Information Technology

Victorian Certificate of Education **Study Design**

Victorian Curriculum and Assessment Authority
2006

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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, flourescent 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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Information Technology

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Contents

IMPORTANT INFORMATION

Accreditation period

Units 1–4: 2007–2010

The accreditation period commences on 1 January 2007.

Other sources of information

The *VCAA Bulletin* is the only official source of changes to regulations and accredited studies. The *VCAA Bulletin*, 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*. The *VCAA Bulletin* is sent in hard copy to all VCE providers. It is available 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 an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment.

The current year's *VCE and VCAL Administrative Handbook* contains essential information on assessment 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

This study focuses on the processing of data and the management of information and information systems to meet a range of individual and societal purposes.

The rapid pace of development in information and communications technology (ICT) is having a major influence on virtually all 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, study, recreation, and in relationships. Social relations and cultural values influence the way ICT is used.

While it is important that students extend their use of ICT as a tool to assist with work, study, recreation and in relationships (which builds on their compulsory education experiences), the study of Information Technology focuses on the capacities, scope and limitations of hardware and software, and their interactions to carry out specialised applications.

With appropriate knowledge and skills, students will be equipped to make use of ICT and make informed personal and workplace choices about future developments and directions in this exciting and challenging field. Innovative approaches to the potential uses of ICT are developed, and students are encouraged to orient themselves towards the future, with an awareness of the implications of these uses.

The study of Information Technology may provide pathways to further studies in IT and to careers in ICT-based areas. It may also prepare students for programs that require either an IT-related subject or for a vast range of careers that require efficient and effective use of ICT.

AIMS

This study is designed to enable students to:

- apply skills, techniques and strategies to creatively and methodically solve information problems and information system problems, in order to foster confidence in using ICT;
- understand the hardware and software components and structure of information systems in order to be capable users and adapters of technology;
- critically evaluate how individuals and society are affected by, and can influence, the use of ICT, in order to confidently initiate or respond effectively to technological change;

- understand how ICT affects the skills, practices and personnel in the workplace, in order to be effective ICT users in the world of work;
- understand the technologies, procedures and legislation that are designed to protect the security and integrity of data, in order to foster the ethical, legal and responsible use of information and technology.

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

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

A glossary defining terms used across Units 1 to 4 of Information Technology is included on page 47.

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. Students may elect to do all six units in this study. All VCE studies are benchmarked against comparable national and international curriculum.

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 notified in the *VCAA Bulletin*. The *VCAA Bulletin* 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*.

MONITORING FOR QUALITY

As part of ongoing monitoring and quality assurance, the Victorian Curriculum and Assessment Authority will periodically undertake an audit of 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 during the teaching year of schools and studies to be audited and the required material for submission.

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.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

In designing courses for this study teachers should incorporate information and communications technology where appropriate and applicable to the teaching and learning activities. The Advice for Teachers section provides specific examples of how information and communications technology can be used in this study.

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

- computers;
- printers;
- a range of software tools, each supporting the solution of a different type of problem. Problem types and associated tools include:
  - formatting, storing and retrieving text; for example, word processor, text editor, database management system
  - 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
  - accessing remote information; for example, email, bulletin board, remote program execution, online information retrieval, software supporting access to satellite data, World Wide Web access
  - creating graphical output; for example, drawing and graphics software
  - program preparation; for example, tools that support programming and scripting, including editing, compilation, execution, debugging/testing;
- link to Internet;
- an ergonomically sound work environment;
- alternative input and output devices; for example, light pen, scanner, digital camera, speakers, plotter, personal digital assistants (PDAs).

KEY COMPETENCIES AND EMPLOYABILITY SKILLS

This study offers a number of opportunities for students to develop key competencies and employability skills. The Advice for Teachers section provides specific examples of how students can demonstrate key competencies 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 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 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 year's *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 Information Technology the student's level of achievement will be determined by school-assessed coursework and an end-of-year examination. The Victorian Curriculum and Assessment Authority will report the student's 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 year's *VCE and VCAL Administrative Handbook* for details on graded assessment and calculation of the study score. Percentage contributions to the study score in 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.

Unit 1: IT in action

This unit focuses on how individuals use, and can be affected by, information and communications technology (ICT) in their daily lives. Students acquire and apply a range of knowledge and skills to create information that persuades, educates or entertains. They also explore how their lives are affected by ICT and strategies for influencing how ICT is applied. Students develop an understanding of the role technology plays in inputting, processing, storing and communicating data and information.

In each outcome of this unit students use software to create solutions and information products. For Outcomes 1 and 3, students use a software tool selected from these types of software: web authoring and multimedia authoring. Additional types of software can be used, such as image editing software, for example, Macromedia Flash and Adobe PhotoShop, but they are not mandatory. For Outcome 2, students use database management software to solve information problems.

AREA OF STUDY 1

IT techniques

When using ICT to solve information problems, students apply a problem-solving methodology and use techniques and procedures to process and manage data, information and files. They must have knowledge of the different characteristics of information in order to create solutions and information products that fulfil their purposes and target particular audiences.

Students develop an understanding of the purposes of information, the characteristics of audiences and the appropriateness of different forms of information products (printed and on-screen) by transforming existing printed products used by specific audiences into on-screen information products. Examples of suitable printed products include instruction manuals, catalogues, magazines, cartoons, games or reports. The printed products should be complex in structure or lengthy enough to warrant navigation paths when transformed into on-screen information products. Examples of on-screen information products include websites and multimedia presentations.

In the process of transforming information products from print to on-screen, students develop and apply knowledge and skills in analysing information problems and in designing, developing, testing, implementing and evaluating solutions and information products. The problem-solving stage of documenting is not addressed in this area of study. During the developing stage, students use web authoring or multimedia authoring software to realise their designs. The evaluating step involves obtaining feedback from specific audiences and incorporating this into the students' own evaluations.

Students develop an understanding of how the transformation from printed to on-screen information products affects the skills and/or work practices of people required to use the information products. In some instances this will be the specific audiences for whom the on-screen information products were created; in other instances, the focus may be on people who are responsible for maintaining the solutions or, depending on the product, updating the information products.

Students use web authoring or multimedia authoring software to create on-screen information products.

Outcome 1

On completion of this unit the student should be able to transform an existing printed information product into an on-screen information product to meet a specific audience need, evaluate the success of this information product, and explain its likely impact on the audience's skills or work practices.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 1.

Key knowledge

This knowledge includes

- characteristics of audiences;
- purposes of information;
- factors affecting the quality of information products;
- a problem-solving methodology involving analysis, design, development, testing, implementation and evaluation;
- design tools for representing solutions and information products;
- design elements that influence the appearance of information presented on-screen;
- characteristics of high-quality user interfaces and effective information architecture of on-screen information;
- formats and conventions applied to information in order to achieve its purpose;
- techniques for manipulating data and information;
- types of file formats and their suitability for printed and on-screen information products;
- file management considerations including naming and classification systems for files, folders and directories, backups, file transfer procedures, communication;
- criteria for evaluating the effectiveness of solutions and on-screen information products;
- techniques for testing solutions and on-screen information products;
- effects of ICT on the skills and work practices of individuals.

Key skills

These skills include the ability to

- analyse requirements needed to produce on-screen information products that meet identified needs;
- select and apply appropriate design tools and techniques to represent the information architecture of on-screen information products;
- apply design elements to enhance the appearance of on-screen information products and the functionality of solutions;
- use web authoring or multimedia authoring software and select and apply appropriate functions, formats and conventions to process data and produce on-screen information products;

- apply testing techniques to confirm whether the on-screen information products operate as intended;
- apply techniques and procedures to manage the production and handling of electronic files;
- evaluate on-screen information products, incorporating feedback gathered from specified audiences;
- explain how the changed form of information products is likely to affect the skills or work practices of specified audiences.

AREA OF STUDY 2

Data management

Databases underpin many ICT applications. Students develop an understanding of the purposes of databases by exploring examples that they and members of their household interact with on a regular basis, such as school records, medical records, banking details, library catalogues, sports membership records.

Students develop and apply knowledge and skills in determining data types required to solve information problems, and in collecting, organising and storing the data. Students examine the flexibility of databases by constructing query searches and sorts, and develop and apply an understanding of design elements that contribute to the effective design of data collection tools, input forms and reports. Where appropriate, students apply mathematical calculations to the data and may create macros to perform repetitive tasks.

Students apply a problem-solving methodology; however, the stages of documentation and evaluation are not addressed in this area of study.

Outcome 2

On completion of this unit the student should be able to solve an information problem by collecting data and using database management software to manipulate that data.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 2.

Key knowledge

This knowledge includes

- a problem-solving methodology involving analysis, design, development, testing and implementation;
- purposes of databases and their applications;
- structure of a database, including fields, records and tables;
- capabilities and limitations of database management software to manipulate data;
- design tools for representing input forms and reports;
- tools for representing the structure of databases;
- data types and data formats;
- data sources and methods of data acquisition;
- characteristics of effective data collection tools and user interfaces for the purposes of entering data;
- techniques for structuring databases to meet different needs;

- techniques for manipulating data;
- techniques for validating data;
- techniques for searching, sorting and filtering sets of data that meet specific criteria;
- formats and conventions applied to create effective reports;
- roles, functions and characteristics of hardware components used to input, store, communicate and output data and information.

Key skills

These skills include the ability to

- explain the purposes of databases and their applications;
- analyse information problems in order to identify the reports required from databases and the data needed to produce the reports;
- use appropriate techniques to describe data types and database structures;
- identify and collect data from appropriate sources, using data collection tools designed to facilitate efficient data entry;
- apply suitable functions to validate and process data efficiently;
- construct simple queries to locate data that match specific criteria;
- apply formats and conventions to create effective reports;
- explain how the software and hardware components interact to enable the input and storage of data.

AREA OF STUDY 3

ICT issues

Applications of ICT can affect the social and economic wellbeing of individuals and societies. This area of study involves consideration of contemporary issues associated with the areas of:

- Privacy of information
- Ownership of information
- Data mining and record matching
- Digital divide
- E-commerce
- Internet ethics
- Electronic monitoring
- Artificial Intelligence
- Robotics
- Environment
- Games and entertainment.

Working in teams, students will develop knowledge about how the applications of particular ICT can cause tensions between different stakeholders. When exploring these issues, students take into account relevant legal, social, economic and ethical factors. They have the opportunity to learn how ICT can be used to visualise their thinking about the issues. Students use web authoring or multimedia authoring software to create on-screen information products that present each of the stakeholder's viewpoints, the team's stance on the issues and the team's strategies for encouraging individuals to influence how ICT is applied in particular situations.

Project plans are developed to record tasks to be completed and team member responsibilities. During the development of information products, progress is monitored and recorded. Dedicated project management tools do not have to be used.

Outcome 3

On completion of this unit the student should be able to contribute collaboratively to the creation of an on-screen information product that presents an analysis of a contemporary ICT issue and substantiates a point of view.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 3.

Key knowledge

This knowledge includes

- applications of ICT in a range of settings;
- how data is processed by the technology related to contemporary issues;
- legal, social, economic and ethical factors contributing to contemporary issues;
- personal and/or professional responsibilities of stakeholders;
- positive and negative concerns of an issue for each stakeholder;
- visualising thinking tools for supporting reasoning and decision-making when analysing issues and ethical dilemmas;
- information search strategies and methods of referencing source data and information;
- techniques for manipulating data and information;
- formats and conventions applied to information in order to achieve its purpose;
- strategies for coordinating the technical and human resources required to create solutions and information products;
- strategies for influencing how ICT is used for particular purposes.

Key skills

These skills include the ability to

- select and apply appropriate tools and techniques to acquire and reference data and information from a variety of sources;
- prepare plans that identify tasks and responsibilities of a team, and timelines and indicators for monitoring progress;
- explain the nature of the selected issues, including identification of the stakeholders;
- explain the relationships between the selected issues and their associated technology;
- analyse the causes and effects of the issues using visualising thinking tools;
- synthesise information regarding the selected issues in order to fairly and accurately report stakeholders' viewpoints;
- substantiate, with evidence, team viewpoints regarding the issues;
- use web authoring or multimedia authoring software and select and apply suitable functions, formats and conventions to process data and produce on-screen information products.

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 skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and 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 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 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:

- using ICT tools and techniques, produce a solution and an information product 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, such as sporting clubs, charitable institutions, small businesses and government agencies use ICT. Students acquire and apply a range of knowledge and skills to create solutions and information products that meet personal and clients' needs. They also examine how networked information systems are used within organisations.

Students develop and apply knowledge and skills in using two different software tools. One tool must be a programming or scripting language that enables students to manipulate data, for example, Javascript, Actionscript, Visual Basic, Java, php. The other software tool should be selected from these types of software: web authoring and multimedia authoring, and, where appropriate, be supported by image editing software, such as Macromedia Flash and Adobe PhotoShop. Students also explore career pathways that involve using knowledge and skills associated with programming or scripting languages.

Working collaboratively in teams is an important and effective problem-solving strategy, and this strategy is applied when students solve information problems for clients in the community.

In each outcome of this unit, students use software tools. For Outcome 1, the software tool should be a programming or scripting language. For Outcome 2, students use software that supports the creation and presentation of animated images, such as multimedia authoring and web authoring. Image editing software may be used in conjunction with these software types. For Outcome 3, students use one or both of the software tools studied for this unit.

AREA OF STUDY 1

Programming and pathways

Programming or scripting language software enables purpose-designed solutions and information products to be created. Students undertake a series of discrete tasks to create a folio that demonstrates progression in acquiring and applying programming or scripting knowledge and skills. An electronic journal is used to record the new knowledge and skills applied in each task, and to reflect on the learning progress by evaluating the extent to which the knowledge and skills are successfully 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 will focus on:

- workers who could be categorised as information system providers, such as systems analysts, programmers, technical writers, and workers who could be categorised as information system users, such as graphic designers, reporters, teachers;
- entry requirements to specific ICT jobs;
- the main roles and tasks involved in ICT jobs;
- career opportunities and pathways.

Outcome 1

On completion of this unit the student should be able to demonstrate progression in the ability to use a programming or scripting language, record the learning progress electronically, and explain possible career pathways that require the use of the software skills.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 1.

Key knowledge

This knowledge includes

- techniques for manipulating data and information;
- naming conventions for files and objects;
- data types and methods of representing and storing text, sound and images;
- methods of representing software design;
- techniques for checking that solutions meet specifications;
- testing and debugging techniques;
- characteristics of logically constructed electronic journals;
- roles and responsibilities of people who develop and support ICT within organisations;
- ICT career opportunities and pathways.

Key skills

These skills include the ability to

- interpret and represent design specifications using appropriate tools;
- apply techniques for manipulating data and information using a programming or scripting language;
- apply testing techniques using test data;
- select tasks to compile a folio that demonstrates progression in the application of the appropriate software tool;
- 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 2

Networks

Networked information systems exist when two or more systems are linked, for example, via cables or wireless technology, so that they can share files and programs, send and receive communications and share resources. Through investigations of networks within organisations, students develop knowledge and understanding of how sets of data flow within networks, including where and how the data is stored and at what points further processing of the data occurs. The networks can be presented as case studies.

