Insights on Poverty and Life Around the World at www.youtube.com

Task 1

Students are to read the following questions prior to watching at least one of these videos. This will allow them to watch Hans Rosling's presentation and note the information needed to answer the questions.

Task 2

Students are to replay the video or watch the other video and answer the following questions:

- In the first few slides, what software tool does Hans Rosling use to create the presentation?

- When dynamic data is presented, list the features of the presentation/s that make the graphic displays interesting and informative.
- Does the use of dynamic data enhance the quality of presentation?
- What features of this software (Google docs, motion charts) are most effective? Why?
- How does Rosling show different relationships between different data sets?
- Rosling uses different means to represent complex data. What technique is most successful? Describe the formatting features that are most appealing.
- How would complex data sets like those manipulated by Rosling usually be presented?

Task 3

- Students are to access data from the Australian Bureau of Statistics at www.abs.gov.au
- They select Statistics, then Statistics by Topic, and locate a set of data of their choice.
- Students access relevant data and apply a range of processing features to present information in an effective graphic form.

AREA OF STUDY 2: Programming and pathways

Outcome 2

Design, and develop using a programming or scripting language, limited solutions, record the learning progress electronically, and explain possible career pathways that require the use of programming or scripting skills.

Examples of learning activities

design an algorithm for a programming problem and design an appropriate desk check

write a program that allows users to enter a range of data types and validates entered data

use the Internet to investigate careers advertised in the area of programming

provide examples of control structures using pseudocode

develop an appropriate testing table for programming problems provided

identify and define key terms used when programming

discuss and document the naming convention to be used in all programming activities

write a simple program that performs calculations given all variables

Detailed example

PROGRAMMING FOLIO

Students undertake a series of tasks in relation to one of the three samples outlined below.

Tasks

Students select one of the following samples and using appropriate design tools design a suitable solution.

They design a test plan and test data.

Students also use a range of software skills and techniques to develop and test the solution.

Sample 1

Ace Blinds Co. discovered its sales staff can measure windows correctly but they make errors in calculating the customer's price. Ace Blinds Co. wants a program that will calculate the price of custom-made sun blinds, given the measurements. In particular Ace wants an interactive program a salesperson can use on a laptop.

Given the width and height of a window and the price per square meter of window, the program must calculate the price of a blind to fit.

The window measurements and the price must be displayed on the screen.

Sample 2

Lucky Pizza is a take-away pizza bar. Four standard pizzas are available (\$7 each) and customers can choose from a range of extra toppings (60c each topping). Unfortunately too many errors creep into the calculations and the owner requires a program that will calculate the price of any pizza order. In particular Lucky Pizza wants an interactive program that employees can use easily. Given the basic pizza order, extra toppings required and number of pizzas, the program must calculate the total price.

The prices must be displayed on the screen.

Sample 3

Highspring Secondary College is running a programming competition for its Years 10 and 11 students. The task is to produce a small program designed for lower primary students that will help them with their maths.

In particular, students enter two numbers and then select a mathematical operation (e.g. addition, multiplication). The total is calculated.

A 'rewarding message' including the student's name can also be displayed.

AREA OF STUDY 3: Tools, techniques and procedures

Outcome 3

Work collaboratively and apply the problem-solving methodology to create an ICT solution, taking into account client feedback.

Examples of learning activities

prepare a project plan for a school-based activity, e.g. a charity day

develop a questionnaire for a client to identify their needs

create an evaluation strategy for determining the quality of a solution

develop a walk-through document for the client

as a group, design a solution to a number of short scenarios and compare possible solutions

develop and implement a plan to create a software solution; evaluate the plan and the solution

Detailed example

SOLVE AN INFORMATION PROBLEM FOR A CLIENT

This example is designed for students using multimedia or web authoring software.

'Top Works' is an innovative program developed by the Victorian State Government to display outstanding VCE students' work in the Melbourne Museum. The purpose of the display is not only to showcase the talented VCE students from the previous year, but also to provide inspiration, guidance and quality examples for the new students.

In particular, the best works by students in Design and Technology, Art, Food and Technology, Studio Arts and Media are displayed. The top students in the Performing Arts (Dance, Drama and Music) are also invited to perform their solo piece in front of the Premier at a Gala Concert held in the Victorian Arts Centre in February.

The VCE Coordinator at Clarkedale Secondary College, Susan Masters, would like to highlight the achievements of their VCE Technology, IT and Arts students and she wants to organise their own 'Top Works' program.

However, due to restrictions in resources (including time, money and display space), she has decided

that a 'virtual exhibition' is preferable where students are invited to submit photos (either digital or hardcopy) of their products so they can be displayed on the 'Top Works' section on the college intranet.

Possible web pages may cover:

- Profiles on each of the exhibiting students
- A photo gallery for each student
- A home page that is attractive and distinctive
- An eye catching logo (not yet developed)
- An introductory page from the Principal, Curriculum Coordinator or VCE Coordinator.

Students use the above scenario to complete the following tasks:

Task 1

Analyse the information problem, including identifying the functional requirements and the constraints.

Task 2

Prepare a project plan that details the tasks, duration, task member responsibilities.

continued

Detailed example (continued)**Task 3**

Each task member must prepare individual designs for 'Top Works'.

As a team, select the most suitable combination of designs and present these to Susan Masters for discussion and approval.

Final designs, including any suggested modifications, are prepared.

Task 4

Either as a team or an individuals and based on the designs created in Task 3, develop a suitable website for Clarkedale Secondary College.

Comply with accepted formats and conventions and follow the principles of effective web design in regards to content and navigation pathways.

Validate the data and test the site functions.

Task 5

Produce a report that evaluates the efficiency and effectiveness of the information products.

