

- *Understand that there are different ways of providing software solutions to specialist applications: - user written, internal development team/department - external software house to specification.*
- *Describe the possible criteria for selection of software solutions to specialist applications and their place within the corporate strategy*

Software Development

General Purpose (off the shelf/Generic)

The organisation could buy an off-the-shelf solution, assuming that the necessary package exists. This has the advantage that it is immediately available and, if it is a widely used and established product it is likely to be reasonably bug free. In addition there may be established user-groups and help lines for the product which will support staff training.

<ul style="list-style-type: none"> • Large numbers are sold, so they are relatively cheap • Continual research and updates • Thoroughly tested • Easy to use • Can give ‘clumsy’ solution 	<ul style="list-style-type: none"> • Rapid availability • Appropriate to wide variety of applications • Suitable for inexperienced user • Extensive documentation • Need to know package inside out
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Bespoke

The organisation could commission software to be written to their specification. This tends to be costly and can take a long time before the solution is ready. If there is no ready written package available and the organisation does not have the necessary staff to write produce their own solution then this may be the only method available.

<ul style="list-style-type: none"> • Should be perfect fit • Can be developed for any application • Should produce better documentation and training 	<ul style="list-style-type: none"> • Changes often difficult to arrange • May take months to produce and test
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In-house

An alternative, in an organisation which has the capability, is to develop an in-house solution. This has the advantage that the people developing the software will have an in-depth knowledge of the requirements but there may be problems if members of the team are required for other work thus causing delays in implementation.

Company IT software policy

The method chosen must comply with the organisation's IT policy for software provision. This will ensure that the new software:

- Fits into the existing support and training structures
- Is compatible with other software and hardware and complies with requirements that may be have been imposed on the use of leased equipment.
- Has an upgrade path consistent with other software used within the organisation

Specialist Applications

A large number of applications have been developed which cater for the needs of various specialised professionals. Examples include musicians, architects, lawyers, designers and managers amongst others.

It is a characteristic of specialised software that the user will need a background in the particular subject area in order to make effective use of the package. When selecting specialist software the user is likely to apply criteria relating to functionality and accuracy above others. In addition the specialist is likely to have been trained to work in a particular way so the HCI will be important. This is demonstrated by the development of graphics tablets for CAD and by the use of a piano type keyboard as input for music systems. In most cases the specialist software will be used for trying out ideas or experimenting with possible solutions to problems so the software will need to allow undoing, deleting and backtracking as part of its editing functions.

Project Management Software	
Geographical Information Systems	
CAD/CAM systems	
Mathematical and Statistical	
Music	

Project Management

The management of a large-scale project will involve organising the allocation of human and other resources to tasks and deciding the order in which tasks are to be accomplished. The problem is made complex because certain tasks will need to be completed before others can be started. In a complex project however there will be a number of different sequences available and a number of tasks will continue in parallel. The management is made more difficult in that some tasks will need particular team members with a clearly defined spread of skills while other tasks could be performed by anyone. Project management software helps the manager assign resources to tasks and to sequence the tasks in the most efficient way, identifying and avoiding potential bottlenecks. It will also help the project manager identify the current status of the project and to monitor its progress. In planning large projects e.g. Millenium Dome, Channel Tunnel etc. It is vital to use project management software to help track and plan projects. Otherwise projects may be cancelled due to cost overruns, quality management problems etc.

The functionality expected will enable a complex project to be broken down into simpler subtasks each with its own completion date and resource requirements.

Specifically

- Allowing the user to input the availability of people and other resources
- To generate the critical path.
- Calculate the time taken for the project to be completed.
- Identify 'slack time'.
- Find the earliest and latest start times for each activity.
- Identify problem areas or 'slippages' as the project progresses.
- Provide reports
- Be able to integrate with your budget data.
- Allow replanning of activities if required.
- Draw different types of graphs and charts - critical path networks, Gantt Charts, work breakdown schedules.