Students develop knowledge of tools to represent data flows and the design of networks. They use software that enables visual representations, such as web authoring and multimedia authoring and, where appropriate, animations to indicate data flows.

Outcome 2

On completion of this unit the student should be able to represent a networked information system within an organisation, and describe the way a specified set of data flows through the system, where it is stored, and where it is processed.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 2.

Key knowledge

This knowledge includes

- reasons for organisations using networked information systems;
- types of information systems and networks;
- an overview of types of transmission media;
- an overview of network topologies;
- functions and characteristics of hardware and software components of networks;
- strategies for securing data and information stored and communicated within and between networks;
- tools for representing data flows, including data flow diagrams;
- tools for representing the logical design and physical design of a networked information system, including context diagrams and simplified network diagrams;
- design elements that influence the appearance of information presented on-screen;
- techniques for manipulating data and information when creating visual representations.

Key skills

These skills include the ability to

- identify types of networks within organisations and briefly explain why they are used in those settings;
- use web authoring or multimedia authoring software and, where appropriate, image editing software, and select and apply suitable functions and design elements to visually represent the equipment and the key sources of data used in networked information systems;
- document the logical designs of networked information systems;
- annotate visual representations (physical designs) of networks to show storage points, processing points and security points and, where appropriate, animate the representations to show data flows.

AREA OF STUDY 3

Tools, techniques and procedures

When using ICT to solve information problems students apply a problem-solving methodology to create solutions and information products, and use techniques and procedures to efficiently and effectively process and manage data, information and files. Students undertake all of the stages of the problem-solving methodology except for documentation.

By working in teams to solve information problems for known clients, students develop an understanding of how constraints imposed by clients affect the techniques and procedures applied when creating solutions and information products. Individual team members prepare designs for the solutions and information products. Collectively, they consider the designs and select one, based on agreed criteria, and make adjustments, if appropriate. These designs are considered by 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 create the entire solution and information product, or each student can contribute to the completion of the team's solutions and information products. 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 such as a teacher or a librarian;
- an organisation such as a sporting club, a charitable organisation, a small business, for example, a farm, a retail outlet, a medical centre.

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

Collaborative problem-solving involves students sequencing tasks, estimating timelines, recording task responsibilities and determining indicators to monitor the progress of projects. Team members record and monitor progress through shared electronic files. One or more of the following software tools should be used to solve the information problems:

- a programming or scripting language;
- multimedia authoring or web authoring software, supported by image editing, if required.

Outcome 3

On completion of this unit the student should be able to work collaboratively to design a solution and an information product for a client, taking into account client feedback, solve the information problem, and evaluate the efficiency and effectiveness of the solution and product.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 3.

Key knowledge

This knowledge includes

- role of end-users in shaping how ICT is used to create solutions and information products;
- a problem-solving methodology involving analysis, design, development, testing, implementation and evaluation;
- strategies for acquiring feedback from clients;
- nature of constraints on solutions and information products;
- design elements that influence the appearance of information products and the functionality of solutions;

- design tools for representing solutions and information products;
- formats and conventions applied to the presentation of information in order to achieve its purpose;
- techniques for manipulating data and information;
- procedures for effectively managing the production and handling of data and information;
- testing techniques;
- criteria for evaluating the efficiency and effectiveness of solutions and information products;
- strategies for coordinating the tasks, people and time required to create solutions and information products.

Key skills

These skills include the ability to

- analyse information problems, including identification of the constraints on solutions and information products;
- select relevant design features that suit the needs of the clients;
- select and apply appropriate tools and techniques to represent the appearance of the products and the production of the solutions;
- liaise with the clients in order to obtain feedback on the preferred designs, and make adjustments, where necessary;
- prepare and follow plans that coordinate the tasks, people and time required to produce solutions and information products;
- use a programming or scripting language, or web authoring or multimedia authoring software and select and apply suitable functions, formats and conventions to produce solutions and information products;
- apply techniques and procedures to manage the production and handling of files;
- select and apply testing techniques;
- apply criteria to evaluate the efficiency and effectiveness of solutions and information products;
- work effectively as a team member.

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 skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and 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 skills should not be assessed separately.

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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:

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

Units 3 and 4:
IT applications

Unit 3: IT applications

Units 3 and 4 are designed to be taken as a sequence. In Unit 3, students use web authoring and database management software to solve information problems. In Unit 4, they use web authoring or multimedia authoring software as well as spreadsheet software to solve information problems. Additional software can be used to support the development of solutions and information products, for example, image editing software, such as Macromedia Flash and Adobe PhotoShop.

Unit 3 focuses on how individuals or organisations use ICT to solve information problems and to participate actively in a society where use of ICT is commonplace. Students acquire and apply knowledge and skills in solving information problems to assist in decision-making and in managing tasks and timelines. The solutions and information products should meet the specific needs of organisations such as sporting clubs, newsagencies, charities, or the needs of individuals. Students also explore how the capabilities of networked information systems support teams of workers or learners to solve problems and share knowledge.

For Outcome 1 of this unit, students must use database management software to solve information problems, and for Outcome 2, students use web authoring software to create prototypes of websites.

AREA OF STUDY 1

Problem-solving

When using ICT to solve information problems, students apply a problem-solving methodology comprising the stages of analysing, designing, developing, testing, implementing and evaluating, and use techniques and procedures to efficiently and effectively process and manage data, information and files. The problem-solving stage of documenting is not addressed in this area of study. In the developing stage, students use database management software to create solutions and information products that utilise a relational database. They create effective user interfaces, apply mathematical calculations to data, create macros to perform repetitive tasks, construct queries and sorts, and create reports that assist in decision-making.

Students develop knowledge of strategies and techniques for managing projects, including planning and monitoring tasks, time and resources. The project plans must be developed in the designing stage of the problem-solving methodology.

Students are presented with design briefs, which describe the decision-making needs of audiences, organisations or individuals within organisations, and their current information-processing practices.

A list of minimum software capabilities or equivalents suitable for database management software will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin*.

Outcome 1

On completion of this unit the student should be able to propose and apply project management and problem-solving strategies to produce a solution and an information product, using database management software, which meets the decision-making needs of a specific audience.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 1.

Key knowledge

This knowledge includes

- project management strategies for coordinating the creation of solutions and information products;
- types of decisions made in organisations, including strategic, tactical and operational;
- characteristics of audiences;
- a problem-solving methodology involving analysis, design, development, testing, implementation and evaluation;
- purposes of databases and their applications in a range of settings;
- capabilities and limitations of database management software to manipulate data;
- structure of databases, including fields, records, tables;
- naming conventions to support efficient use of databases;
- advantages and limitations of flat file databases and relational databases;
- data types and data formats;
- characteristics of effective user interfaces;
- design tools including Input-Process-Output charts, data tables, structure charts, annotated diagrams/mock-ups, layout diagrams;
- techniques for validating and efficiently processing data;
- procedures for effectively managing the production and handling of data and information;
- formats and conventions applied in the creation of information products in order to meet their purposes;
- techniques for testing solutions and information products, and testing for user acceptance;
- criteria for evaluating the efficiency and effectiveness of solutions and information products.

Key skills

These skills include the ability to

- analyse current information-processing practices in order to identify the nature of the problems, the requirements of the information products in order to meet the identified decision-making needs, and the constraints of the solution;
- select and apply appropriate design tools to represent the input requirements, the processing steps and the output requirements;
- prepare project management plans and monitor the progress of the projects;
- use database management software and apply suitable functions, formats, conventions, data validation and testing techniques to efficiently process data and produce effective products;
- evaluate how the efficiency of the solutions and the effectiveness of the products meet identified decision-making needs.

AREA OF STUDY 2

Organisations: Networks and collaborative problem-solving

Organisations need information in order to make decisions that will assist in achieving their goals. Information systems that are networked can support collaborative problem-solving and the sharing of knowledge between individuals, employees and organisations. Students develop an understanding of the variety of settings in which networked information systems are used in our knowledge-based society for the applications of collaborative problem-solving and knowledge sharing by real and virtual teams.

Students develop knowledge of types of networks, network architecture and protocols, and the functions and characteristics of network operating systems. They develop knowledge and understandings of how networks enable the sharing of files, the sending and receiving of communications, the sharing of resources to support these applications, and the protection of data and information used by virtual teams.

Students demonstrate their understandings of these applications by designing websites and creating working prototypes of these websites. This entails using design representation tools to show the appearance and information architecture of the complete website, but only producing, through the use of web authoring software, those parts that support the two identified applications, namely, collaborative problem-solving and the sharing of knowledge.

Students develop and apply knowledge and skills in designing high-quality user interfaces and effective information architecture, and in using web authoring software. Additional software can be used to support the development of websites.

Students identify the network requirements for both the organisations and individual users, who are part of the virtual team, that are needed to support the applications of knowledge sharing and collaborative problem solving. Examples of network requirements include security devices, transmission media and operating systems.

Students respond to a scenario that describes the nature of the organisation, its goals and current practices regarding:

- decision-making and knowledge sharing
- personnel responsible for problem-solving
- current file management practices
- data security procedures

and states:

- circumstances that require the sharing of knowledge
- membership of the virtual team
- information needs of the virtual team.

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

Outcome 2

On completion of this unit the student should be able to design, create and evaluate a prototype website that meets an organisation's needs of sharing knowledge and collaborative problem-solving within a virtual team environment, and explain the requirements of the networked information system that supports the use of this website.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 2.

Key knowledge

This knowledge includes

- organisational goals and objectives and how these can be achieved through networked information systems;
- an overview of types and characteristics of networks, and functions of network operating systems;
- types of information systems and settings in which they are used;
- suitability of types of transmission media to support local and remote communication, including cabling and wireless links;
- characteristics of collaborative problem-solving practices and knowledge sharing practices within virtual teams;
- design elements that influence the presentation of on-screen information products;
- characteristics of high-quality user interfaces and effective information architecture of websites;
- design tools for representing websites including storyboards, annotated diagrams/mock-ups, layout diagrams, site maps;
- techniques and procedures for manipulating information in order to create working prototype websites;
- techniques and procedures for managing and transmitting files used in a virtual team environment including encryption, access hierarchy, regular backups, virus-detection software, classifying and naming files into appropriate directories/folders, version control;
- criteria for evaluating the effectiveness of websites.

Key skills

These skills include the ability to

- identify the needs of the virtual team;
- select and apply appropriate tools and techniques to represent the user interfaces and information architecture of websites;
- select and apply appropriate design features for websites;
- use web authoring software and select and apply suitable functions, formats and conventions to produce prototypes of websites;
- apply techniques and procedures for effectively managing the production and handling and protection of data and information;
- apply criteria to evaluate the extent to which the prototypes meet the needs of the organisation;
- describe and justify the hardware and software network requirements of the organisation to support the virtual teams;
- describe the hardware and software that is required by individual members of the virtual team to participate in knowledge sharing and collaborative problem-solving in the virtual environment.

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 an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and 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 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 to the study score.

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

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 an assessment handbook published 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 optional assessment tasks are used, teachers must ensure that they are comparable in scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Propose and apply project management and problem-solving strategies to produce a solution and an information product, using database management software, which meets the decision-making needs of a specific audience.	40	A solution and information product in response to a design brief. Students annotate the solution and information product to indicate how the identified decision-making needs are met. **And**
	10	A project management report that includes the management plan and a record of progress, created using software tools.
Outcome 2 Design, create and evaluate a prototype website that meets an organisation's needs of sharing knowledge and collaborative problem-solving within a virtual team environment, and explain the requirements of the networked information system that supports the use of this website.	30	A prototype website. **And**
	20	One of the following that focuses on the evaluation of the prototype and the recommended network requirements for the organisation and one team member: • a test • a written report.
Total marks	**100**	

*School-assessed coursework for Unit 3 contributes 25 per cent to the study score.

Unit 4: IT applications

This unit focuses on how ICT is used by organisations to solve ongoing information problems and in the strategies to protect the integrity of data and security of information. Students develop and acquire knowledge and skills in creating solutions and information products using spreadsheet software that can be re-used in the future with new sets of data. When solving information problems, students apply all of the problem-solving stages: analysis, design, development, testing, documentation, implementation and evaluation. Students apply their ICT knowledge and skills to record their decision-making strategies when solving information problems and to reflect on the effectiveness of these strategies.

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

Students are required to use two types of software for Outcome 1: spreadsheet and web authoring or multimedia authoring.

AREA OF STUDY 1

Organisations and information needs

When solving ongoing information problems experienced in organisations, students develop knowledge of how information systems enable information needs to be met. Through the application of ICT techniques and procedures and a problem-solving methodology, ongoing solutions are developed that support the goals of these systems. Students also develop knowledge and skills in producing user documentation that supports solutions, whose use are ongoing.

Solutions with an ongoing capacity to process new sets of data are created using spreadsheet software, and on-screen user documentations are created using software such as web authoring or multimedia authoring. Students can use any appropriate software when retracing and analysing the decisions made and actions taken when problem-solving.

Outcome 1

On completion of this unit the student should be able to use spreadsheet software to solve an ongoing information problem, taking into account the information needs of an organisation, and evaluate the effectiveness of their problem-solving strategies.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 1.

Key knowledge

This knowledge includes

- types of decisions made in organisations, including strategic, tactical and operational;
- goals of organisations and information systems;
- role of hardware and software components of information systems;
- a problem-solving methodology involving analysis, design, development, testing, documentation, implementation and evaluation;
- reasons why information problems occur;
- design tools for representing solutions and information products;
- techniques and procedures for efficiently and effectively processing data to create solutions and information products that meet specific needs, including the application of formats and conventions, the validation of data and the testing of the solutions;
- criteria for evaluating the efficiency and the effectiveness of solutions and information products;
- content and types of on-screen user documentation including quick start guide, tutorial, content sensitive help and manual;
- design elements that influence the appearance of information presented on-screen, including proportion, orientation, clarity and consistency, colour and contrast, usability and accessibility, appropriateness and relevance;
- characteristics of high-quality user interfaces and effective information architecture of on-screen information products;
- techniques for visually representing the decisions to be made and actions taken when problem-solving;
- criteria for evaluating the effectiveness of the decisions made and actions taken when problem-solving.

Key skills

These skills include the ability to

- identify the goals of information systems and explain how the systems enable the creation of the information needed by organisations;
- analyse current information-processing practices in order to identify the nature of the problems, the requirements of the ongoing solutions and the constraints;
- select and apply appropriate tools and techniques to represent the input requirements, the processing steps and the output requirements of solutions and information products, and the on-screen user documentation;
- use spreadsheet software and apply suitable functions, formats, conventions, data validation and testing techniques to efficiently and effectively produce solutions and information products for ongoing information problems;
- use web authoring or multimedia authoring software to create on-screen user documentation;
- evaluate how the solutions, information products and user documentation meet the information needs of organisations;
- record visually the decisions made and actions taken when problem-solving;
- evaluate the effectiveness of problem-solving strategies.