UNIT 3: IT APPLICATIONS

In Area of Study 1, a useful learning approach is for students to critique a range of websites in terms of their ability to support particular online communities. By identifying the characteristics, purposes and information needs of an online community, students should be able to assess critically for each website its content, features, user interface, information architecture and use of design elements. Students should also be able to explain the technical requirements to host the websites and non-technical constraints, including social online protocols, and privacy, copyright and human rights requirements.

In this area of study, a prototype website is created using web authoring software. Other additional software (e.g. image editing) may be used, but is not mandated.

In Area of Study 2, an understanding of the 'front-end' of data acquisition via a website provides a good segue into the fundamentals of a relational database management system (RDBMS), including their purpose and structure. Students can then develop their skills in using the functions and techniques within an RDBMS to efficiently and effectively manipulate and validate data in order to produce a solution to an information problem. Students should be provided with individual data sets, or may select from a very large data set, to complete this task. Not all functions within the RDBMS are required to be demonstrated.

Sequencing of areas of study

The order in which the areas of study are undertaken in Unit 3 is not sequential; however, there may be merit in doing Area of Study 1 first as it includes content about the technical underpinnings of websites.

Sources of data

In Area of Study 1 students must be supplied with data and information about a particular online community. This would typically include images, membership characteristics, membership needs and technical and non-technical constraints.

Example activities

AREA OF STUDY 1: Online communities

Outcome 1

Apply stages of the problem-solving methodology to create a prototype website that meets an online community's needs, and explain the technical requirements to support the hosting of this website.

Examples of learning activities

using the annually published VCAA list of approved types of websites, investigate the different types and purposes of online communities that support the purposes of collaboration, knowledge sharing and collective identity

using the annually published VCAA list of types of approved websites, investigate a range of different online communities, identifying the different types, purposes, functionality and characteristics of the websites developed to satisfy the specific needs of these online communities

using the annually published VCAA list of types of approved websites, identify the non-technical constraints on the websites, including access rights, privacy, copyright and human rights

critique a range of websites from the VCAA annual list of approved websites; include design elements of effective and efficient websites, characteristics of efficient and effective user interfaces and effective information architecture

produce a list of web design guidelines, referencing authoritative sources

discuss social online protocols and accepted ways of behaving on websites that support the communication of information (e.g. identity, information exchanged, language used, members' rights)

discuss the consequences of breaching of these social online protocols; breaches include fraudulent identity, cyberbullying, harassment, inappropriate information and language

introduce current legal obligations and key provisions as detailed in the *Privacy Act 1988*, *Information Privacy Act 2000*, *Health Records Act 2001*, *Copyright Act 1968*, *Charter of Human Rights and Responsibilities Act 2006* (VIC) (sections 13, 14 and 15) and the *Spam Act 2003* (Part 1.3, Simplified outline)

prepare a listing that compares the key features and characteristics of wikis, blogs, forums, and social networking sites

visit your school's file server room or arrange for your network manager to visit your class to discuss the different technical requirements to support the hosting of a website

produce a listing of the technical requirements (hardware and software) needed to host websites and list the function of each item

use animation software to produce an animation that represents how a member of an online community can share knowledge, collaborate or socialise

compare the capabilities of different communications technology including wired and wireless

critique your school's website in terms of design elements, characteristics of efficient and effective user interfaces and effective information architecture

using a range of design tools including a sitemap, layouts and storyboard, redesign your school's website

apply stages of the problem-solving methodology to create a prototype website that meets an online community's needs; explain the technical requirements to support the hosting of this website

Detailed example

WORLD PLATYPUS SOCIETY

Design Brief

Overview

Dr David Smith is a worldwide expert on monotremes (the duckbill platypus and four species of echidna) and lectures at an internationally recognised university in Australia. In particular, he has spent over 20 years studying the behaviour and habitat of the platypus or *omithorhynchus anatinus*, and his articles and research have been regularly published by the Australian Geographic Society.

Unlike other Australian animals including the southern corroboree frog, southern hairy nosed wombat and helmeted honey eater, the platypus is not listed as endangered on the International Union of Conservation of Nature's (IUCN) Red List. As a passionate conservationist and environmentalist, Dr Smith is keen to preserve this standing and protect the platypus for further generations.

Current Practices

Through a variety of means, Dr Smith stays in contact with other people interested in all aspects of 'Platypoda'. There are small websites in each state of Australia and at different zoos across the world (including Milwaukee and Chicago) where interested people can communicate. He has also set up an email group and a wiki for his undergraduate and postgraduate students, which has proved to be a success with the students.

Future Needs

At a national conservation conference Dr Smith was able to view <www.froggy.com.au>. This website was developed to enable Australian frog enthusiasts

to collaborate, exchange knowledge and socialise online. It included frog-related activities, events and amphibian conservation in general.

Dr Smith has decided that he should organise the development of a user friendly, visually appealing and informative website for an online community of platypus enthusiasts.

He recognises the necessity to attract teenagers and young adults to the community to continue his environmental pursuits. He is also aware of how popular and appealing social networking sites are to younger people and he would like to incorporate some of these interactive features to attract a young audience.

Dr Smith would like a prototype website developed that demonstrates the functionality, navigation options and user interface. He understands that this will not be a fully operational website but simply reflects the overall 'feel' of what is possible.

Instructions

Supply students with content material (including images). Students need to select information from this material that they consider relevant to their website. They may use other software such as image editing software in the completion of this assessment task.

Students are to produce a prototype website for Dr Smith. Their website should demonstrate navigation options, the user interface and the overall functionality. All included features (e.g. wiki, blog, forum) do not have to be fully functional. The following tasks provide a breakdown of the methodology used.

continued

Detailed example (continued)**Task 1: Prototype website (40 marks)****Analysis**

1. Provide a brief overview of the online community, including its purpose, function and goals.
2. Provide a succinct problem statement that describes the problem to be solved.
3. Identify the type/s of website/s required referring to the information needs of the online community.
4. Identify the input and output requirements.
5. Identify any technical or non-technical constraints.
6. Describe the benefits of the website for the online community.