The need for specialist application knowledge

These techniques can save thousands of pounds because a user does not have to stockpile resources. But the use of the software relies upon the good judgement of the user, experience in project management techniques and the ability to motivate the project team.

Geographical information systems (GIS)

Heathcote Chapter 67

A Geographical Information System (GIS) is a computer mapping system. These might show population shifts, route maps, underground pipes etc.

Maps on paper are difficult to keep up-to-date, are relatively inflexible (think of overlays) and sometimes complex to interpret.

A GIS provides information related to geographical position. For example it would provide a delivery service with shortest path delivery routes to reduce fuel costs. It might seem a simple problem to identify the most efficient route to take to visit a number of sites but in fact the problem becomes complex remarkably quickly as the number of points increases. This software can also help managers make decisions about siting distribution centres, methods of distribution and locally based advertising and promotional campaigns.

- British Gas use a GIS to document the location, size and maintenance records of their pipes. Information on abandoned mines, burst main repairs, relining, water quality and soft cleaning is stored on a database. Pipes are stored by map reference. A GIS would enable the information to be stored and displayed geographically and would be able to record precisely the location of bursts. Analyses could be performed relating to the frequency of bursts etc.
- GIS is often used by businesses e.g. a street network can look at the implications of siting a business in an area. Delivery and transportation networks can be analysed.
- Marks and Spencer, Sainsbury, Asda and Woolworth use GIS systems to help in strategic planning e.g. analyse customer profiles, define the most efficient delivery routes and use the GIS to generate "What-If" scenarios.
- GIS can be used to collate, display and analyse data about plagues of locusts.
- A GIS is used to track the movement of the Greenland Ice Sheet.
- The deforestation of the Amazon Basin is monitored by storing and processing data collected from satellites.

CAD / CAM systems Heathcote Chapter 68

Advantages will include

- Being able to integrate with a CAM system to manufacture the component.
- Drawings can be accurate to thousandths of a millimetre.
- Parts of components can be analysed i.e. volume, weight, etc.
- Editing is very easy
- A wire frame drawing can be rendered and rotated in 3-D

You should be aware of the differences between Bit Maps (see page 431) and Vector graphics (see p.433)

The need for specialist application knowledge

- Creativity is required

Mathematical and statistical software Heathcote Chapter 69

Much statistical work involves a large amount of 'number crunching' which is best performed by a computer system. Information is often provided in graphical form and the use of the computer to present the information in this format speeds up the work of the statistician leaving him or her free to interpret the results.

Simulation Software (p.306).

Make your own notes on the following advantages of using simulation software

- Testing
- Safety
- Economy
- Prediction
- Speed and Flexibility.

A Monte Carlo Simulation is often used to calculate figures in risk analysis.

Mathematical software

Rearranging formulas

- Solving algebraic equations
- Calculus e.g. integration and differentiation.
- Working with vectors and matrices.
- Plotting functions.

Write notes on at least three of the applications given on page 308-312

Spreadsheets

We are familiar with

- Goal Seeker (Excel)
- Statistical Functions (Excel)

the following examples can be found

- Financial Planning
- Stock Control Simulation
- Simulating Traffic Lights Arriving at Traffic Lights.

Graphing tools

Specialist statistical packages

- Measure similarities and differences in data (standard deviations etc)
- Perform different types of statistical analysis
- Extrapolating data e.g. forecasting and time series analysis.

- Producing tabular and graphical reports.

Information in newspapers and on TV are available in forecasting the results of General Elections, the effects of the Budget and providing a dynamic model of the economy. The stock exchange and money markets use complex mathematical models, as does portfolio management (Nick Leeson).

Music software Heathcote Chapter 66

One leading area of specialist software development in music is the processing of musical notation. Writing music by hand is a slow and error prone process. A composer would need to write a score containing all the parts for the different instruments. The music for each individual instrument would then be copied out. Specialist software would allow the composer to play each part on a keyboard attached to the computer. The music would appear on the screen where it could be edited using a GUI. When the composer was satisfied then score and parts could be printed. The system has the advantage that the computer can produce a synthesised sound output so that the composer can hear the final result and make any necessary changes.