AREA OF STUDY 2

Data and information security

Data and information must be protected from accidental and deliberate actions that compromise the integrity and/or security of data and information. Students develop knowledge and understandings of the nature of these transgressions and actions, and the procedures and technology that are most appropriate for protecting the integrity of data and the security of information. This area of study also provides students with the opportunity to examine key legal obligations of organisations and individuals with respect to the storage, communication and disposal of information, and to consider ethical dilemmas faced by organisations and individuals regarding privacy of information.

Outcome 2

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

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 2.

Key knowledge

This knowledge includes

- an overview of the legal and ethical reasons why organisations should monitor and control the storage, communication and disposal of information;
- accidental and deliberate actions and technical failures that threaten the 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 users;
- possible consequences for organisations of the violation of, or failure to follow, security measures;
- disaster recovery strategies, including testing;
- criteria for evaluating the effectiveness of data security management strategies.

Key skills

These skills include the ability to

- outline the relevant legal obligations of the organisation with respect to how it stores, communicates and disposes of information;
- outline any guidelines used by the organisation to resolve ethical dilemmas;
- propose criteria to evaluate the effectiveness of the procedures and equipment used by organisations;
- describe the nature of threats to the integrity of data and security of information;
- evaluate the consequences of violation of, or failure to follow, security measures for organisations;
- recommend strategies to prevent future accidental and deliberate actions and equipment malfunctions from threatening organisations' data and information.

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 an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and 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 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 to the study score.

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

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 an assessment handbook published 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 optional assessment tasks are used, teachers must ensure that they are comparable in scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Use spreadsheet software to solve an ongoing information problem, taking into account the information needs of an organisation, and evaluate the effectiveness of their problem-solving strategies.	35	A solution and information product in response to a design brief. Students annotate the solution and information product to indicate how the information needs of an organisation are met.
		And
	15	On-screen user documentation.
		And
	10	A visual representation that retraces the decisions made and actions taken when problem solving, and evaluates the effectiveness of these strategies.
Outcome 2 Evaluate the effectiveness of the strategies used by an organisation to manage the storage, communication and disposal of data and information, and recommend improvements.	40	One of the following: • a written report • a test • an annotated visual representation.
Total marks	**100**	

*School-assessed coursework for Unit 4 contributes 25 per cent to the study score.

End-of-year examination

Description

All outcomes and the key knowledge and skills that underpin the outcomes in Units 3 and 4 are examinable. Aspects of some outcomes that require the use of computers will not be examined; however, underpinning key knowledge associated with the practical aspects is examinable.

The examination will be set by a panel appointed by the Victorian Curriculum and Assessment Authority.

Both Units 3 and 4 will contribute approximately equally to the examination.

Format

Students will answer a series of questions in a question and answer booklet. Questions may require students to respond to stimulus material such as design briefs, case studies and visual images. There will be a variety of question types such as multiple choice and short and extended responses.

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 to the study score.

Units 3 and 4:
Software development

Unit 3: Software development

Units 3 and 4 are designed to be taken as a sequence. Unit 3 focuses on the techniques and procedures for determining the ability of networked information systems to meet organisational needs and on how the development of purpose-designed software, using a programming language, helps fulfil these needs. Students explore the roles and functions of networked information systems, and the types of networks. They apply three phases of the waterfall model of the systems development life cycle (SDLC): analysis, design and development. They use this concept as the methodology for making changes to networked information systems.

For Outcome 1 in this unit, students analyse the operations of networked information systems, and explore design options in order to produce the physical design specifications for modified or new networked information systems. In Outcome 2, the development phase of the SDLC is realised by students designing and coding software modules, using a programming language. Students are not expected to fulfil entire software design specifications; only modules need to be developed. Typically the stages of software development involve analysing, designing, developing, testing, documenting, implementing and evaluating. In this unit students are required to engage in the stages of designing, developing and testing. Students also explore how the development of programs is influenced by legal obligations and ethical considerations. In Unit 4 students are required to undertake all stages of software development.

The programming language selected will be studied for both Unit 3 and Unit 4. The language must be a general-purpose language.

AREA OF STUDY 1

Systems analysis and design

Information systems support organisations to achieve their goals. Often these systems have to change for economic, social and technical reasons. The systems development life cycle (SDLC) is a methodology for controlling the development of new or modified information systems. While students develop knowledge of the SDLC, the emphasis in this area of study is on the analysis and design phases.

Students acquire and apply knowledge of networks by examining network components and their relationships. They develop knowledge and understanding of strategies to analyse information systems, and use tools and techniques to describe the logical designs of existing and proposed systems. Drawing on their knowledge of the capabilities and components of networks, students propose physical designs that outline the hardware and software components and security procedures that will enable the logical design specifications to be met. A description of the current networked information systems and their information-processing practices will be presented to students in design briefs.

Outcome 1

On completion of this unit the student should be able to analyse an existing networked information system used in an organisation, and propose physical design specifications for a new or modified networked information system.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 1.

Key knowledge

This knowledge includes

- types of information systems and settings in which they are used;
- information system goals and objectives;
- types of networks, and strengths and weaknesses of different network topologies;
- purpose and functions of operating systems and network operating systems;
- purpose, functions and capabilities of communications technology, including network interface cards, transmission media (cables and wireless), routing devices and protocols;
- economic, social and technical factors prompting organisations to change information systems;
- threats to data integrity and security of information, including deliberate actions, accidental actions and technical failures;
- technical underpinnings of actions that threaten the security of information stored and transmitted, including viruses, trojans, spyware, hacking and denial of service;
- security devices and procedures available to protect data and information;
- the systems development life cycle (SDLC) and techniques for managing this, including a detailed study of the waterfall model of the SDLC and an overview of rapid application development (RAD), prototyping, and Agile models;
- the analysis phase of the SDLC, including identification of what systems currently do and what new or modified systems have to do;
- tools for representing the logical designs of networked information systems, including context diagrams, data flow diagrams, data dictionaries;
- methods for collecting data for analysis, including direct observation, surveys, interviews, reading system program documentation and logs;
- the design phase of the SDLC, including identification of the components (people, procedures, data and equipment) that will enable the logical design specifications to be implemented;
- tools for representing the physical designs of the new or modified systems, including system flow charts, structure charts;
- functions and characteristics of hardware and software components, including security devices available to protect data and information;
- physical design specifications for the input, processing and output requirements that will enable the new or modified information systems to achieve their goals.

Key skills

These skills include the ability to

- explain the economic, social or technical factors causing organisations to change their networked information systems, including reference to security weaknesses; and/or inefficiencies of data processing;
- propose a range of methods to collect data for analysis;

- apply logical design tools and techniques to document existing systems;
- identify the processes, procedures or equipment that must be changed in order to fulfil an information system goal or objective;
- describe the physical specifications of the new or modified system, including the input and output devices, format, size and use of files, software capabilities, control procedures, backup procedures, security procedures;
- represent visually the components of proposed networked information systems and their relationships.

AREA OF STUDY 2

Software development

While area of study 1 focuses on the analysis and design phases of the systems development life cycle (SDLC), the focus of this area of study is on the development phase, in particular, the development of the software. Students develop knowledge, skills and understanding of the tools and techniques for developing the software to meet the specifications identified in the design phase of the SDLC.

Students focus on the designing, developing and testing stages of software development. When expressing software designs students become familiar with methods such as flow charts, pseudocode and Nassi-Shneiderman diagrams, and develop a detailed understanding of one of them. The solutions developed by the students should be modules that meet a part of software design specifications. These design specifications will be provided in scenarios, which include a brief description of the organisations, their information-processing practices or needs and the activities of relevant personnel.

When producing solutions, students develop knowledge and understanding of the legal obligations and ethical responsibilities of programmers.

A list of suitable languages will be published annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin*.

Outcome 2

On completion of this unit the student should be able to produce a software module suitable for implementation on a portable computing device, in response to a design specification, verify its performance against this specification and explain how the program has taken into account an ethical dilemma or a legal obligation.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 2.

Key knowledge

This knowledge includes

- stages of software development, including design, development and testing;
- procedures and techniques for handling and managing files, including security, archiving, backing up and disposing of files;
- data types, data structures and data representation methods;
- data validation strategies;
- types and specifications of portable (mobile) computing devices, including personal digital assistants (PDAs), mobile phones, laptops, gaming consoles;

- methods of expressing software design using data tables and algorithms, including an overview of flow charts, pseudocode, Nassi-Shneiderman diagrams, object descriptions and a detailed understanding of one of them;
- purpose and characteristics of internal documentation;
- naming conventions for program elements;
- legal obligations of programmers and ethical considerations regarding the development of programming solutions;
- characteristics of high-quality user interface;
- criteria for evaluating software, including effectiveness, efficiency, stability, reliability, usability, maintainability;
- a programming language as a method for developing software;
- techniques for checking that coded programs meet design specifications, including construction of test data;
- principles of hardware operation essential to the development of software modules.

Key skills

These skills include the ability to

- interpret the design specifications by representing processes in the form of algorithms and data structures in the form of a data table;
- use a programming language from the list published annually by the Victorian Curriculum and Assessment Authority;
- apply appropriate naming conventions and formatting;
- apply data validation techniques;
- document the code;
- apply relevant constructs of the programming language to produce a working module within the constraints of the chosen portable computing device;
- develop and apply a testing strategy to compare the intended with the actual module capabilities;
- explain how the program has taken into account an ethical dilemma or a legal obligation.

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 an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and 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 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 to the study score.

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

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 an assessment handbook published 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 optional assessment tasks are used, teachers must ensure that they are comparable in scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Analyse an existing networked information system used in an organisation, and propose physical design specifications for a new or modified networked information system.	40 10	In response to a given design brief: • a written report (including documentation of analysis and design) **And** • a labelled visual representation of a networked information system.
Outcome 2 Produce a software module suitable for implementation on a portable computing device, in response to a design specification, verify its performance against this specification and explain how the program has taken into account an ethical dilemma or a legal obligation.	40 10	A software module, in response to a design specification. **And** One of the following: • a written report • a test.
Total marks	**100**	

*School-assessed coursework for Unit 3 contributes 25 per cent to the study score.

Unit 4: Software development

This unit focuses on techniques, procedures and strategies to develop, implement and evaluate proposed networked information systems. Students explore the technical, human, procedural, economic and management factors that need to be considered when undertaking these phases of the systems development life cycle (SDLC). The development phase is realised through the creation of software solutions using the programming language studied in Unit 3.

For Outcome 1 of this unit students continue to study the programming language selected in Unit 3. They are required to engage in all stages of software development: analysis, design, development, testing, documentation, implementation and evaluation. Details of information system objectives and the needs of the users are provided in design briefs. For Outcome 2, students continue their study of the SDLC by examining in detail the phases of development, implementation and evaluation.

AREA OF STUDY 1

Software engineering

This area of study focuses on the range of tools and techniques to produce purpose-designed software. All stages of software development are studied: analysis, design, development, testing, documentation, implementation and evaluation. Students prepare documentation intended for the end-users. Students continue to use the programming language studied in Unit 3.

Students respond to design briefs, which briefly describe the organisations, including a statement of the networked information system objectives and the needs of the end-users.

Outcome 1

On completion of this unit the student should be able to apply the stages of software development to produce purpose-designed software that takes into account a networked information system objective and the needs of end-users.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 1.

Key knowledge

This knowledge includes

- types of information system goals and objectives;
- stages of software development: analysis, design, development, testing, documentation, implementation and evaluation;
- methods of organising files to suit particular software needs, including serial, sequential and random access;
- factors affecting access of data, including file size, storage medium, organisation of files;
- naming conventions for program elements;
- the syntax of a programming language;
- factors affecting software design, including user interface, end-user needs, processing efficiency, development time;
- forms and uses of data structures to organise and manipulate data;
- methods and techniques of representing an algorithm;
- data validation and testing strategies;
- forms of user documentation, including printed, CD, online Internet site, and types of user documentation, including quick start guide, tutorial, content sensitive help and manual;
- applications and purposes of utilities in a programming environment;
- the relationship between the developers of purpose-designed software and end-users.

Key skills

These skills include the ability to

- identify factors affecting the design and implementation of software solutions, taking into account the information system objectives;
- define the requirements of the software solutions;
- represent specifications in the form of algorithms and data tables;
- develop and apply data validation techniques and security procedures;
- develop and apply testing strategies;
- write programs and internal documentation;
- write appropriate user documentation;
- run and debug programs so that they produce output that is well organised and readable and that meets user needs;
- propose evaluation strategies to determine the extent to which the programs fulfil the information system objectives;
- explain how purpose-designed software may cause possible conflict between the individuals or organisations responsible for developing it and end-users.

AREA OF STUDY 2

Systems engineering: Development, implementation and evaluation

This area of study focuses on the systems development life cycle (SDLC) phases of development, implementation and evaluation. By proposing strategies for the development, implementation and evaluation of networked information systems that operate within a global environment, students explore the problems and possibilities for individuals and organisations that arise from operating in this type of environment.

Students develop knowledge and understanding of project management strategies for coordinating the tasks and resources associated with each of the relevant SDLC phases. Their understanding of documentation is further developed by examining types of documentation that support the implementation of systems.

Outcome 2

On completion of this unit the student should be able to propose and justify strategies for managing, developing, implementing and evaluating the introduction to an organisation of a networked information system that will operate in a global environment.

To achieve this outcome the student will draw on knowledge and related skills outlined in area of study 2.

Key knowledge

This knowledge includes

- purposes for organisations using information systems in a global environment;
- advantages and disadvantages for organisations and society in using information systems in a global environment;
- the development phase of the systems development life cycle (SDLC), including the realisation of the physical design specifications with respect to acquiring the identified hardware requirements, acquiring and/or developing software, identifying required personnel and their knowledge and skills, and assembling and testing the new information systems;
- project management tools and techniques to schedule and monitor tasks, assign resources, identify milestones and determine contingency plans;
- technical, human, procedural, economic and management factors influencing the acquisition of specific hardware and software components to fulfil design specifications;
- testing techniques to ensure that the components operate as intended and to gain acceptance of the networked system;
- the implementation phase of the SDLC, including preparation of user documentation, designing and conducting training programs, preparation of disaster recovery plans and the changeover to new systems;
- types of system support documentation to assist end-users with the implementation of the proposed information systems;
- training requirements for the users of the proposed information system, including location of training and nature of training;
- methods for implementing the proposed information systems, including direct, phased, pilot and parallel conversions;
- procedures to protect and secure stored and communicated data and information;
- the evaluation phase of the SDLC, including determining if the information system is fulfilling its design specifications;
- criteria and strategies for evaluating the performance of the proposed information systems.

Key skills

These skills include the ability to

- prepare project management plans for coordinating the development, implementation and evaluation of the proposed systems;
- explain what factors influenced the acquisition of specific hardware and software components and personnel to fulfil the specifications;
- devise appropriate testing strategies;
- propose implementation strategies that include a description of the changeover method, types of documentation, training and procedural requirements and key disaster recovery actions;
- formulate strategies to evaluate the performance of the proposed information systems;
- explain one way in which organisations and their end-users will be affected by the implementation of the proposed information systems.