Design

1. Select and apply appropriate design tools to represent the user interface, information architecture and functionality of the prototype website.
2. Produce suitable evaluation criteria.

Development

1. Develop a prototype website that meets the World Platypus Society (WPS) community's needs.
2. Use validation techniques where appropriate.
3. Ensure that your website follows accepted formats and conventions.
4. Prepare and complete a test table, using appropriate test data.

Task 2: Written report (10 marks)

Produce a written report that addresses these two elements:

1. Justifies how your prototype website suits the needs of the online community.
2. Describes the technical requirements of the organisation hosting the World Platypus Society's website.

AREA OF STUDY 2: Organisations and data management

Outcome 2

Design, and develop using a relational database management system, a solution to an information problem, and discuss why and how data is acquired via websites.

Examples of learning activities

review a range of websites to ascertain the type of data being acquired and how the data is acquired

consider the characteristics and limitations/advantages and disadvantages of three different online data acquisition techniques, e.g. forms, surveys, drop down boxes

produce a listing of different types of websites that involve the acquisition of data and categorise them according to e-commerce, social networking, information exchange, voting, etc.

select four different settings in which websites are used to collect data, and list possible input data, data types, data formats and validation techniques that would be used

discuss different security techniques that could be used to protect the rights of data providers

investigate how Transport Layer Security (TLS) or Secure Sockets Layer (SSL) protocols work

identify six reasons why an organisation would acquire data through a website and rate them in order

produce a folio of samples showing development in software skill acquisition using a relational database management system

develop a data structure chart and an entity-relationship diagram for a sporting club's membership database

in small groups identify criteria that will ensure effective reports; present the criteria in order of importance and demonstrate each criterion with an example

use three different social networking websites and identify the different data types that would be collected

design and develop using a relational database management system, a solution to an information problem, and discuss techniques for efficiently and effectively acquiring data from websites

Detailed example**READY SET GO****Design Brief****Overview**

Ready Set Go is an online sporting goods store started by Natalie Clarkson and Daniel Calleja a year ago. They recognised the need for an online sports store that sells popular brands at affordable prices. They sell a limited range of sporting goods including shoes, clothing, accessories and equipment. They are gaining a reputation for providing excellent service at competitive prices, but have been criticised for the speed of delivery of the goods.

However, due to the initial success of the business and good marketing to a range of sporting clubs, they have expanded and now employ a full-time accountant and six part-time staff to work in the warehouse.

Current Practices

At present, customers view the stock on the Ready Set Go website. Once they have decided what they want to buy, the customer contacts the company by phone or email and places an order. This order is processed at the warehouse and goods dispatched to the customer. Customers generally pay by credit card over the phone; however, electronic transfer of funds is also available. Sometimes customers send a cheque when they have received the delivery.

Natalie and Daniel recognise that this is a very inefficient system. Ready Set Go requires an ICT solution that will save the company time and effort in processing and dispatching orders. They also need to reduce the number of errors due to double handling of data and lack of validation, and be able to produce relevant reports in a timely manner.

Future Needs

Prospective customers will logon to the website www.rsg.com.au and view the range of goods for sale. To place an order, the customer needs to add the items to their shopping cart (including brand, item, code, size, colour, etc) and then fill in their delivery and payment details.

A relational database management system (RDBMS) will manage all data acquired through the online ordering form. The RDBMS will maintain all

records relating to customers, stock and orders. The orders will be processed by this system at the central warehouse in Melbourne and the goods dispatched within three days.

Information generated by the system will include customer invoices, updated stock list, mailing labels, monthly financial summaries, and sales reports.

The total budget is \$6500 and the solution needs to be produced within weeks. Obviously the customer's details must be safe from unauthorised access during communication and storage. A combination of username and passwords and a back up strategy will be used to protect the data.

Individual customer data and orders will be used in developing the ICT solution; however, sample data for one customer is as follows:

Sample Customer and Order

Mrs Isabella Clarke, 14 Thomas St, Essendon 3040
Credit Card: 1234 5678 9012

TT264 1 small Nike Airmax Striped Hoodie (Blue) \$80
SH136 1 size 9 Nike Pegasus +25 Runner Grey \$160
TP321 2 Large Converse basketball black pants \$50 each

Students are to apply the following tasks to the above scenario.

Task 1: ICT solution (40 marks)**Design**

1. Select and apply appropriate design tools to represent all aspects of the solution.

Development

1. Develop an RDBMS that satisfies the needs of Ready Set Go using a range of software functions and techniques to manipulate and validate the data acquired from the website.
2. Construct and produce a range of queries to effectively retrieve required information and to produce reports that would satisfy the needs of the organisation.

continued

Detailed example (continued)

3. Prepare and complete a test table, using appropriate test data.

Task 2: Written Report (10 marks)

Produce a written report that addresses these elements:

1. Explain the reasons why data is acquired and supplied via Ready Steady Go's website.
2. Explain why their customers (data providers) would supply data via a website to Ready Steady Go.
3. List a range of techniques that Ready Steady Go could use on their website to acquire data.
4. Propose and explain three data acquisition techniques that Ready Steady Go should use on their website.
5. List a range of techniques Ready Steady Go could use on their website to protect the rights of their data providers.
6. Propose and explain three techniques Ready Steady Go should employ to protect the rights of their data providers.

UNIT 4: IT APPLICATIONS

In Area of Study 1, students solve an ongoing information problem by developing a solution and accompanying user documentation. In response to a design brief, students apply knowledge and skills in either an RDBMS or spreadsheet software to develop an efficient and effective information solution that meets the goals and information needs of an organisation. The solution must have the capacity to process new sets of data for the recurring problem.