- MIDI - Musical Instrument Digital Interface- stores all the information about a note - pitch, length, dynamics, type of sound. This can then be synthesised.

A2 MODULE 5 (ICT5) 14.8 SOFTWARE DEVELOPMENT CHAPTER 62)

- SEQUENCER - a mult-track recording studio that allows music to be built up from many separate parts.

<p>Some highly recommended class notes entitled "Software Acquisition and Testing."</p> <p><u>Construx Software</u> Software development checklists. These provide some very useful insights into this topic.</p> <p>http://www.sdmagazine.com/uml/Development</p> <p>http://www.sdforum.org/material.</p> <p>Website dedicated to all aspects of software http://www.school-resources.co.uk/ComputerProjects.htm</p>	Software development	5.8
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EXAMINATION QUESTIONS

1 A range of software packages can be described as “Project Management Software”. What is project management software and what does it do?

Software which provides tools to help the user schedule tasks, manage resources, monitor costs and generate reports for analysis and presentation. (2)

2 The management of a local college has decided to buy a computer-aided design (CAD) package to help to plan the best use of the available space in the college.

(a) Describe suitable hardware to support the user of the package. (4)

(b) Identify two features available in a CAD package that are not generally found in a simple drawing package. (2)

(c) Give, with reasons, three advantages of using a CAD package rather than manual methods for this application.

(d) At various times the management is required to produce statistical reports using a spreadsheet with data currently held in the CAD package. Describe the functionality required by the CAD package to allow this to happen.

(a) Top-range PC with high processor speed, disc capacity and screen resolution. Digitising tablet, plotter, printer. (4)

(b) Any appropriate example: e.g. rotator a vector image, layers etc (2)

(c) Advantages: library of diagrams, cut & paste sections, updating facilities, rotation and views. (4)

(d) Dynamic link or production an export file to a spreadsheet to allow detailed analysis on space e.g. total room utilisation. (2)

1997 A recording studio is considering providing a range of specialist software solutions to support its musical recording and composition work.

List SIX features you would expect such software to include. **(6 marks)**

<i>storage/retrieval of compositions (1)</i>	<i>playback facility (1)</i>
<i>playback in different modes/keys etc. (1)</i>	<i>output to a range of devices e.g. speakers, synthesisers, cd, tape, etc (1)</i>
<i>complex or multi-featured user interface (1)</i>	<i>designed to take account of expert musician/engineer skills (1)</i>
<i>support for range of input devices inc. keyboard, mouse, musical instruments etc. (1)</i>	<i>ability to accept data in a variety of formats e.g. live recordings, CD, tape, other packages (1)</i>
<i>graphical representation of sounds (1)</i>	<i>mix sounds from several sources (1)</i>
<i>simulation of different instruments (1)</i>	<i>library of sound effects (1)</i>
<i>print musical scores (1)</i>	<i>Ignore generic functionality</i>
<i>auto repetition of sounds (1)</i>	<i>edit/update of compositions (1)</i>

1998.3 (6 marks)

A range of software packages can be described as “Project Management Software”. List **six** features that you would expect such packages to include.

- *Max. 6 x 1 from :*
- *add/ edit/ modify project tasks/start dates/end dates/ duration's (1)*
- *add/ edit/ modify resources available to complete tasks(1)*
- *add/ edit/ modify relationships between tasks/subtasks (1)*
- *assign resources to tasks (1)*
- *calculate project completion times (1)*
- *calculate project resource requirements (1) complex or multi-featured user interface (1)*
- *designed to take account of expert project management skills (1)*
- *schedule tasks for best/ critical path/ optimum performance (1)*
- *display/print project in graphical format/chart e.g. Gantt/pert, etc (1)*
- *display/print tabular reports on tasks, resources, etc. (1)*
- *establish milestone tasks (1)*
- *establish a project timeline (1)*
- *change time formats/scales e.g. hours/weeks months (1)*
- *ability to link/share tables between related tasks/projects (1)*
- *Don't accept generic answers such as print, save, cut, paste, etc.*

1999.3 (8 marks) A market research company wants to purchase a statistical package to analyse the results of surveys.