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 an assessment handbook that includes advice on the assessment tasks and performance descriptors for assessment.

The key knowledge and skills listed for each outcome should be used as a guide to course design and the development of learning activities. The key knowledge and 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 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 to the study score.

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

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 an assessment handbook published 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 optional assessment tasks are used, teachers must ensure that they are comparable in scope and demand. Teachers should select a variety of assessment tasks for their program to reflect the key knowledge and skills being assessed and to provide for different learning styles.

Outcomes	Marks allocated*	Assessment tasks
Outcome 1 Apply the stages of software development to produce purpose-designed software that takes into account a networked information system objective and the needs of end-users.	35	Information technology solution (including internal documentation) in response to a design brief. **And**
	15	User documentation and an explanation of how purpose-designed software may cause conflict between program developers and end-users in one of the following modes: • a test • a written report.
Outcome 2 Propose and justify strategies for managing, developing, implementing and evaluating the introduction to an organisation of a networked information system that will operate in a global environment.	50	One of the following: • a written report • a test.
Total marks	**100**	

*School-assessed coursework for Unit 4 contributes 25 per cent to the study score.

End-of-year examination

Description

All outcomes and the key knowledge and skills that underpin the outcomes in Units 3 and 4 are examinable. Aspects of some outcomes that require the use of computers will not be examined; however, underpinning key knowledge associated with the practical aspects is examinable.

The examination will be set by a panel appointed by the Victorian Curriculum and Assessment Authority.

Both Units 3 and 4 will contribute approximately equally to the examination.

Format

Students will answer a series of questions in a question and answer booklet. Questions may require students to respond to stimulus material such as design briefs, case studies and visual images. There will be a variety of question types such as multiple choice and short and extended responses.

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 to the study score.

GLOSSARY

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

Term	Definition
Analysis	(1) Examination of how an information system works by gathering data about the system, identifying data inputs, documenting the flow of data through the system and the data stores and output. The results of the analysis are documented in a logical design for the new or modified system. (2) Examination of how information is currently produced in order to determine the nature of the information problem, what data is to be processed to produce the required output, and to list any constraints.
Audience characteristics	Attributes possessed by the intended users of an information product. Influencing factors include the gender, special needs, culture, age, status and location of the intended audience.
Authoring software	A category of software that enables users to create multimedia and web information products without the need to write programming code. The software generates the code required to run the application created. Often used for designing web pages (for example, MS FrontPage, Macromedia Dreamweaver), multimedia presentations (for example, Sunburst Hyperstudio, Ulead DVD MovieFactory, MS PhotoStory 3), games (for example, Game Creator, 3D Gamemaker, Conitec 3D GameStudio).
Capabilities	How well a piece of hardware or software can perform its function/s; for example, a modem may transmit data at 56bps; a digital camera may capture images with 1200 x 800 pixel resolution; image editing software may allow the creation and editing of 32-bit images.
Characteristics	The identifying elements of a piece of hardware or software; for example, Microsoft Word can process words, format documents for online use, produce diagrams; Realplayer can play mpeg files; CD burner records data using a laser beam.
Computer system	A combination of components designed to process and store data. It comprises at least one input device, a processing unit, an output device, and a storage device, and may contain a communications device. The components include the cpu, buses, main memory (RAM and ROM) and peripherals.
Constraints	Factors that must be taken into account when solving an information problem. Typically these factors are classified as economic, for example, budget available to create an information product; technical, for example, availability, capabilities and limitations of equipment; social, for example, culture, ethnicity, age, location, education, special needs and status of end-users; operational, for example, the requirement to use specific techniques and procedures.
Conventions	Commonly understood and accepted ways of doing something; for example, displaying file size and download time required for video links in a web page; using a common method for naming objects of the same class; right justifying monetary values displayed in a column; inserting a subject line in an email message.

Design	(1) Identification of the components (people, procedures, data, equipment) required for a new information system, conversion of the logical design of the information system into a physical design, and preparation of evaluation criteria for the system. (2) Determining alternative ways of solving a problem, applying criteria to select the preferred option, documenting the inputs, processes, and outputs of the preferred option and developing criteria for evaluating the finished information product.
Design elements	Factors that contribute to the appearance and functionality of an information product. In this study these elements are proportion (visual hierarchy), orientation (direction/aspect), clarity and consistency, colour and contrast, usability and accessibility, appropriateness, relevance.
Design tools	Methods of representing the appearance and functionality of information products. Tools to represent designs include data flow diagrams, flow charts, pseudocode, Input-Process-Output charts, structure tables, charts and diagrams, annotated diagrams/mock-ups, storyboards, layout diagrams.
Develop(ment)	(1) Acquire, assemble and test a new information system, in accordance with the physical design, ready for implementation. (2) Transform a design into a working information product ready for implementation. A design is not properly developed until it has been tested.
Disaster recovery plans	Intended actions to be taken by organisations in the event of a disaster occurring with their information systems. Typically these plans cover ways in which organisations prepare for potential disaster, how they will minimise the effects of any disasters and how they will resume normal operations after the event. These plans should be documented and tested.
Dispose	To remove/delete unwanted files and can involve the transferring of inactive files to an auxiliary storage area (archiving).
Effectiveness	A measure of how well something works, such as an information system, file management strategies and an information product, and the extent to which it achieves its intended results. Measures of an effective information system include reliability and maintainability. Measures of an effective information product include completeness, readability, attractiveness, clarity, accuracy, accessibility, timeliness, communication of message, relevance and usability. Measures of an effective file management strategy include integrity of data, security, ease of retrieval and currency of files.
Efficiency	A measure of how little time, cost and/or effort is wasted in order to achieve intended results. Measures of an efficient information system include its productivity, processing time, operational costs and level of automation. Measures of an efficient information product include the speed of processing, the functionality of the solution, the ease of use of the solution and output and the cost of information processing.
Electronic journal	A way of electronically documenting learning and storing information for the purposes of reflection. For example, blogs can be developed and maintained as e-learning journals, which should be chronologically ordered and, where appropriate, include links to evidence of learning. Entries are typically brief, with a focus on reflection.

End-users	People who use a computer directly to input or retrieve data and information.
File formats	How data in a file is stored, such as jpeg, bitmap, MP3.
Function	(1) The tasks performed by information system components. (2) Tasks or operations performed by software.
Global environment	An economy in which potential suppliers, customers, employees, or branches may be located anywhere around the globe.
Image editing	Types of software used to create and edit images, for example Macromedia Flash and Adobe PhotoShop.
Implement	(1) The fourth stage of the systems development life cycle (SDLC) that includes activities relating to the introduction of a new or modified system, such as acquiring user acceptance, developing and running a training strategy, developing documentation and changing over an existing system to a new system. (2) Making the software solution ready for use by those who need it. This may involve creating user documentation, making sure that the equipment on which the solution is going to be used can support it, clearing the solution of any test data and protecting the files.
Information architecture	The content and navigation pathways within an on-screen information product. Effective information architecture enables users to intuitively and confidently locate information they require.
Information characteristics	Attributes by which information can be described, including structure (for example, detailed, summarised), form (for example, text, sound, images, statistics), layout and meaning of text and symbols (for example, order of text, placement of icons, formality and tone of text).
Information and communications technology (ICT)	The use of computer-based information systems and communications systems to process, transmit and store data and information.
Information purposes	See purposes of information.
Information product	Information created by using ICT tools, functions and techniques. A product can be an action, viewed on-screen or printed. The quality of an information product is evaluated on the basis of its suitability, reliability, meaning, accuracy, accessibility, completeness, timeliness, relevance and bias.
Information system	The combination of people, procedures, equipment, and data that process data and information. Types of information systems include transaction-processing, office automation, managing information, decision-support, expert support.
Internal documentation	Comments written into program code to explain variables, procedures, methods. Well-documented code assists future programmers to update the program.
Known audience/client	An individual or organisation for whom an information product is specifically created. The solution and product take into account the attributes and needs of that client or audience. The client or audience (individual or organisation) can be real or their details provided in a design brief.

Legal obligations	Legal responsibilities that individuals and organisations have with respect to the ownership and privacy of information. For the purposes of this study the key provisions of the following laws are relevant: *Privacy Act 1988*, *Information Privacy Act 2000*, *Health Records Act 2001* and the *Copyright Act 1968*.
Logical design	Describes the functions required of a system, that is, what is to be done, not how it will be done. Logical design is not concerned with hardware and software requirements but rather with the processes to be performed.
Logical design tools	Methods of representing what is required of an information system, including context diagrams, data flow diagrams and data dictionaries.
Network architecture	The types and characteristics of the network components and how they are connected; for example, routers, switches, cables.
Network operating system	Software that controls the operations of a network; controls the computer systems and peripherals, and the communication between them.
Network topologies	Ways of configuring or laying out a network. Common topologies are bus, star, hybrid.
Networked information system	An information system (people, procedures, data, equipment) in which the equipment is connected to share files and resources, and is able to send and receive communications.
New/modified information system	Any change to any component (people, procedures, equipment, data) of an information system may result in a new (or modified) system.
On-screen information product	Information which is to be viewed only on-screen. It is not intended to be printed. It is created using ICT tools, functions and techniques.
Physical design	Describes how an information system will be physically implemented in order to meet its logical requirements. This involves specifying the technical (hardware and software) components that will enable the logical design specifications to be implemented. Tools to represent the physical design include system flow charts and structure charts.
Portable devices	Devices that are compact and portable and often enable wireless high-speed broadband access, including laptops, personal digital assistants (PDAs), gaming consoles, mobile phones.
Problem-solving methodology	A method for solving information problems. In this study the method chosen involves stages of analysing, designing, developing, testing, documenting, implementing, evaluating.
Procedural factors	Any proposal to change an information system must include consideration of the impact of the proposed change on procedures for controlling data flow through the system.

Project management strategies	Methods of planning, organising and monitoring a project in order for it to be completed on time and within budget. Managing projects may include identifying required functionalities, scheduling and monitoring tasks, allocating resources, identifying milestones and determining contingency plans. Tools to assist in this process include Gantt charts, PERT charts, precedence diagrams, worksheets (spreadsheets) and tables.
Prototype	A model or simulation of a solution or an information product that demonstrates, for example, its functionality, partial navigation options and interface.
Purpose-designed software	Software written by a programmer for a specific purpose.
Purposes of information	(1) To inform – to report about an issue, event, person. (2) To persuade – to assist in making decisions about a course of action or to change a person's point of view on an issue. (3) To educate – to increase a user's level of understanding of a concept. (4) To entertain – to amuse, to give enjoyment, to give pleasure.
Role	The part played by an information system component; for example, the role of a network administrator is to keep the system functioning; the role of a scanner is to read documents and convert them into digital form that the computer can process.
Security devices	Equipment used to assist in the protection of systems and files produced and received by organisations, including virus protection software, encryption software, biometrics, backup media, firewalls, surveillance technology, locks and grills, alarms.
Software	System software is the operating system and utilities programs that control a computer system. Application software are programs that enable users to process data.
Software design factors	Elements which influence the design of software, such as audience needs, specific user interface requirements, processing efficiency and development time.
Software development methodology	A set method for solving information problems using a programming language. In this study the method chosen involves stages of analysing, designing, developing, testing, documenting, implementing, evaluating.
Software module	A small self-contained program that carries out a clearly defined task and is intended to operate within a larger program suite.
Software tools	Software used to perform particular types of functions, for example, software to create information products for on-screen viewing; software for creating models of events and phenomena.
Software types	Specific software that fulfil the requirements of software tools, for example, multimedia authoring and web authoring software are types of software that enable the creation of information products for on-screen viewing.
Solution	A method of achieving a specific information need through the application of technology and techniques. From a solution, a product can be generated, for example, a chart (a product) can be created from a sheet (solution) in a spreadsheet file.

Specifications	The characteristics and capabilities of hardware and software items.
System software	The software that controls the operations of a computer system. It is a group of programs rather than one program. The operating system controls the hardware in the computer and peripherals, manages memory and files, and multi-tasking functions, and is the interface between applications programs and the computer. Utilities programs format, check and defragment disks.
System support documentation	Manuals and instructions that enable technical users of an information system to maintain and update the system. They may include hardware and software specifications and capabilities stored in system information files, file management, backup and disaster recovery procedures.
Systems development life cycle	A method for developing information systems. In this study this method has five main phases: analysis, design, development, implementation, evaluation.
Technique	The way a process is performed; for example, whether a word-processing function is invoked by mouse selection or keyboard shortcut; whether data is gathered by a survey or online questionnaire.
Test	(1) Testing an information system involves checking that procedures, equipment, and staff process data as expected. Each component may be tested and then the whole system tested. (2) Test data should be developed to ensure the procedures and formulas of a solution operate and process data as expected. This test is normally performed during and immediately after the development of the solution. When using a programming language it is called debugging. Once debugged, someone not involved in the program development tests it.
Test plan	A technique for recording tests to be carried out and the expected results of the tests. Typically a plan states the type of test, what test data will be used, what results are expected, and the actual results.
Transmission media	Means by which a communications signal is carried from one system to another (for example, twisted-pair wire, coaxial cable, fibre-optic cable) and wireless links (for example, satellite, microwave and radio and infrared systems).
User documentation	User guides/instruction manuals to enable operational users to use the system. They may include instructions for accessing and using programs, accessing, naming, and saving files, and protocols; for example, for using email, troubleshooting.
User interface	The way a user interacts with a computer system; for example, a screen and keyboard as in a desktop computer or ATM, a keypad as in an ID security system, a barcode reader and screen.
Validate	To check that data input to a computer system is of an appropriate type for processing and within acceptable boundaries.
Virtual team	A group of people who share knowledge and solve problems using ICT. They may never meet face-to-face, conducting all communications via electronic means.

Advice for teachers

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 skills which relate to the outcomes.

Teachers must develop courses that include appropriate learning activities to enable students to develop the knowledge and skills identified in the outcome statements 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 some outcomes, or aspects of an outcome, the assessment tasks are prescribed. The contribution that each outcome makes to the total score for school-assessed coursework is also stipulated.

Flexibility in course design

The order in which the outcomes are addressed may vary from school to school. In some units, there is a developmental relationship between outcomes that suggests a logical sequence. For example, in Unit 2, Outcome 1 should be addressed prior to students attempting Outcome 3. There is knowledge associated with Outcome 1 that is needed before students can confidently tackle Outcome 3. In some units, the order in which outcomes are addressed is not important. Sometimes it may be appropriate for students to engage in learning activities related to two or more outcomes.

Factors such as software tools, items of hardware, solutions development, organisational contexts and types of networked information systems 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 the equipment, interest and experience.

Some outcomes require students to create an information product. Students must represent the design of the solution and any product, where appropriate. For example, the design of a website is best represented in a storyboard. The information displayed in a website is appropriately represented in layout diagrams. The design of a game could be represented in an Input-Process-Output chart or structure chart. A game may have no output or the output may be so simple that the time required to draw a design is not justified. The only output might be a message 'You lost 10 ships. I win!'. If the output is more substantial, say a list of the types of ships lost and their relative value, then the way this information is formatted is important to the user. In this case the design of the output should be represented in a layout diagram.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

In designing courses and developing learning activities for Information Technology teachers should make use of applications of information and communications technology and learning technologies, such as computer-based learning, multimedia and the World Wide Web, where appropriate and applicable to teaching and learning activities.