As the solution should be capable of being retrieved at a later date to process new sets of data, onscreen user documentation needs to be developed. Students select and apply appropriate design tools to represent the design of the user documentation and then produce the documentation using either web authoring or multimedia authoring software.

In the evaluation process students should identify a strategy or plan, including a timeline for the evaluation, data for collection, methods and techniques for acquiring the data, relationship between data and each evaluation criterion. Students should then apply their criteria and report on the extent to which the solution (including user documentation) meets the information needs of the organisation.

In Area of Study 2, students are required to recognise that the security threats to data and information can be affected by accidental actions (such as losing a portable storage device containing files), deliberate actions (such as denial of service and worms) and also by events (such as a power surge). Students should have knowledge of contingencies including disaster recovery strategies in case of compromised security of data and the integrity of the information. When recommending information management strategies students need to take into account existing or potential ethical dilemmas. Examples of dilemmas include weighing up an individual's right to privacy against the benefits to society, matching data sets to increase a company's profits, and releasing data to highlight performance against achievement targets.

Sequencing of areas of study

The two areas of study in Unit 4 are non sequential and independent.

Sources of data

Areas of Study 1 and 2 do not require teachers or students to source large amounts of data. However, where data is sourced, it should be referenced and used according to legal obligations as listed in the Glossary on page 13.

Example activities

AREA OF STUDY 1: Organisations and information needs

Outcome 1

Use selected software to solve an ongoing information problem, and evaluate the efficiency and effectiveness of the solution in meeting the information needs of an organisation.

Examples of learning activities

select a familiar organisation (e.g. your school, place of employment, local business); produce an organisational chart that identifies the different levels of management and suggest appropriate strategic, tactical and operational decisions for each level of management

select a local organisation and identify some organisational and system goals

produce a folio of samples showing the development of skill acquisition with a relational database management system or spreadsheet software

select a local organisation and produce a range of designs for a database or spreadsheet that they require

develop criteria to evaluate efficient and effective user interfaces and effective information architecture of onscreen solutions; use the criteria to evaluate a range of products

using a database that was developed in Unit 3, produce a range of efficient and effective reports that demonstrates a range of database functions and techniques

select relevant data from given data sets; using a range of spreadsheet functions and techniques, develop a range of charts that meet different purposes

select authentic data from a large data repository and present key aspects of the data in an appropriate visual form (e.g. graphs, charts)

write a critique of two different types of user documentation that clearly describes their positive and negative elements

produce a table that summarises the differences between a quick start guide, tutorial, content sensitive help and a manual

prepare user interfaces for each of the following types of documentation: quick start guide, tutorial, content sensitive help and a manual

use spreadsheet software to solve an ongoing information problem; evaluate how well the solution meets the information needs of an organisation

Detailed example

WEB WORKS

Design Brief

Overview

Twelve months ago, Amy Webster started a web design consultancy business, Web Works. Since then Web Works has grown rapidly and Amy has employed six contract staff to assist with the business. Amy’s mother Gayle, an experienced accountant who retired four years ago, does most of the paper work for the business and tends to manage the business using non ICT techniques. Web Works has income from two sources: selling web design services and selling a firewall software package “Proof IT”.

Employment contract terms are as follows:

Wages:

- Staff work a 35-hour week at the normal rate
- Overtime is paid one and half times the normal pay

Sales commission:

Web design 10%

Firewall Software:

- 1% above \$1000
- 2% above \$5000.

Current Practices

Currently, every fortnight, Gayle goes through the forms and paperwork to manually calculate staff wages. There have been frequent mistakes and it has caused a lot of embarrassment for Amy.

An example of a week’s pay figures and sales data is below:

Name	Hours	Hourly Rate \$	Sales Total	Total Web Design Software (\$)
Harry Nguyen	55	45	0	10 000
Annalise Smith	35	40	5 000	0
Angelo Bettiol	24	45	15 000	0
Matthew Clark	58	40	2 500	12 000
Aaron Mehta	40	50	0	20 000
Donna Woods	14	60	2 000	10 000

Australian Tax Office rates as at July 2009 are listed below:

Annual income	Tax rate
\$0 – \$6 000	0
\$6 001 – \$35 000	15
\$35 001 – \$80 000	30
\$80 001 – 180 000	38
Over \$180 000	45

This does not take into account the 1.5% Medicare Levy which is applied to income above \$6 000 per year.

Future Needs

Amy would like an ICT (spreadsheet) solution to her information problem. In particular, Amy would like a solution that efficiently calculates staff wages every fortnight and produces effective pay slips. She would also like a graphical representation of her staff’s performance and the overall fortnightly income, highlighting income generated from the web design services and firewall software sold.

Because the solution will be used on an ongoing basis, online user documentation is also required that explains in detail how to re-use the solution every fortnight.

Students use the above scenario to complete the following tasks:

Task 1: ICT Solution (50 marks)

Part A

Analysis

1. Provide an overview of the organisation, including its purpose, function and goals.
2. State the ongoing information problem in a succinct and logical problem statement.
3. Identify the goal/s of the information system.
4. Identify the information needs of the organisation.
5. Identify the input and output requirements and any technical or non-technical constraints.
6. Explain how the solution will benefit the organisation.

continued

Detailed example (continued)**Design**

1. Select and apply appropriate design tools to represent the design of the solution.
2. Develop criteria to evaluate the extent to which the solution meets the information needs of the organisation.

Development

1. Develop an ICT solution using a range of the selected software's functions and techniques. Apply appropriate formats and conventions, and validation techniques.
2. Prepare and complete a test table using appropriate test data and include user acceptance.
3. Produce appropriate output to solve the ongoing information problem.

Part B**User Documentation****Design**

1. Select and apply appropriate design tools to represent the design of the user documentation.
2. Develop criteria to evaluate the extent to which the user documentation meets the needs of the organisation.