Teachers are encouraged to incorporate ICT with teaching and learning activities; for example, use of computer-based learning and multimedia, submission of work via the school Intranet, and PowerPoint presentations for student delivered lessons. Students can practice file management skills by organising their own files of learning activities, outcomes, and reference material. In managing their own directories/folders, students will learn the importance of regular file maintenance procedures, such as using appropriate file naming conventions, deleting outdated files, backing up, and archiving.

KEY COMPETENCIES AND EMPLOYABILITY SKILLS

Students undertaking the following types of assessment, in addition to demonstrating their understanding and mastery of the content of the study, typically demonstrate the following key competencies and employability skills.

IT applications

Assessment task	Key competencies and employability skills
Annotated information product	Initiative and enterprise, use of ICT, teamwork (with 'audience')
Written report	Planning and organisation, (written) communication
Website	Problem solving, planning and organisation
Test	Problem solving, planning and organisation, (written) communication, self management
On-screen user documentation	Planning and organisation, use of ICT
Written brief	Initiative and enterprise
Annotated visual representation	Initiative and enterprise, use of ICT

Software development

Assessment task	Key competencies and employability skills
Software module	Use of ICT, problem solving, planning and organisation
Written report	Planning and organisation, (written) communication
User documentation	Planning and organisation, use of ICT
Test	Problem solving, planning and organisation, (written) communication, self management
Written report	Problem solving, planning and organisation, self management, use of ICT
Labelled visual representation	Initiative and enterprise, use of ICT

In completing work for this study, students may also demonstrate other key competencies and employability skills, such as working with others and in teams, and using mathematical ideas and techniques.

LEARNING ACTIVITIES

Examples of learning activities for each unit are provided in the following sections. Examples highlighted by a shaded box are explained in detail in accompanying boxes. The examples that make use of information and communications technology are identified by this icon ICT.

Unit 1: IT in action

Unit 1: IT in action focuses on the importance of ICT in the daily lives of individuals. In particular it highlights how data can be collected, manipulated, organised and stored by individuals to produce effective information products for a variety of real life situations. Different software tools are used including database management, and web authoring and/or multimedia authoring.

By concentrating on the purpose of the information for a specific audience, students will produce appropriate solution and information products enabling them to become competent, creative and critical ICT users.

There are three outcomes in Unit 1 and the sequencing of the outcomes is flexible. All outcomes require students to demonstrate their knowledge and skills when using a range of ICT equipment. It is expected that students demonstrate skill progression in the use of ICT, especially software, and all solutions and information products are developed following accepted information architecture guidelines and agreed formats and conventions.

For Outcome 1, students transform an existing printed product (e.g. catalogue, magazine, manual) into an on-screen information product (e.g. website or multimedia presentation) taking into account the characteristics of the specific audience and the purpose of the product. The new on-screen information product will, in some way, affect all or part of the audience's work practices or skills and this will be identified in the evaluation part of the assessment task. Students use either web authoring or multimedia authoring software, which can be supported by other software such as image editing software, for example, Macromedia Flash and Adobe PhotoShop.

To complete this task, students must follow all stages of the problem-solving methodology except documentation. A fundamental element of this task is the student's ability to design an on-screen information product using a range of appropriate design tools, whilst taking into account design elements like proportion, usability, accessibility, clarity and consistency. Students develop products that allow users to safely, confidently and intuitively follow all navigation pathways; this is referred to as the information architecture of the product.

It is important that students realise that both the audience and purpose are already known and unchanged, and that the new on-screen information product is the result of creative and original ICT use. The existing printed product must be substantial enough to support navigation paths – a one-page 'flyer' would probably not suffice.

Examples of possible products to meet specific purposes include:

- inform (e.g. newspapers, film reviews)
- persuade (e.g. resumes, advertising catalogues, job applications)
- educate (e.g. a range of manuals including First Aid, Victorian learner drivers, sports coaching, computer game instructions)
- entertain (e.g. cartoons, magazines, theatrical scripts, short stories).

Once developed, the on-screen information product is presented to a member of the specified audience for feedback. The specified or known audience can be, for example, an individual, a class, a group. Using both formal and informal techniques to gather feedback (e.g. questionnaires, observation, interviews, etc.), the on-screen information product is evaluated based on attributes such as accessibility, usability and completeness. An important part of the evaluation is reporting on how the on-screen product will ultimately affect existing work practices or skills of the specified audience.

For Outcome 2, students, in response to a design brief that outlines an information problem, follow the problem-solving methodology (except documentation and evaluation) to produce a solution and information product that requires the use of database management software. The information problem that is presented should be sufficient to ensure that a wide range of software functions (such as macros, calculated fields, etc.) can be employed in developing the solution. While students are not required to use a relational database, it may be a preferred option if they are intending to further their IT study.

In preparing for this outcome, students should undertake a range of learning activities directly related to the efficient organising and storage of data. In particular, the skills, knowledge and techniques to efficiently manage data and produce effective information must be adequately covered. In this outcome, students must demonstrate that they can successfully solve information problems related to data management.

When demonstrating this outcome, students should be able to identify and collect their own data from appropriate sources. In designing the database, students will use a range of design tools that enable the representation of the complete solution including the database structure, data format and types, input forms and the reports.

For Outcome 3, students should have researched a wide range of contemporary issues relating to the use of ICT, including privacy, e-commerce, Artificial Intelligence and robotics, computer games and entertainment. In the learning associated with this outcome, students would typically study more than one issue to develop a broader knowledge and appreciation of the social, economic, legal and ethical factors surrounding the use of ICT in today's society. The assessment task, however, should focus on one issue.

As a team, students practice project management skills and techniques to create an on-screen information product that demonstrates their understanding of a contemporary ICT issue, and gives them a platform on which to express an opinion about their selected issue. Dedicated project management software does not have to be used, but team project plans need to be developed. Spreadsheet software is an adequate tool for this purpose.

Students should be encouraged to develop an innovative on-screen information product that maximises their technical skills and maintains the attention of an audience. ICT tools and techniques should be used creatively to present an overview of the issue, including a profile of the key stakeholders, the associated technology, the reasons for the issue, various opinions and appropriate response strategies. Students could develop, for example, a website that includes images (video) of the different stakeholders with audio output. Other examples of products include an online magazine and an animation or cartoon.

AREA OF STUDY 1: IT techniques

Outcome 1

Transform an existing printed information product into an on-screen information product to meet a specific audience need, evaluate the success of this information product, and explain its likely impact on the audience's skills or work practices.

Examples of learning activities

select four different printed and on-screen products and identify the audience and its characteristics

identify different products (both printed and on-screen) according to their purpose


select four websites and produce a structure chart for each website to highlight the navigation levels


produce a folio of samples showing the development in skill acquisition and applications associated with either the web authoring or multimedia authoring software tool and equipment


prepare an evaluation feedback form

acquire a range of printed products that are intended to inform, educate, persuade or entertain and evaluate their effectiveness


transform an existing printed product into an on-screen information product

Detailed example

LEARNER DRIVER'S ON-SCREEN PRODUCT

'U Drive' is a driving academy that teaches driving skills. They are concerned that many teenagers are not adequately prepared for their learner driver's permit. With an average fail rate of approximately 10%, it is obvious that many prospective learners have not adequately learnt the road rules before applying for their permit.

The existing printed booklet 'Road to Solo Driving' is over 180 pages long and is colourful with lots of informative pictures and text. It uses a range of navigation techniques including contents list, chapters, page numbering and an Index page to allow the reader to find the information relatively easily.

'U Drive' thinks that an electronic version of the manual might appeal more to teenagers and would ensure that learner drivers are better prepared before starting on the road.

They envisage an interactive on-screen information product that is not only informative and presents the information in an effective manner, but also includes animations, video, sound, multiple-choice questions, etc. to appeal to a young audience.

The task:

- Analyse the information problem.
- Identify and describe the audience and their characteristics.
- Identify the requirements of the on-screen information product.
- Use appropriate design tools and techniques to design the content and navigation pathways (information architecture) of the on-screen information product.
- Prepare a test plan and test data.
- Prepare an evaluation feedback form and gain feedback from the known audience (teenage learner drivers).
- Produce a report that explains how the skills and knowledge of learner drivers will be affected by the new on-screen information product.
- Use web authoring or multimedia authoring software to produce the on-screen information product.

AREA OF STUDY 2: Data management

Outcome 2

Solve an information problem by collecting data and using database management software to manipulate that data.

Examples of learning activities

produce a folio of samples showing the development in skill acquisition and applications associated with the database software tool and ICT equipment

select four different settings in which databases are used (e.g. sporting club, small business, resource centre and private collection), and list the input data, data types and validation techniques necessary for each application

consider the advantages and disadvantages of three different data collection techniques, e.g. interview, survey, observation

list the characteristics of a database management system, describing its capabilities and limitations

use database software to design a membership database for a local club

create a database solution that an organisation will use continually

Detailed example

CREATING A DATABASE SOLUTION

Centrestage is a costume/fancy dress hire business started by Janice Browne and Sally Clarke in 2003. Janice, an enthusiastic drama teacher, and Sally, an equally enthusiastic dance teacher, recognised that there was a great need in the local community for affordable costume hire.

Local schools, dance academies, community drama companies and individual clients were all paying a lot of money to large commercial organisations to outfit their performers for end-of-year concerts and special events (e.g. annual musicals). Individually, the groups made a lot of the costumes themselves. These were never fully reused and were stored in boxes from year to year.

Janice and Sally recognised that by combining existing resources and charging an annual subscription fee ($50), many community organisations would be able to benefit from a cooperative approach.

Janice and Sally have decided that the following price structure is reasonable:

Individual Hire:

Weekend hire (2 days):	$30 per costume
Overnight hire:	$15 per costume
Refundable deposit:	$20 per costume

Group Hire (more than 10 costumes):

Weekend hire (2 days):	$10 per costume
Overnight hire:	$5 per costume
Refundable deposit:	$50 (total)

At any time, Janice and Sally need:

- a complete stock listing
- a listing of all rented costumes
- the names and addresses of all costumers
- a report that calculates the monthly income.

Tasks to complete:

- Prepare a data structure diagram that lists the required input data.
- Using appropriate acquisition techniques, collect the necessary data ensuring that the correct data type and format is used.
- Develop a database that solves the information problem and uses suitable functions to validate and process the data efficiently.
- Produce a report that explains how the software and hardware components interact to enable the input and storage of data.

AREA OF STUDY 3: ICT issues

Outcome 3

Contribute collaboratively to the creation of an on-screen information product that presents an analysis of a contemporary ICT issue and substantiates a point of view.

Examples of learning activities


use the Internet to investigate how different organisations protect the safety of credit card data transmitted over the Internet

discuss ways of protecting data stored on a network from unauthorised access

read short case studies, identify the key points of the contemporary ICT issue and explain the positive and negative effects


working collaboratively, produce a 'skeleton' website


access two websites and compare the content of the information in articles they present about a current ICT issue

classify a prepared list of contemporary ICT issues according to their nature: legal, social, economic and ethical

outline how you use email, a mobile phone or SMS, and comment on whether it has changed the behaviour of you and your peers


working as part of a team, analyse a contemporary ICT issue and substantiate a point of view

Detailed example

ICT ISSUE

Access a range of websites on the Internet that require you to give personal information, e.g. e-Bay, Coles-On-Line, Commonwealth NetBank, HotMail. Personal information includes your 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.

Your task:

Part A: Project management

- Form a team of three to four members.
- Prepare a project plan that identifies the task, timelines and indicators for monitoring progress.

Part B: Research

Research the contemporary ICT issue:

- Identify the contemporary ICT issue and the stakeholders.
- As a team, gather data from a range of websites using effective search strategies.
- Produce an accurate summary of each stakeholder's viewpoint and the associated causes and effects.
- As a team, decide on a team viewpoint having collected evidence to substantiate that viewpoint.
- Identify strategies that enhance the positive effects or minimise the negative effects of privacy legislation.

Part C: On-screen product

Use web authoring or multimedia authoring software to produce an innovative, creative and original on-screen information product that analyses a contemporary ICT issue and substantiates a point of view.

Unit 2: IT pathways

Unit 2 emphasises the importance of information in organisations like sporting clubs or small businesses. It supports the development of the techniques, skills and knowledge that are required to appropriately manipulate, store and communicate information for an information-based society.

The sequencing of the three outcomes is partially flexible. Outcome 1 (programming or scripting), however, does need to be completed before students select their Units 3 and 4 subjects (IT applications or Software development), so that students can make an informed decision. Outcome 1 must also be delivered before Outcome 3 can be commenced.

For Outcome 1, students use either a programming or scripting language to complete a set of discrete folio tasks that demonstrate skill development. It is not the intention of this outcome for students to design and develop complex programs (as would be expected in Units 3 and 4 Software development). It is advised that the programming language be selected from the list approved annually by the VCAA in the *VCAA Bulletin*.

Students record their progress in an electronic journal by detailing all new skills that were used and demonstrated in each folio task and reflect on their learning. These entries are not intended to be lengthy, and students may use their blogs as a method of storing and communicating records of their progress. Only new skills need to be recorded each time; existing skills do not need to be entered. As part of the skill development, students use appropriate programming design tools to represent their designs. While students may undertake a range of learning tasks, small tasks should be completed under assessment conditions. Students still record their reflections on their learning progress. Typically a folio would comprise three to five pieces of work, demonstrating progress.

Within this task, students also investigate ICT careers and pathways and the technical skills that are necessary to work in an ICT associated area. Both information system providers and information system users are investigated to broaden students' knowledge and appreciation of ICT careers.

For Outcome 2, students must demonstrate their understanding of the components of networked information systems and how data flows through the system and where the data is processed and stored. By using their web or multimedia authoring skills, supported by their image-editing skills, students will visually depict how data is transported through a networked information system.

Through case studies, site visits, videos, practical tasks or guest speakers, students investigate a wide range of networks and develop an understanding of basic network design and architecture, including types, components, topology, security and transmission media. Students are not required to develop in-depth and comprehensive technical knowledge, but simply to have an overview of what constitutes a network and how networks handle data.

In response to a design brief, students apply their multimedia or web authoring skills to create an on-screen information product that visually represents part of an organisation's networked information system. An accompanying report will detail the different types of networks that exist and the logical design that is chosen. Examples include an email system, VASS system, VTAC results, university enrolments, purchasing goods on line, stock control.

Outcome 3 is a multifaceted task that involves the demonstration of project management, problem-solving, evaluation strategies, human resource management, solution design and development.

Following a client-based approach, students follow the problem-solving methodology to work collaboratively in teams, to solve information problems that requires the development of solutions and/or information products using either software tool they studied in Unit 2 (i.e. programming/scripting or multimedia/web authoring). Each team member prepares designs based on the client's brief and as a team select the most suitable combination of designs to solve the information problem. These preferred

designs are then presented to the client for approval and any modifications suggested by the client is incorporated into the final designs. The solution and/or information product can then be developed either individually, or if preferred, as a team. For example, if a client wants an electronic instructional manual, the task responsibilities could be equitably allocated and each team member create a segment of the manual. Alternatively, if the information product size is small, each team member could create the entire product, all following the design endorsed by the client.

The client can be an individual or an organisation. For this outcome, the teacher can arrange the client (e.g. resource centre, local sporting club or small business) or the students can select their own client. For the latter, there must be sufficient access to the client so feedback can be received within the nominated timeframe and proof must be provided that this client-designer consultation has occurred.

AREA OF STUDY 1: Programming and pathways

Outcome 1	***Examples of learning activities***
Demonstrate progression in the ability to use a programming or scripting language, record the learning progress electronically, and explain possible career pathways that require the use of the software skills.	investigate the functions and skills required of people involved with IT
	visit the website of an IT faculty at a major college or university and record the different ICT courses and entry requirements
	design a test table and test data to check a specific calculation
	visit the Australian Computer Society's website and the Australian Bureau of Statistics to obtain information on different ICT pathways
	produce a folio of samples showing the development in skill acquisition and applications associated with the software tool and equipment
	write a simple program that performs calculations given all variables

Detailed example

PROGRAMMING FOLIO

Students undertake a series of tasks to fulfill the requirements identified in a sample below. Students select those tasks for their folio that demonstrate progress of learning.

Sample 1:

Ace Blinds Co. discovered its sales staff can measure windows correctly but they make errors in calculating the customer's price. You have been employed by Ace Blinds Co. to write 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 metre 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 ($6 each) and customers can choose from a range of extra toppings (50c 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.

continued

Detailed example (continued)

In particular Lucky Pizza wants an interactive program the 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:

Avondale 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, etc.)

The total is calculated.

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

Tasks:

Select one of the above samples and using appropriate design tools, design a suitable solution.

Design a test plan and test data.

Using a range of software skills and techniques develop and test the solution.

In a journal, record any new knowledge and skills you have employed in the development of this task, and evaluate the extent to which you can apply these new skills and knowledge.

AREA OF STUDY 2: Networks

Outcome 2

Represent a networked information system within an organisation, and describe the way a specified set of data flows through the system, where it is stored, and where it is processed.

Examples of learning activities

label the parts on a diagram of a networked computer system and explain their functions

interview your school's network manager or technician and then prepare a network diagram for your school's network

recommend a networked information system for simple case studies

investigate the school network, identify its topology, comment on the merits and problems with this topology

complete an incomplete data flow diagram

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

Detailed example

DESIGN A SMALL NETWORK

McCartney & Lennan Real Estate is a successful real estate agency located in a picturesque town in Victoria. Margaret McCartney is the owner/manager and she is ably supported by a receptionist and two other real estate agents. Due to excellent service and a commitment to meeting the needs of their clients, the company has consolidated over the past 2 years and is now considered one of the leading agents in the area.

Margaret has decided to expand her company because an opportunity has presented itself to open another office in a nearby suburb. The vacant shop (formerly a bakery) needs to be set up from scratch, and must include a computer network that satisfies the following requirements:

- Three employees (two agents and a receptionist) need a workstation each
- A workstation is required in reception for customers to access and search for listed properties
- The network will need to store all sales, property listings, rental records, staff details, advertisements and prospective clients
- Adequate printing facilities
- Internet access
- Email for all staff.

Tasks:

Draw a simplified network diagram of the system you would recommend for McCartney & Lennan.

Identify one set of data that is used in the system (e.g. rental payments, house sales, property listings, etc) and draw a corresponding data flow diagram.

State the functions of each of the equipment components.

How will the networked information system help McCartney & Lennan improve efficiency?

Identify different physical and logical security measures that would need to be implemented.

Using appropriate software, develop a representation of the networked information system. Use animation techniques to highlight the data flow through the system including storage points, processing points and security points.

AREA OF STUDY 3: Tools, techniques and procedures

Outcome 3

Work collaboratively to design a solution and an information product for a client, taking into account client feedback, solve the information problem, and evaluate the efficiency and effectiveness of the solution and product.

Examples of learning activities

produce a folio of samples showing the development in skill acquisition and applications associated with the chosen software tool and equipment

access and explore a range of products, commenting on the ease of navigation

review a range of client briefs, identify the constraints and produce appropriate designs

collect samples of output and apply a set of criteria to evaluate its efficiency and effectiveness

create a solution to an information problem that is based on a client brief

prepare a project plan chart for an end of year SRC event (e.g. a social)

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 a 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 a '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.

Task 1

Analyse the information problem including identifying the input and output requirements and constraints.

Task 2

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

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 as 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 (information architecture).

Validate the data and test the site functions.

Task 5

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

Units 3 and 4: IT applications

Unit 3

In Unit 3 students solve information problems using two software tools, to assist organisations to make decisions. Students also examine the capabilities of networked information systems and how they support workers to solve problems and share their knowledge.

Outcome 1 requires students to produce solutions and information products using database management software, which meet the decision-making needs of specified audiences. For the assessment task, students are presented with a design brief that describes the decision-making needs of the organisation or an individual and their existing information-processing practices. Students apply six of the seven stages of the problem-solving methodology to create a database that meets the needs of the audience and employ project management techniques to coordinate the construction of the database. When creating the solution and information product, students need to utilise a relational database and create effective input screens. This would include applying functions to undertake mathematical calculations, use of macros and querying, and sorting and reporting to assist in decision-making.

Outcome 2 requires students to design and produce a prototype website that enables organisations to support knowledge sharing and collaborative problem-solving within a virtual team environment. Students also assess the extent to which the networked information system supports the use of the website for these purposes. Students must gain an understanding of types of networks, network architecture and protocols, and the advantages and disadvantages of networked information systems. While students understanding does not have to be detailed, unlike the requirements of Software development (Units 3 and 4), they need sufficient understanding to discuss the strengths and weaknesses of different networks.

The assessment task should include a case study that describes the nature of the organisation, its goals, current processes for decision-making and knowledge sharing, details of staff responsible for problem-solving, file management practices and data security strategies. The case study should also provide information about events that require knowledge sharing, the people involved in the virtual team and their information needs. The prototype must be created using web authoring software and appropriate tools must be used to represent the appearance and information architecture of the complete website. However, the prototype should only include those parts that support collaborative problem-solving and knowledge sharing.

Unit 4

In Unit 4, students use ICT to solve ongoing information problems and examine strategies used by organisations to protect the integrity of their data and security of information. Students also record their decision-making strategies and reflect on the effectiveness of these strategies. The strategies and devices for storaging, communicating, and disposing of data and information are also explored.

Outcome 1 requires that students use spreadsheet software to solve an ongoing information problem, considering the information needs of the organisation. They evaluate the effectiveness of the solution and information product and they evaluate the success of their problem-solving strategies in meeting the organisation's needs. Students use spreadsheet software to create the solution and information product, and web authoring or multimedia authoring is used to create on-screen user documentation. The recording and analysis of the decisions made and actions taken when problem-solving can be created with an appropriate software tool such as word processing, flow charting.

In this outcome, students engage in all of the stages of the problem-solving methodology and especially focus on the content and types of on-screen user documentation, including quick start guides, tutorials, content sensitive help and manuals. Additionally, characteristics of high quality user interfaces and effective information architecture of on-screen information products should be examined. Information architecture refers to the ability to navigate a website intuitively, confidently and safely. Students should investigate various ways in which their decision-making can be recorded and visually presented and evaluate the usefulness of their choices and resolutions.

For Outcome 2 students need to evaluate the effectiveness of the strategies employed by organisations to manage the storage, communication and disposal of data and information. They need to be able to recommend ways in which organisations can improve their data security. This outcome also requires that students gain an understanding of key legal obligations of organisations to secure their data and information, and ethical dilemmas which may arise and how these can be addressed.

Unit 3: IT applications

AREA OF STUDY 1: Problem-solving

Outcome 1

Propose and apply project management and problem-solving strategies to produce a solution and an information product, using database management software, which meets the decision-making needs of a specific audience.

Examples of learning activities

produce a folio of samples showing the development of skill acquisition with database management software

design a database that will record school texts; identifying the fields required and any relevant validation techniques

in small groups, identify the criteria that will ensure high-quality reports from database management software; present the criteria in order of importance and demonstrate each criterion with an example

create a Gantt chart or PERT network diagram to represent the planning involved in organising the Year 12 Ball; your diagram should show the tasks, sub tasks, milestones and time allocated to each

produce a database that meets the decision-making needs of a specific audience

Detailed example

WESTERN REGION TOY LIBRARY

Four years ago, six families who knew each other through the local kindergarten, came up with an idea to gather their children's toys together and loan them out to one another's children so that youngsters could enjoy a variety of toys and each family was not overspending on the latest toys and gadgets.

The toy library has grown considerably and includes many more families, some who live several suburbs away. Currently the library is located in a large backyard shed, and swapping of toys is done on a rostered basis (different parents volunteer to be on duty managing the Library) every Saturday morning between 9 am and 12 noon. Records of families, payments, purchases, children, toys, borrowings and so on are written by hand into standard exercise books.

Last year, the parents elected a Management Committee for their organisation and introduced an annual family fee to support the ongoing purchase of toys for the library.

The children continue to be delighted with having many toys to choose from, and the families are also pleased as it has eased financial pressures. However, the Management Committee feel that they are living amid an information overload, because the Toy Library continues to rapidly expand and no one person can keep track of all the details, let alone find facts from the records written in various ways by different parents.

In addition, many toys are outdated and need to be replaced. To date, toys were purchased from various toy stores but it is difficult to monitor which toys come from where, and what they originally cost. Furthermore, not all families are paying their annual fees on time and need to be chased up. Toys become lost and, quite often, parents are keeping them beyond the return date. Not all of the library members adhere to the regulations in relation to fees, borrowings and doing rostered duty.

As an IT expert, you have been called in by the Management Committee to help solve their information problem. They want you to find a solution and create a product that they will be able to use after you have left.

They will input data from the old records themselves, but have asked you to populate your solution with enough test data to ensure that all aspects work properly.

- You agree to do the job for $6 500 and have been given 12 days from start to finish.
- You decide to manage it through Project Management, to keep an Error Log during its construction, and to write a detailed report at the end.
- You will provide the Toy Library Management Committee with the solution to be run on their computer that has Office 2003 installed, as a user-friendly package.
- You may assume that all users can use a computer.
- You do not want people interfering with the important parts of your solution, so you should carefully design the parts that users are able to see, and hide the parts you do not want them to see.

Problem-solving steps

1. Analysis
   a. Define the problem.
   b. Define the organisation – type, purpose and goals.
   c. Suggest possible decisions to be made and classify as operational, tactical or strategic.
   d. Analyse the problem using an IPO chart and determine any constraints.
   e. Prepare a project plan that identifies tasks, duration, milestones, and dependent tasks.
   f. Create a Gantt chart for the whole project.
2. Design a solution by:
   a. Determining the data structure (table names, field names, data types).
   b. Determine Queries, Sorts, Forms and Reports to be produced.
   c. Identify data validation tests.
   d. Identify a set of test data to test validation procedures.
   e. Design input screen layout.
   f. Design and justify report layout.
3. Development
   a. Develop solution and monitor progress.
4. Testing
   a. Conduct various tests using the test data and record and amend problems.
   b. Include user testing.
5. Implementation
   a. Finalise your database product.
6. Evaluation
   a. Write a report that evaluates the efficiency of the solution and the effectiveness of the reports in meeting the identified decision-making needs of the organisation.

AREA OF STUDY 2: Organisations: Networks and collaborative problem-solving

Outcome 2

Design, create and evaluate a prototype website that meets an organisation's needs of sharing knowledge and collaborative problem-solving within a virtual team environment, and explain the requirements of the networked information system that supports the use of this website.

Examples of learning activities

visit any two .com websites and evaluate their usability and effectiveness by commenting on the following criteria: standard resolution, loading time, readability of text, ease of navigation, accessibility

choose an information system with which you are familiar such as purchasing a ticket to use public transport, using EFTPOS or an ATM or recording your school attendance; investigate and record the equipment, procedures and people involved in the system

investigate each of the following and create a table that compares their transmission speed, use, advantages and disadvantages: coaxial cable, fibre-optic cable, wireless transmission, microwave transmission and satellite transmission

identify the users of your school network; discuss with your teacher the different access rights that each user has to files on the network

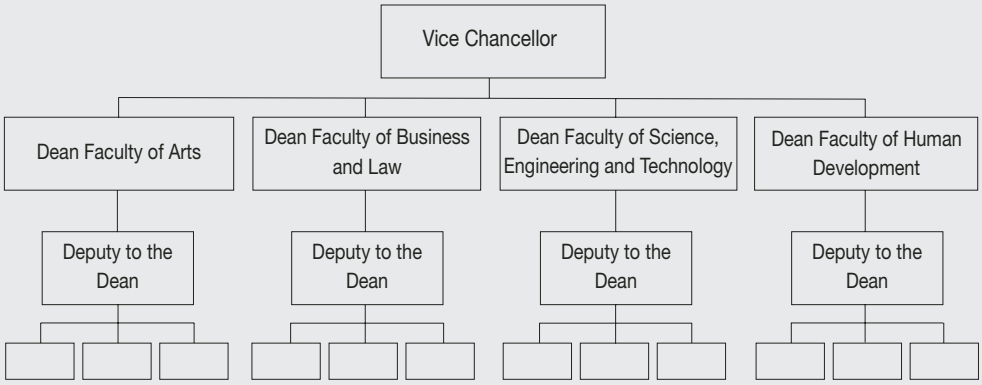
examine your school website; redesign it using a storyboard or site map; ensure that your website includes all the information that is currently available and follows effective web design principles

design, create and evaluate a prototype website that meets an organisation's needs of sharing knowledge and collaborative problem-solving within a virtual team environment

Detailed example

SHERWOOD UNIVERSITY WEBSITE

Sherwood University is a growing organisation with a large campus on the outskirts of Melbourne. Similar to other tertiary institutions, the University comprises several faculties. These are Faculty of Arts, Faculty of Business and Law, Faculty of Science, Engineering and Technology and Faculty of Human Development. The organisational structure within each faculty is as follows:



continued

Detailed example (continued)

Each Head of Department answers to the Deputy of the Dean and each faculty comprises of several departments. Furthermore, teaching and ancillary staff are managed by the Heads of Department.

As the hierarchy suggests:

- the Vice Chancellor is responsible for the overall strategic direction of the University
- each Dean and his/her Deputy are responsible for the decisions made regarding each faculty
- Heads of Department support the tactical decision-making
- teaching and ancillary staff engage in operational decision-making that affects the everyday teaching and learning that takes place.

Recently, the University council formed a Strategic Plan for 2007–2010. Key objectives of this plan are:

- To encourage students to learn, and to provide a basis for their careers and their successful participation in the wider society.
- To ensure that staff work in a creative and rewarding learning community that benefits students, staff and other stakeholders.
- Strengthen current strategic collaborations and forge new alliances that will create new knowledge and opportunities for students, staff, local and global industries.