Development

1. Use web authoring or multimedia authoring software to create onscreen user documentation.
2. Prepare and complete a test table using appropriate test data and include user acceptance.

Task 2: Evaluation: Written report (10 marks)

1. Propose a range of strategies that could be used to evaluate how the solution and user documentation meets the needs of the organisation.
2. Using your evaluation criteria, explain how the solution and user documentation meets the information needs of the organisation, including assisting decision making.

AREA OF STUDY 2: Information management

Outcome 2

Evaluate the effectiveness of strategies used by organisations to manage the storage, communication and disposal of data and information, and recommend improvements to current practices.

Examples of learning activities

use the Internet to research information system security breaches that have occurred in the last twelve months; select two and summarise the main points of the article/s and identify the weaknesses in the system

examine the *Privacy Act 1988*, *Information Privacy Act 2000*, *Health Records Act 2001*, *Copyright Act 1968*, *Charter of Human Rights and Responsibilities Act 2006* (VIC) (sections 13, 14 and 15) and the *Spam Act 2003* (Part 1.3, Simplified outline); summarise the key points of each law

use the Internet to find the code of ethics for various occupations, e.g. magicians, dog breeders, journalists

prepare a presentation that explains ethics to younger students; include examples from sport teams where the behaviour is not against the rules of the sport but could be considered unethical

discuss ways of ensuring the safety and security of data and the strategies used to store, communicate and dispose of data and information

discuss which email messages should be encrypted and whether all emails should be filed

select a security technique or procedure, and prepare an animation that explains the key features

use the Internet to research cloud computing and report on its advantages and disadvantages

investigate different cloud computing options offered by Google Docs, Etherpad, Everlast, Amazon Elastic Compute and Zoho

arrange for a guest speaker to outline the security threats to your school's network, and the necessary security devices and techniques required to combat these threats

investigate Web 2.0 and prepare a slideshow that explains Web 2.0 to younger students

evaluate the effectiveness of strategies used by organisations to manage the storage, communication and disposal of data and information, and recommend improvements

Detailed example**RYPE COMPUTER SECURITY****Overview**

Peter and Hannah O'Toole established Rype Computer Security three years ago in response to a need they felt existed in the marketplace for an organisation to provide Internet and data security services to small businesses. Since then they have expanded their business and now serve many small organisations within the Melbourne metropolitan area, providing advice on how these small organisations can best store their data, and the equipment that can be used to minimise data loss and theft.

Current Practices

Peter and Hannah store their client data on a computer located within an office located at Chisholm Springs. The data contains details of clients, the security procedures and equipment they currently have in place within their business, and an analysis of the possible threats to the business and recommendations for the business.

The office has a reception area from which clients and visitors cannot access the main office area. Peter or Hannah may activate the door latch after visitors have buzzed the bell at the reception desk. The main office area is one large room where all of the client files, computers and other peripherals and office furniture are located.

Peter and Hannah are concerned about the security of the data on their information system and have implemented a number of measures to ensure that their own data is secure. They store their client data on the hard drive on their computer system. Once a week one of them completes a backup of any files created or updated during the week onto a DVD. This is then stored in a lockable fireproof cupboard in the office. Each DVD is labelled with the date on which it was created. A new folder is set up on the hard drive when a new client is taken on and all files relating to that client are stored within the folder. Each filename consists of the first three letters of the client name, the type of file, the date the file is created and the version number of the file.

After an initial interview with a client, which usually takes place at the client's place of work, Peter or Hannah often contact the business via email to ask additional questions about their procedures and equipment to ensure the overall assessment is complete and accurate. Once the report on the business is completed and recommendations made, a copy of the report is forwarded to the business manager via email and a copy is also sent by courier to ensure that the business manager receives the report.

Every twelve months, Peter or Hannah archive the client files in order to make room for new client files. The archive is stored in a lockable filing cabinet in the office. If the client does not make contact within the following twelve months, the archive, and any associated hardcopies, are destroyed.

Future Needs

Being in the IT business, Peter and Hannah want to use the latest ICT techniques, equipment and procedures to satisfy the needs of their clients. They have always been proud of offering their clients the latest ICT solutions and they are willing to explore any of the latest developments.

It has been suggested that they explore an Internet based solution where their client data would be stored by a large specialised data centre that offers on demand and shared services to offsite storage, processing and computer resources. However, they are also obviously concerned about how such a company also stores, communicates and disposes of the data and information.

Peter and Hannah want the most secure, efficient and effective information management strategy possible. They are happy to accept recommendations on how to safely store, communicate and dispose of their data and information using the latest ICT equipment, techniques and procedures.

continued

Detailed example (continued)

Students use the above scenario to answer the following questions.

Question 1

- a) Describe the organisation's purpose, goals and function.
- b) What are the information management strategies used by Rype Computer Security to store, communicate and dispose of data and information?
- c) Why are these information management strategies presently being used?

Question 2

- a) What are the threats to the integrity and security of data and information? Indicate whether the threat would be the result of an accident or deliberate action or technical failure, and whether the threat relates to the storage, communication or disposal stage.
- b) Select two particular threats and discuss the nature of the threats in detail in relation to the integrity and security of data and information for Rype Computer Security.

Question 3

- a) What are the ineffective information management strategies outlined in the case study?

- b) For each ineffective management strategy, discuss the possible consequences that could result if particular threats are enacted.

Question 4

- a) What legal, ethical and social tensions might arise between the different stakeholders?
- b) For each identified tension, propose a strategy to minimise its impact on the different stakeholders.

Question 5

- a) Select six information management strategies and propose criteria that could be used to evaluate their effectiveness.
- b) Apply your criteria to evaluate the effectiveness of three information management strategies.