As a result of this, the University Council has decided to redevelop the University website so as to further enhance the knowledge sharing that takes place amongst staff, students, and external agencies. Furthermore, the website should aim to assist key decision-makers to collaborate in a more productive manner and to solve problems using the technological tools available.

Your task

Design and create a prototype website for Sherwood University that will enable various virtual teams (faculty staff, teaching staff, students, public) to realise their goals and to enhance decision-making, knowledge sharing and collaborative problem-solving.

Analysis of the problem

1. Define the type of organisation.
2. Describe how the organisation works, i.e. consider its prime function (core activity), purpose (goals), functional activities (processing practices) and structure (shape).
3. Provide a problem statement that describes the problem to be solved.
4. Define the benefits to the organisation in redesigning the website – consider their strategic goals.
5. List the audience's information needs (audience includes faculty staff, teaching staff, students, public).
6. Describe the input and output requirements, and the constraints.

Design

1. Represent a solution and an information product using the following design techniques:
   a. Flowchart
   b. Site Map – show the hyperlink interrelationships between the web pages (how the pages link to each other and to external sites)
   c. Web page design layouts/storyboard – detailed drawings of the web pages where you indicate layout, fonts, colours and textures, backgrounds, images, graphics, etc. Ensure that you cite sources of any images or graphics used and provide the required information for each of these.

Testing

1. Test table with test data and results – include individual testing, page testing and user testing.

Development

1. Depict a range of functions, techniques and procedures used to process data – use a range of functions to produce a solution and an information product that enhances decision-making and knowledge sharing; enables collaborative problem-solving and meets the organisational goals.
2. Annotate the solution and information product to illustrate the techniques and functions used to process data.
3. Apply correct formats and conventions to produce the output.
4. Annotate the solution to illustrate the techniques and procedures used to validate the solution and/or product.

A short report that:

1. Evaluates the extent to which the prototype meets the needs of the organisation.
2. Describes and justifies the hardware and software network requirements of the organisation to support the virtual teams.
3. Describes the hardware and software that is required by individual members of the virtual teams to engage in knowledge sharing and collaborative problem-solving in the virtual learning environment.
4. Describes the data security procedures and techniques employed for managing and transmitting files in the virtual team environment.

Unit 4: IT applications

AREA OF STUDY 1: Organisations and information needs

Outcome 1

Use spreadsheet software to solve an ongoing information problem, taking into account the information needs of an organisation, and evaluate the effectiveness of their problem-solving strategies.

Examples of learning activities

collate your results from all subjects for the year in a spreadsheet; use a layout diagram to design a spreadsheet that will record these results, determine your current average and include charts that compare your progress in different subjects

using accepted formats and conventions create the spreadsheet designed above and implement validation rules to ensure that unacceptable data cannot be entered

examine the online help system of a spreadsheet software program; comment on its usefulness

list the characteristics of an item of hardware, describe its capabilities and explain the limitations the item places on the quality of the solution and output you can create

examine the user guide or manual of an electronic product that you own; write a critique of the guide that clearly describes its positive and negative elements

interview a local business manager and identify the organisational goals; record the decisions made by the manager in the last week and classify these as strategic, tactical or operational

solve an ongoing information problem using spreadsheet software, taking into account the information needs of an organisation, and produce on-screen user documentation

Detailed example

WEB WORKS

Wilma Webster has been running a web design consultancy business, Web Works for a year. Web Works is growing rapidly and Wilma has put on six contract staff to assist with the business. Wilma's mother Wendy does most of the paper work for the business as she has had extensive management and business experience. However, she is advanced in years and has a poor memory. Her computer skills are also at a very low level.

Web Works has income from two sources: selling web design services and selling a firewall software package called Proof IT!

Employment contract terms are as follows:

- Staff work a 35-hour week at a normal rate and are paid one and half times their normal pay for extra hours they work.
- Sales commission: Web – 10%, Software – 1% above $1000, 2% above $5000

Currently Wilma has to go through the old forms and paperwork to manually work out everyone's pay. There have been mistakes and it has caused a lot of embarrassment. An example of this week's pay figures and sales data is below.

continued

Detailed example (continued)

Sample payroll data

Name	Hours	Hourly rate ($)	Sales total	
			Web design ($)	Software ($)
Fred Baggins	55	45	0	10 000
Harold Potter	35	40	5 000	0
Matt Matrix	24	45	15 000	0
Beatrix Belle	58	40	2 500	12 000
Aaron Narnia	40	50	0	20 000
Delta Dogood	14	60	2 000	10 000

Pay office tax rates

Income tax rates		Superannuation	
Income ($)	Rate (%)	Income ($)	Rate (%)
0–200	0	0–200	7
201–500	15	201–500	8
501–1000	30	501+	9
1001–1500	40		
1501+	50		

Note that the superannuation is an employee contribution (taken from the employee's wages) and is matched by an equal amount by the employer. Both of these amounts and a total need to be calculated and recorded on the employee's payslip. The income tax is deducted from the total wages.

Wilma would also like a graphical representation of her staff's performance. The information she requires to assess quickly is the amount of web design services and firewall software sold. In addition, an indication of which employees earn more than $1200 is useful.

Problem-solving steps

1. Analysis
   a. Define the problem.
   b. Identify input and output requirements.
   c. Identify any constraints.
   d. Prepare a project plan that identifies tasks, duration, milestones, and dependent tasks.
   e. Create a Gantt chart for the whole project.
2. Design a solution
   a. IPO chart, fully annotated layout diagrams for all aspects of the solution, flowchart to show the processes undertaken to complete the solution, determine software and hardware requirements.
   b. Identify data validation tests.
   c. Identify a set of test data to test validation procedures.
3. Development
   a. Develop solution and monitor progress including an error log.
4. Testing
   a. Conduct various tests using the test data and record and amend problems.
   b. Include user testing.

continued

Detailed example (continued)

5. Documentation
   a. Use layout diagram to design on-screen user documentation.
   b. Create on-screen user documentation using web authoring or multimedia software tool.
   c. Keep a visual record of decision-making and actions taken when problem-solving.
7. Implementation
   a. Finalise your spreadsheet product.
8. Evaluation
   a. Write a report that evaluates the effectiveness of the problem-solving strategies.

AREA OF STUDY 2: Data and information security

Outcome 2

Evaluate the effectiveness of the strategies used by an organisation to manage the storage, communication and disposal of data and information, and recommend improvements.

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/item and identify the weaknesses in the system

examine the *Information Privacy Act* (VIC.) (IPA) and the *Copyright Amendment (Digital Agenda) Act 2000* and create a table that summarises the key legislation affecting the communication, storage and disposal of information

use the Internet to find the code of ethics of various organisations; analyse these and then in small groups write a code of ethics for your school or class

research one of a smart chip on a credit card, keystroke recorder and biometric device on a computer, and discuss their impact on the security of data and information within an organisation

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

Detailed example

PC PEACE

Peter and Penny O'Toole established PC Peace in 2002 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 2002, Peter and Penny have expanded their business and now service 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.

Peter and Penny store their client data on a computer located within an office in 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 until Peter or Penny activate the door latch after visitors have buzzed the bell on 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 developed a software package that businesses can load onto their computers, designed to minimise the threat of data theft through the use of encryption, limiting data access to authorised personnel, and to program regular back-ups of data. He and Penny are currently in the stages of perfecting their software package and know that if they succeed with their development, they have a real chance of taking over the market. Hence they 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 and rival companies are not able to copy the new software package.

Peter and Penny store their client data on a 40 GB hard drive on a computer system. Once a week one of them completes a backup of any files created or updated during the week onto a writeable CD that is stored in a lockable fireproof cupboard in the office. Each CD 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.

For example, a file for Jay's Hair Salon would be stored within a folder called 'Jay's Hair Salon'. If the file was the first version of the initial appraisal created on 21 August, the file would be called 'JAYappraisal1208v1.doc'.

After an initial interview with a client, which usually takes place at the client's place of work, Peter or Penny often contact the business via email to ask additional questions about their procedures and equipment to make sure 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 by courier is sent also, to ensure the business manager receives a record that the report has been received.

Peter and Penny's email program is password protected, and one of the initial recommendations to most businesses is to ensure their email also provides some form of password protection; however, this is not always in place when clients are first contacted.

Once an analysis is completed and recommendations for a client made, Peter or Penny remove the client files from the computer in order to make room for new client files. A copy of each of the computer files is printed and stored in a lockable filing cabinet in the office, along with a CD that contains an electronic copy of all files associated with that client. Also the copy of the client files on the computer is deleted once they are copied to the CD. If the client does not make contact within the following twelve months the printed copy of the files is shredded, files are disposed of in the recycle bin, and the CD is destroyed.

1. Identify the goals of PC Peace.
2. Explain how the information system assists the organisation to achieve its goals.
3. Explain how PC Peace stores, communicates and disposes of files.
4. Describe the strengths and weaknesses of the equipment and procedures used by the organisation to manage the storage of files.
5. Describe the strengths and weaknesses of the equipment and procedures used by the organisation to communicate data and information.

continued

Detailed example

6. Describe the strengths and weaknesses of the equipment and procedures used by the organisation to dispose of files.
7. Describe how the privacy acts impact upon the business.
8. Select one of the procedures currently used by the organisation to manage the storage, communication or retrieval of data and information and explain the potential consequences to the organisation if the procedure is violated or ignored.
9. Recommend some improvements that could be made to enhance the management of storage, communication and disposal of files produced by the organisation.
10. Write some guidelines that could be included in a code of ethics for the organisation.

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 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: IT applications assessment tables.

Outcomes	Marks allocated	Assessment tasks
Unit 3 **Outcome 1** Propose and apply project management and problem-solving strategies to produce a solution and an information product, using database management software, which meets the decision-making needs of a specific audience.	40	A database solution and reports for a toy library. The solution and reports are annotated to indicate how the identified decision-making needs are met. **And**
	10	A project management report that includes the management plan and a record of progress, created using software tools.
Outcome 2 Design, create and evaluate a prototype website that meets an organisation's needs of sharing knowledge and collaborative problem-solving within a virtual team environment, and explain the requirements of the networked information system that supports the use of this website.	30	A prototype website for a university. **And**
	20	A written report that evaluates the prototype and recommends network requirements for the university and one external student.
Total marks for Unit 3	**100**	
Unit 4 **Outcome 1** Use spreadsheet software to solve an ongoing information problem, taking into account the information needs of an organisation, and evaluate the effectiveness of their problem-solving strategies.	35	A solution and information product that manages the payrolls of contract staff. The solution and information product are annotated to indicate how the information needs of the business are met. **And**
	15	On-screen user documentation. **And**
	10	A visual presentation that retraces the decisions made and actions taken when problem solving, and evaluates the effectiveness of these strategies.
Outcome 2 Evaluate the effectiveness of the strategies used by an organisation to manage the storage, communication and disposal of data and information, and recommend improvements.	40	A test.
	100	

Units 3 and 4: Software development

Unit 3

For Outcome 1, students analyse an existing networked information system and describe the design of a new or modified networked information system focusing on the analysis, design and development phases of the systems development life cycle (SDLC). Students must demonstrate knowledge of some system analysis and design tools to represent both the logical and physical designs of an information system.

The logical model describes the functions that are being carried out or need to be carried out by the system. It identifies what is being done or needs to be done; not how it is being done. This design is not concerned with hardware and software specifications, but rather with what processes are being performed or should be performed. Context diagrams, data flow diagrams (DFDs, levels 0 and 1) and data dictionaries are useful tools in representing the logical model of a system. Students must be able to create DFDs and interpret data dictionaries.

A physical model describes how the processing is performed or needs to be performed; for example, whether the data is input by a person or read by a bar code reader, whether a file is in electronic or print form. Tools to represent the physical model include system flow charts and structure charts. For the assessment task, students document only the logical model of the existing system.

As a result of their analysis of the logical model of the existing networked information system, students should create a labelled visual representation of a new or modified networked information system that addresses a need within the organisation. This representation should clearly display the relationships between components of the proposed networked information system; that is, the people, equipment and key data sources. The components must be annotated to indicate the roles of the people and the functions of the equipment. Analysis of the operations of the networked information system is required, including the purpose and function of the network topology, the network operating system, hardware such as network cards, cabling types, bandwidth and communications protocols.

For Outcome 2, students develop a software module suitable for implementation on a portable computing device, such as a laptop, a personal digital assistant (PDA), a gaming console, a mobile phone. Students do not need to develop a whole software application, but one module only. Nor do they need to be able to physically implement the software module on a portable computing device, merely be able to test the functions of the software in a convenient environment in order to demonstrate that the design brief requirements have been met. To achieve this outcome, students must be able to interpret and create flow charts, pseudocode algorithms, and Nassi-Shneiderman (N-S) diagrams. Students write algorithms using one of these three methods. For this outcome and Outcome 1, Unit 4 students use the same programming language to create a software program. The software programs need not be as sophisticated as would be required in actual use in an organisation. The purpose of each response is to serve as a model for a real situation. The programming language must be selected from a list provided annually by the Victorian Curriculum and Assessment Authority in the *VCAA Bulletin*. When appropriate, this list will be updated to include new programming languages.

Outcome 2 requires students to explain how their program 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. An awareness of the main provisions of relevant legislation is required.

Unit 4

For Outcome 1 students apply a problem-solving methodology to produce purpose-designed software in response to a design brief, and prepare a written report. The scenario described in the design brief should include a statement of the networked information systems objectives and the needs of the end-users. It should take into account the outcome requirement that students explain how the software solution they developed may cause conflict between the organisation and the end-user.

This outcome has two assessment tasks. The first task is an information technology solution that includes internal documentation, but not user documentation. The second task comprises user documentation and an explanation of how purpose-designed software may cause conflict between the programmers who develop the solution and the people who use the solution (end-users). This task can be undertaken as a test or a written report. This outcome contributes 50 marks to school-assessed coursework for the unit, but students score a separate mark for each task. The information technology solution is worth 35 marks and the user documentation and explanation is worth 15 marks.

Outcome 2 explores networked information systems that operate in a global environment. For the purposes of the study design this relates to organisations that use the Internet to make e-commerce transactions or to communicate with remote parties (for example, suppliers, customers, branches of a business). This outcome requires the study of a change in a networked information system that operates in a global environment. Students' responses to the associated assessment task (a written report or test) need to address the development, implementation and evaluation phases of the SDLC and strategies to coordinate these. Students are expected to develop skills in creating project management plans including PERT charts or Gantt charts.

When developing a course, a thematic approach can be taken, whereby all the outcomes focus on the one networked information system. Another option is for each outcome 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 outcomes be undertaken in the order in which they appear in the study design. The placement of Outcome 2, Unit 3 and Outcome 1, Unit 4 should allow students the time to acquire the necessary programming skills to demonstrate the outcomes.

Unit 3: Software development

AREA OF STUDY 1: Systems analysis and design

Outcome 1

Analyse an existing networked information system used in an organisation, and propose physical design specifications for a new or modified networked information system.

Examples of learning activities

discuss concepts such as organisational aims and system goals and objectives and demonstrate understanding of 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 a data flow diagram, and list processes

explain the relationship between RAM, processor speed and bus width

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

investigate the school network, identifying what sort of topology it uses and discuss the merits of this topology and how the school network could be improved

design an information system for a small business

Detailed example

DESIGN AN INFORMATION SYSTEM

Gates Home Solutions (GHS) is a small building firm.

When a customer calls GHS and requests a quote, the secretary passes this request on to the nearest salesperson. The sales person then consults his/her diary and books a convenient time for the customer to visit the property to discuss what is required. The salesperson uses a duplicate quotation pad to work out a rough quotation price, which is 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 salesperson enters the customer's details and the starting date into a central database on the PC. The builders / 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.

GHS has a small network which will consist of seven P4s with: 1.4GHz CPU, 40 GB HDD, 128 MB RAM, CD-ROM, sound card, 10/100 LAN card, keyboard, mouse and 17" CRT monitors. They are located in the following areas: one in the manager's office, one on the secretary's desk, one on each of the salesperson's desks (they all share a single office), one in the tea room for general access by the firm's builders and installers and one in the showroom (directly opposite the secretary) for public use.

A file server is located in the manager's office. It has the same specifications as the other computers but has an 80 GB HDD, 256 MB RAM and an 8x CD burner (in addition to the CD-ROM). The file server is connected to a 10/100 network hub with 5 other ports. These ports are connected to each of the other computers in the network (via Cat 5 cable) except for one port which connects to another 10/100 network hub in the salesperson's office, which in turn connects to their computers.

The lack of Internet facilities has led to a downturn in business. Many customers comment that they would have liked to have been able to access a website or an email address to request further details from GHS. In addition to this, GHS has no printing facilities.

continued

Detailed example (continued)

Tasks

- Draw a context diagram and a data flow diagram for the current system.
- Explain inefficiencies in the flow of data in the organisation and how these are preventing goals being achieved.
- State a goal and two objectives of the new system.
- State the functions of the equipment components in the new system.
- Explain the purpose of the network topology and why it is suitable for this network.
- Explain what functions a network operating system will need to perform.
- Propose new items of hardware or software that should be considered by GHS to solve their current difficulties.
- Draw a detailed diagram of the proposed system, including annotations which show where hardware components are located, who they are used by, how they are connected and relevant technical capabilities such as transmission speeds.

AREA OF STUDY 2: Software development

Outcome 2

Produce a software module suitable for implementation on a portable computing device, in response to a design specification, verify its performance against this specification and explain how the program has taken into account an ethical dilemma or a legal obligation.

Examples of learning activities

desk check a given piece of pseudocode and identify the errors

discuss concepts such as debugging, testing, validation and evaluation

compare two representation techniques for program design such as a flow chart and N-S diagram

give examples of the programming control structures of sequence, selection and iteration in a flow chart and in pseudocode

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

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 package, with no permission or recognition of the programmer's work

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

ICT produce a software module intended for a Pocket PC that will provide a customer with a quote for a painting job while at the customer's house

Detailed example

PRODUCE A SOFTWARE MODULE

Brees Painting Services (BPS) is a recently established home renovation/painting firm. BPS employs two salespeople and five painters on a full-time basis. BPS is owned and operated by Drew Brees.

Drew currently has a stand-alone computer on his desk which he has set up to record the customers' details and the starting dates of jobs. This data is entered into a simple database which Drew has set up himself.

Drew has been spending a lot of time considering options for a new computer system at BPS and has settled on the following configuration. Each of his two salespeople will be supplied with new desktop computers and Pocket PCs which they will take to customer's homes to do quotes. On arriving back at the office, the quote information will be added to the database via a desktop cradle connecting the Pocket PC to the desktop PC. A new network will ensure that all PCs are able to access the database.

When the salesperson is preparing the quote, they use a simple formula to determine how much the painting will cost. The length and height of all painting surfaces are measured in metres and then multiplied together to give the total painting area. This is then multiplied by a number of factors which translate this into the time required and the total cost. The customer's details are also recorded at this time.

Design a prototype module that will run on the Pocket PCs and will be able to be used by the sales representatives of BPS to prepare an on-site quote for a customer. A similar product is being prepared by a friend who has been contracted by a firm that performs security door installations.

Tasks:

- Write an algorithm as pseudocode or an N-S diagram.
- Design a data dictionary that shows the required data items, a description of their purpose, their format, their size and their data type.
- Produce a documented working module.
- Test the module.
- Compare the module developed with the algorithm; explain how the actual capabilities of the program compare with the intended capabilities.
- The friend offers you a large proportion of their completed code to include in your own module. Should you accept this offer? Explain your response.

Unit 4: Software development

AREA OF STUDY 1: Software engineering

Outcome 1

Apply the stages of software development to produce purpose-designed software that takes into account a networked information system objective and the needs of end-users.

Examples of learning activities

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

read short case studies and identify appropriate test data


compare and contrast software developed to the same design specifications


write user documentation for a program and have other members of the class evaluate its effectiveness

discuss the possible sources of tension between software developers and a group of end-users whose needs are non-specific and prone to change

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


design, develop and test software to enable a medical practice to store data on its patients

Detailed example

DESIGN, DEVELOP AND TEST SOFTWARE

Tomlinson Medical Centre currently employs three general practitioners (GPs), two pathology nurses and three office administrators. They have recently set up a new networked information system that includes a dedicated PC for each of the GPs and the nurses, as well as two PCs in the main office/ reception area. Each of these PCs is connected to a file server also located in the main office area. A patient database has been created on the file server that contains all of the patient information and their billing details.

A program needs to be created that will allow the GPs to modify or add to patient records from their own PCs.

The program should perform the following tasks:

- Allow patient data to be modified.
- Allow new patients to be added or existing patients removed.
- Allow the results of consultations to be recorded.

You are to create a prototype of the software application required to achieve the system objectives.

Tasks

- Write an algorithm to represent the prototype design. Include representation of the main processes and screen layout diagrams.
- Design a data dictionary.
- Determine validation techniques.
- Design a test table to test the software application.
- Code and document the program.
- Write appropriate user documentation.
- Prepare a written report that explains how the software application could cause conflict between the medical centre and patients.

AREA OF STUDY 2: Systems engineering: Development, implementation and evaluation

Outcome 2

Propose and justify strategies for managing, developing, implementing and evaluating the introduction to an organisation of a networked information system that will operate in a global 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

create a guide for individual users wishing to establish a permanent connection to the Internet for the first time, outlining software they should install, procedures they should follow and issues they should be aware of

compare two strategies for managing change 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 attendance rates can be an indicator of system performance

read a short case study describing proposed changes to an information system; design a plan to manage the implementation of the system

Detailed example

IMPLEMENTING A NEW SYSTEM

The Victoria Hospital (VH) wants to develop a new information system to overcome a nursing shortage because a recent survey found a 30 per cent shortfall of nurses. VH held focus discussion groups and discovered that nurses wanted better rosters, more communication with management, changes to work practices, and education opportunities.

VH will provide ten computers and four Internet kiosks for exclusive nursing staff use. The kiosks will give staff free Internet access and the computers will give updates from hospital management through the hospital's Intranet system. All nurses will have email accounts and nurses on night duty can sort out problems such as payroll from the ward computer instead of coming in during office hours. Nurses can also apply for jobs at a hospital over the Internet and study VH sponsored courses over the Internet.

VH employs 800 nurses and has vacancies for 150 nurses. It currently has a network with a P4 3.2 Ghz 512 MB RAM PC file server running Windows XP, 17" LCD and 2 x 120 GB HDD in a mirrored configuration. The network also has 16 similarly configured PCs each with 256 MB RAM and an 80 GB HDD. This network is run by a Network Manager and is currently used for processing and managing financial data, patient data, and document processing.

An IT consulting company, Janzoon Technologies (JT) provided these specifications for the new system to be installed in the hospital:

- File server similar to the current one, but with 2 x 80 GB HDD in a mirrored configuration
- Five PCs to be similar to the current network computers attached to the file server
- Four Internet kiosks with Windows keyboards, joystick, 15" LCD, 80 GB HDD and ISDN access

continued

Detailed example (continued)

- Windows XP, IE6, MS Office 2003 with Outlook
- Dedicated phone line

Tasks:

- State the purpose of the new system.
- Evaluate the appropriateness of the components suggested by JT.
- Describe the techniques that you will use to test the system components and the whole system.
- Select a changeover method and justify your choice.
- 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.
- State what procedures must be developed to ensure only nurses can use the network.
- Describe the procedures required to ensure records are kept of all emails sent to management.
- Explain how you will evaluate the performance of the system and when you will do this.
- Explain how you will coordinate the development, implementation and evaluation of the system.
- Explain one way the hospital and the nurses will be affected by the new system.

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 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: Software development assessment tables.

Outcomes	Marks allocated	Assessment tasks
Unit 3 **Outcome 1** Analyse an existing networked information system used in an organisation, and propose physical design specifications for a new or modified networked information system.	40 10	In response to a given design brief, a written report (including documentation of analysis and design) on the network requirements for a business that prepares on-site quotations. **And** A labelled visual representation of the networked information system for the above business.
Outcome 2 Produce a software module suitable for implementation on a portable computing device, in response to a design specification, verify its performance against this specification and explain how the program has taken into account an ethical dilemma or a legal obligation.	40 10	A software module, in response to a design specification, that calculates on-site quotations. **And** A test.
Total marks for Unit 3	**100**	
Unit 4 **Outcome 1** Apply the stages of software development to produce purpose-designed software that takes into account a networked information system objective and the needs of end-users.	35 15	Information technology solution (including internal documentation) that allows doctors to modify or add to patient records from their own computers. **And** User documentation and an explanation of how purpose-designed software may cause conflict between program developers and the doctors in the form of a written report.
Outcome 2 Propose and justify strategies for managing, developing, implementing and evaluating the introduction to an organisation of a networked information system that will operate in a global environment.	50	A written report that explains and justifies how a new information system is to be introduced to a small country hospital.
Total marks for Unit 4	**100**	

SUITABLE RESOURCES

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

Some of the print resources listed in this section may be out of print. They have been included because they may still be available from libraries, bookshops and private collections.

At the time of publication the URLs (website addresses) cited were checked for accuracy and appropriateness of content. However, due to the transient nature of material placed on the web, their continuing accuracy cannot be verified. Teachers are strongly advised to prepare their own indexes of sites that are suitable and applicable to the courses they teach, and to check these addresses prior to allowing student access.

TEXTBOOKS

Andersen & Timmer-Arends 2004, *Macquarie Study Guides: VCE Information Processing & Management Units 3 & 4*, Macmillan Education, Australia.

Barnes, A 2002, *Navigating Information Systems*, AC Barnes Pty Ltd.

Ferguson & Zuccon 2002, *Heinemann DIGITAL: Information Technology Units 1 & 2*, Heinemann.

Fitzpatrick, M & Keane, T 2006, *Software Develoment VCE Units 3 & 4*, 3rd edn, Thomson Nelson, Melbourne. (Forthcoming.)

Graham, Meyenn & Thatcher 2003, *Information Processing & Management*, 3rd edn, John Wiley & Sons, Australia.

Janson, A 2005, *Visual Basic Net for Education*, Adrian Janson Publishing.

Meredith et al. 2002, *Heinemann DIGITAL: Information Processing & Management Units 3 & 4*, Heinemann.

McGovern & Norton 2002, *Content Critical*, Pearson Education Ltd, Great Britain.

McGovern, Norton & O'Dowd 2002, *The Web Content Style Guide*, Pearson Education Ltd, Great Britain.

Potts, C, Fitzpatrick, M & Keane, T 2003, *VCE Information Technology Units 1 & 2*, 3rd edn, Thomson Nelson.

Potts, C, Keane, T, Lawson, J & Scott, M 2006, *Information Technology VCE Units 1 & 2*, 4th edn, Thomson Nelson, Melbourne. (Forthcoming.)

Potts, C, Keane, T, Lancaster, J, Lawson, J & Lawson, M 2006, *IT Applications VCE Units 3 & 4*, 2nd edn, Thomson Nelson, Melbourne. (Forthcoming.)

Shortell & Stillman 2004, *Excel Revise in a month VCE Information Processing & Management*, Pascal Press.

CD-ROMs

Design Awareness in Schools, 2006, Victorian Curriculum and Assessment Authority.

Graham, C 2003, *Networking curriculum support CD for senior secondary studies*, Victorian Information Technology Teachers Association.

WEBSITES

Agile Management
www.agilemanagement.net/Articles/hidden/AGSE_Overview.pdf

ASCILITE
www.ascilite.org.au/conference/perth04/procs/farmer.html
(Discussion boards, blogs, online learning environments)

Australian Computer Society
ICT Careers Portal, ACS
www.acs.org.au/ictcareers/careers/descriptions

Australian Copyright Council
www.copyright.org.au

Australian Government, Privacy Laws
Office of Privacy Commissioner
www.privacy.gov.au/

Australian PC
Australian Personal Computer magazine
www.apcmag.com/

Australian Privacy Commissioner
www.privacy.gov.au/act

Communication Research Institute of Australia
www.communication.org.au/html/papers_to_read.php
(Information design)

Computer User
www.computeruser.com

Department of Communications, Information Technology and the Arts
www.dcita.gov./au/ie/benchmarking/csop

DG Communications
PC World magazine
www.pcworld.idg.com.au/

Haymarket Media
PC Authority magazine
www.pcauthority.com.au/

How Stuff Works Inc.
Computers
www.howstuffworks.com

Jupiter Networks
Webopedia – online computer dictionary
www.webopedia.com

MSN
PC User online
www.pcuser.com.au/

Privacy Victoria
Office of the Victorian Privacy Commissioner
www.privacy.vic.gov.au

Step Two Designs
www.steptwo.com.au/about/index.html
(Information architecture)

TechSoup
www.techsoup.org/howto

Tech Target Network
IT encyclopaedia and learning centre
www.whatis.com

The Condé Nast Publications Inc.
Wired magazine online
www.wired.com/wired

University of Southern Queensland
www.usq.edu.au/electpub/e-jist/docs/Vol7_No1/currentpractice/Blogs.htm
(Blogs)

Webopedia
www.webopedia.com

Wikimedia
Wikipedia – The Free encyclopaedia
http://en.wikipedia.org

VIDEOS

The following videos are available from Video Education Australiasia (www.vea.com.au)

Cybersecrecy (1996)

Inside Story – E-commerce Business (2003)
– Social and Ethical Issues in IT (2003)

IT: Counting the Socio-Economic Costs and Benefits (1999)

*Killing Games (*2004)

Sport and Technology (2001)

System Development Lifecycle: A Case Study of Group Wisdom (2002)

ORGANISATIONS

Australian Computer Society
www.acs.org.au

Australian Information Industry Association
www.aiia.com.au

ICT in Education Victoria
www.ictev.vic.edu.au

Victorian Curriculum and Assessment Authority
www.vcaa.vic.edu.au

Victorian Information Technology Teachers Association
www.vitta.org.au