Question 6

- a) What are four current practices used by Rype Computer Security to manage the storage, communication and disposal of data and information?
- b) For each selected current practice, propose improvements to the current strategy.
- c) Justify why these improvements are required.

SCHOOL-ASSESSED COURSEWORK

Units 3 and 4: IT applications

In Units 3 and 4 teachers must select appropriate tasks from the assessment table provided for each unit. Advice on the assessment tasks and performance descriptors to assist teachers in designing and marking assessment tasks will be published online by the Victorian Curriculum and Assessment Authority in an assessment handbook. The following is an example of a teacher's assessment program using a selection of the tasks from the Units 3 and 4 assessment tables.

Outcomes	Marks allocated	Assessment tasks
Unit 3		
Outcome 1 Apply stages of the problem-solving methodology to create a prototype website that meets an online community's needs, and explain the technical requirements to support the hosting of this website.	40	In response to a design brief and given data: <ul style="list-style-type: none"> a prototype website capable of supporting the information needs of a computer game community
	10	And A written report that justifies a prototype website and explains the technical requirements of the host network.
Outcome 2 Design, and develop using a relational database management system, a solution to an information problem, and discuss why and how data is acquired via websites.	40	In response to a design brief that includes an analysis of an information problem: <ul style="list-style-type: none"> the design and development of a solution that allows costumers who have ordered online fancy dress costumes to be queried on a variety of criteria
	10	And A test that focuses on why airline and entertainment organisations and their customers use websites for transactions, and how organisations fulfil their legal obligations in protecting customer data.
Total marks for Unit 3	100	
Unit 4		
Outcome 1 Use selected software to solve an ongoing information problem, and evaluate the efficiency and effectiveness of the solution in meeting the information needs of an organisation.	50	A solution that generates graphic reports showing daily and weekly trends in profit margins of a fruit and vegetable shop, and onscreen user documentation.
	10	And A concept map that shows the relationship between evaluation criteria, specific features of a solution and reasons why the criteria have or have not been met, including, where appropriate, hyperlinks to solution features.
Outcome 2 Evaluate the effectiveness of strategies used by organisations to manage the storage, communication and disposal of data and information, and recommend improvements to current practices.	40	A test that focuses on the effectiveness of information management strategies used by a range of organisations and ways in which these strategies can be improved.
Total marks for Unit 4	100	

UNIT 3: SOFTWARE DEVELOPMENT

When developing a course, a thematic approach can be taken, whereby the focus of all areas of study is on the one networked information system. Another option is for each area of study to have a different setting. Alternatively, a course could involve students studying one networked information system in Unit 3 and another in Unit 4. Whichever course structure is chosen, it is intended that areas of study be undertaken in the order in which they appear in the study design.

For Area of Study 1, students analyse an existing information problem and produce software requirements specifications (SRS) that will be used to inform solution design. Students must demonstrate knowledge of some system analysis tools to represent the information system within which the solutions will operate. The operation of a networked information system can be analysed by documenting the functions that are being carried out by the system.

Students must be able to create use cases diagrams and interpret the functional elements of the system that they represent. A use cases diagram shows how a system responds to requests that originate from outside of the system. It is not expected that students would be highly skilled in the use of this tool, but they should understand that this is the context in which the tool is used.

The Glossary on page 14 details what the purpose and content of an SRS is for the purposes of this study. Students completing Area of Study 1 would include all of the results of their analysis into their SRS, as the tools that they have used each represent a different aspect of the analysis. The SRS should contain elements that identify the sequence of tasks that need to be undertaken to create a solution, and the project timeline. Note that the study does not ask students to use project management tools. The focus is rather on an understanding of the key tasks that will need to be accomplished and their ordering.

For Area of Study 2, students design and develop a prototype solution for the purposes of testing the logic of processes that are in development for a larger software project. From a programming perspective, this area of study provides students with the opportunity to begin to develop programming knowledge and skills, in readiness for the development of a complete solution in Unit 4.

Although in this area of study students are only creating a prototype solution, it is still important to write test data and test the functionality of the program. By testing the prototype, the success of the proposed solution can be evaluated against evaluation criteria.

Sequencing of areas of study

There is no flexibility in the sequence of the areas of study as they follow the stages of the problem-solving methodology (PSM).

Sources of data

Areas of Study 1 and 2 do not require teachers or students to source large amounts of data. However, where data is sourced, it should be referenced and used according to legal obligations as listed in the Glossary on page 13.

Example activities

AREA OF STUDY 1: Analysing information problems

Outcome 1

Analyse an information problem in order to produce software requirements specifications for a solution that operates within a networked environment.

Examples of learning activities

discuss concepts such as organisational aims and system goals and objectives with a view to understanding the relationship between them

investigate user needs using a range of methods such as surveys (paper-based, electronic), interviews, email, mailing lists, video conferencing

complete an incomplete data flow diagram, which has a list of processes

discuss the differences between the layers in the OSI model and determine which of these would be the most relevant to a software developer

investigate the role and skills required of the people involved with information systems

investigate the school network and identify the challenges that a software developer would encounter in creating software to reside in and operate on such a network

investigate the types of threats that need to be taken into account when designing software for a network environment

analyse an information problem and document the findings as software requirements specifications (SRS)

Detailed example**ANALYSIS OF INFORMATION PROBLEM**

Rivers Window Tinting (RWT) is a small building company that specialises in window tinting for both commercial and residential buildings.

When a customer calls RWT and requests a quote, the secretary passes this request on to the nearest sales person. The sales person then consults their diary and books a convenient time for the customer to visit the property to discuss what is required. At the property the sales person measures the windows that will be tinted and uses a duplicate quotation pad to work out a rough quotation price. This price is then given to the customer. If the customer accepts the quotation (within 7 days), the installation is booked in at the next most convenient time to the customer. The sales person enters the customer's details and the starting date into a central database at the RWT head office. The installers are then booked. After the installation has been completed, and the work meets with the approval of the customer, the fee for the job is due.

RWT has a small network which consists of three PCs running Windows 7. Each has 400GB HDD, 2GB RAM, DVD R/W, sound card, 1Gb LAN card, keyboard, mouse and 19" LCD monitors. They are located in the following areas: one in the manager's office, one under the secretary's desk and one in the general office used by the sales people. All of the PCs are networked in a star topology with the manager's computer acting as a file server (via shared folders).

Design brief

RWT would like a software solution that will allow RWT to manage customer data at the central office, as well as a mobile software solution that will allow quotes to be accurately made on-site. The first step in this process is the creation of a software specification document.

Students are to complete the following tasks in relation to the above design brief.

Tasks

- Drawing a context diagram and a data flow diagram for the current system.
- Explaining inefficiencies in the flow of data in the organisation and how these are preventing goals being achieved.
- Stating two objectives related to this goal, for the proposed new system.
- Drawing a use cases diagram that describes the way the new software solution will work.
- Listing the tasks that will need to be included in a project management plan.
- Completing a brief software requirements specifications (SRS) that includes: the proposed architecture of the software solution, methods of transmission, modules within the solution and security considerations.

AREA OF STUDY 2: Design and development

Outcome 2

Represent a software design and apply a range of functions and techniques using a programming language to develop a prototype solution to meet a specific need.

Examples of learning activities

desk-check examples of pseudocode and identify the errors

discuss concepts such as debugging, testing and evaluation criteria

give examples of the programming control structures of sequence, selection and iteration in pseudo-code

for each of the types of data structure that are contained in the course, write a short program to read data into that data structure and process the data in some way

discuss the advantages and disadvantages of several types of data structures and suggest scenarios in which the use of them would be most appropriate

discuss the purpose of internal documentation and where the remarks/comments should be placed in the program code

design a test table and test data to check a program module designed to calculate a theatre ticket price for adult customers which gives 15% discount to those over 60 years of age

read short case studies and identify appropriate test data

interpret software specifications by designing and developing a prototype solution

Detailed example**DESIGN AND DEVELOP A PROTOTYPE SOLUTION**

Tolbert IT Services has been contracted by an online auction website to write the software that will manage the auction items, bids and user profiles.

The analysis of the current system has already been completed. Tolbert IT Services have designed aspects of the new system already. They need help in coding the calculation module, which will add a percentage commission to the final bid price and an amount of postage based on the location of the buyer.

The specifications of this module are:

When a sale is finalised, a 12.5% commission is added to the final sale price. The successful bidder enters their postcode, and the postage is calculated by using the table of values below:

0000–0999:	Northern Territory – \$25.00
1000–1999:	New South Wales – \$15.00
2000–2999:	ACT – \$15.00
3000–3999:	Victoria – \$12.00
4000–4999:	Queensland – \$20.00
5000–5999:	South Australia – \$15.00
6000–6999:	Western Australia – \$25.00

The successful bidder may have a coupon that they can enter, which will give them a discount (or other bonus). Even though coupon types can be added or removed, the module that will be created should cater for the following coupon codes:

'BIGSALE' – 10% discount on final total (including the commission and the postage)

'FREEPOST' – free postage

'SMALLCOMMS' – pay only 5% commission

The student task is to write a prototype program that can be used to test the calculation of the final price after a bidder has been successful in their bid for an item.

Students will:

- Write an algorithm in pseudocode to represent the calculation process.
- Design a data dictionary that shows the required data items, a description of their purpose, their format, their size and their data type.
- Design a test table to test the program.
- Include sufficient internal documentation so that others will be able to modify the code as part of the whole system development.
- Test the program.
- Within the testing table, add columns that allow comparison of the program developed with the algorithm. That is, explain how the actual capabilities of the program compare with the intended capabilities by adding columns titled 'intended result' and 'actual result'.

UNIT 4: SOFTWARE DEVELOPMENT

For Area of Study 1, the focus is on the stages of design and development. Students must be provided with a design brief that includes an analysis of an information problem, couched in terms of an SRS.

Students must also explain how their programmed solution takes into account a legal obligation or an ethical responsibility. To do this, students will need an overview of the legal obligations of programmers and the ethical considerations regarding the development of software. Relevant legislation does not need to be rote learned, but rather an awareness of the main provisions is adequate.

Area of Study 2, explores criteria and techniques that can be used to evaluate the efficiency and effectiveness of software solutions that have been implemented into networked information systems environments. Students' responses to the associated assessment task (a written report or test) need to address the evaluation phase of the PSM. At this stage in the PSM, software developers are able to look back to the SRS and compare the results of their efforts to the original design brief.

Students are not expected to evaluate the quality of the solutions that they have developed, but rather consider the strategies that organisations and software developers use to conduct such evaluations. The evaluation process must also consider the extent to which the users of the solutions were supported through strategies such as training and user documentation.

Sequencing of areas of study

There is no flexibility in the sequence of the areas of study as they follow the stages of the problem-solving methodology.

Sources of data

Areas of Study 1 and 2 do not require teachers or students to source large amounts of data. However, where data is sourced, it should be referenced and used according to legal obligations as listed in the Glossary on page 13.

Example activities

AREA OF STUDY 1: Purpose-designed solutions

Outcome 1

Apply stages of the problem-solving methodology to produce a solution for use on a mobile device, which takes into account technical and legal requirements.

Examples of learning activities

discuss the implications of designing software modules for portable computing devices in terms of the available memory, the constraints on the user interface and the methods by which data can be input and output

discuss the ethics of using another programmer's code to complete a software solution, with no permission or recognition of the programmer's work

produce a software module intended for a Pocket PC that will provide a customer with an on-the-spot quote for a painting job, while at the customer's house

debate the comparative value of online help, multimedia tutorials, printed manuals and onscreen help files as forms of user documentation

write types of user documentation (e.g. Quick start guide) for a program and have other members of the class evaluate its effectiveness

discuss the possible reasons for tension between software developers and a group of end-users who are frequently changing the requirements of the software during the development phase

discuss the merits of using different data structures and different methods of file storage

design, develop and test software to enable a restaurant to efficiently handle meal orders

Detailed example**PURPOSE-DESIGNED SOLUTIONS**

Oliver's Mexican Cantina is a small restaurant located in Fitzroy. Paul Oliver, the manager and owner of the restaurant, wishes to improve the communication between the restaurant and the kitchen while reducing the amount of paper that is being used.

A solution needs to be created that will allow the waiting staff to enter orders into Pocket PCs while at the table they are currently serving.

The program should perform the following tasks:

- Allow the waiter to enter the table's order.
- Allow the waiter to confirm the order with the diners at the table – removing or adding any requested items.
- Allow special requests to be appended to the order or to individual dishes.
- Save all of the collected data into a text file.

Once the order has been confirmed, the waiter will transmit the order to the kitchen using another software package. This will take the text file and send it to another program operating on a display in the kitchen area.

Students are to create a software solution to achieve the system objectives.

Tasks

- Writing an algorithm to represent the design.
- Designing what the user interface of the solution will look like and the way it will behave by using screen layout diagrams and storyboards.
- Designing a data dictionary.
- Determining validation techniques.
- Designing a test table to test the software solution.
- Coding and documenting the solution.
- Writing appropriate user documentation.

Paul Oliver argues that as the data being transmitted is not sensitive in nature, there does not need to be any security or encryption included in the program. Discuss this and present an argument for inclusion of security and encryption.

A friend offers a large proportion of their completed code to be included in the solution. Should this offer be accepted? Explain why or why not.

AREA OF STUDY 2: Evaluating purpose-designed solutions

Outcome 2

Recommend and justify strategies for evaluating the effectiveness and efficiency of solutions that operate in a networked environment.

Examples of learning activities

discuss which email messages should be encrypted and whether all emails should be filed

use the Internet to investigate the validity of customer fears about the safety of credit card data transmitted over the Internet

debate the proposition that introducing software to a network requires more planning than introducing hardware to a network

compare two strategies for managing the introduction of a new software solution and debate their appropriateness in different situations

discuss ways of ensuring that data is safe and secure, and ways in which information systems can be restored to full operation following an unforeseen catastrophic event

discuss how staff absentee rates can be an indicator of system performance

read a short case study describing how a new software solution was introduced into a networked information system, and propose how you would evaluate the success of that system

Detailed example

EVALUATING PURPOSE-DESIGNED SOLUTIONS

Jackson Secondary College is a large school of over 1500 students from Years 7 to 12. It has a large hybrid network that consists of over 800 workstations and 10 servers. Workstations are a mixture of both PC and Apple platforms.

Jackson SC wishes to implement a piece of software called 'Easy Survey'. This will allow students to respond to surveys that can be assigned to them over the course of the year. The software allows for any number of surveys to be assigned to any number of students. For example, teachers can survey their own classes, the administration can survey the entire school or surveys can be created for interest groups within the school.

The software was written by a US company called 'Bolt-ware'. One of its original functions was the ability to monitor student activity as soon as the program is activated. Even though Jackson SC is not purchasing the software for this purpose, they see the advantages in utilising this feature.

Another feature of the software is that students are locked out of the school network if they do not

respond to surveys in a set amount of time. The school administration like this feature as well, as it will hopefully ensure a 100% response rate.

The software runs through Internet Explorer 8. The database that stores the data needs to reside on a server together with the main student database.

Students use the above scenario to complete the following tasks:

- State the purpose of the new system.
- Describe the techniques used to test the new software package.
- Describe the documentation needed to support this new system and explain its purpose.
- Identify who will need training, what type of training they will need and when.
- Identify possible security issues that will need to be addressed.
- Explain how the performance of the system will be evaluated and when this will happen.
- Describe possible reasons why the student body may not be happy with the introduction of this new piece of software.

SCHOOL-ASSESSED COURSEWORK**Units 3 and 4: Software development**

In Units 3 and 4 teachers must select appropriate tasks from the assessment table provided for each unit. Advice on the assessment tasks and performance descriptors to assist teachers in designing and marking assessment tasks will be published online by the Victorian Curriculum and Assessment Authority in an assessment handbook. The following is an example of a teacher's assessment program using a selection of the tasks from the Units 3 and 4 assessment tables.

Outcomes	Marks allocated	Assessment tasks
Unit 3		
Outcome 1 Analyse an information problem in order to produce software requirements specifications for a solution that operates within a networked environment.	40	Produce software requirements specifications which document the analysis of an information problem experienced in a small medical practice.
Outcome 2 Represent a software design and apply a range of functions and techniques using a programming language to develop a prototype solution to meet a specific need.	60	In response to software requirements specifications, create a prototype solution that calculates discounts for different types of memberships for a sports organisation.
Total marks for Unit 3	100	
Unit 4		
Outcome 1 Apply stages of the problem-solving methodology to produce a solution for use on a mobile device, which takes into account technical and legal requirements.	45	Information technology solution that allows on-the-spot parking fines to be issued via a personal digital assistant (including internal documentation).
	15	And User documentation and a written report that explains how security and legal matters are managed when creating solutions.
Outcome 2 Recommend and justify strategies for evaluating the effectiveness and efficiency of solutions that operate in a networked environment.	40	A test that focuses on evaluating the success of a purpose-designed software solution for a business that hires tools and equipment in terms of meeting its information, technical and personnel needs.
Total marks for Unit 4	100	

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