- (a) List **six** features you would expect such a software package to include. (6)
- (b) Explain what other factor is critical for the effective use of this software, apart from an appropriate computer system. (2)

- (a) generic functionality such as print, save, import/export data to/from other packages etc. (1)*
complex/sophisticated HCI to ease data manipulation (1)
standard statistical functions such as mean, standard deviation, probabilities, averages, etc (1)
user defined functions/macros (1)
forecasting/modelling/identify trends (1)
tabulation of data (1)
output of data in graphical form (1)
e.g. Histograms/bar charts/pie charts (1)
carry out standard statistical tests (1)
access to standard statistical tables (such as normal distribution) (1)
methods to facilitate input and management of volumes of data.
(accept sorting) (1)
for survey work- questionnaire design (for OCR/OMR input perhaps) (1)
any 6x1=6
3. (b) IT capability alone is not sufficient (1) – need some knowledge and experience of statistics (1)
ANSWERS ABOUT TRAINING ARE NOT ENOUGH
1+1=2

2000 5 (10)

A college has hired a consultant to manage the implementation of a large building project. A manager at the college has suggested that the consultant should use a spreadsheet to keep track of the tasks that need to be carried out, and the resources needed. The consultant has responded by suggesting that specialist project management software would be more appropriate.

- (a) What factor is critical to the effective use of this specialist software apart from having the appropriate computer system? (2)
- (b) Describe four features of specialist project management software that cannot easily be replicated on a spreadsheet. (8)

Spring 2003.10

Software solutions can be provided for specialist applications in a number of ways. Discuss the possible ways of providing such solutions. Your discussion should include:

- How the solution can be provided;
- Advantages of providing the solution in this way;
- Disadvantages of providing the solution in this way;
- Criteria for deciding which approach is the most appropriate.

The Quality of written Communication will be assessed in your answer (20 marks)

The solution for this question is intended to provide a framework of key concepts rather than a definitive solution. The aim is to establish an agreed standard that can be applied consistently, by all examiners, taking account of the many alternative answers to this type of question.

Allocation of marks:

Possible ways of providing the solution (code as P) - 4 marks

Advantages of each method (code as A) - 4 marks

Disadvantages of each method (code as D) - 4 marks

Criteria for deciding of suitable approach (code as C) - 4 marks

Quality of written communication (code as Q) - 4 mark

Maximum mark for content is 16/20.

Possible way of providing the solution (P marks)

Use generic application package/ generator to develop a specific solution (1)

Purchase specialist software off the shelf appropriate to the specific task (1)

Employ an in-house team to develop a specific solution (1)

Employ external consultants to develop a solution that meets the user specification (1)

Advantages of each method (A marks)

Generic - max 2 marks

Easily available solution c/w the others (1)

Lots of support available in terms of documentation, courses etc. (1)

Can be adapted for solving other problems (1)

Large skill base available in the workforce (1)

Able to transport data to other applications easily (1)

Etc.

Off-the-shelf specific package - max 2 marks

Designed with this type of problem in mind (1)

Relatively short lead-time to operation c/w others (1)

Well supported by developers and other users (1)
Availability of personnel with proven skills on this software (1)
Etc.

Bespoke software - max 2 marks

Exact match to the problem at hand (1)
More control over final outcome c/w others (1)
Possibility of marketing solution if very successful (1)
There may not be a suitable software solution on the market for this problem, so there may be no other choice (1)
Etc.

Disadvantages of each method - (D marks)

Generic - max 2 marks

Solution still has to be created (1)
May not produce the most efficient/ ideal solution(1)
Difficult/ ill advised to alter coding of the application/ alterations may invalidate available support (1)
Etc.

Off-the-shelf specific package - max 2 marks

May not have all the required functionality/ may have too much functionality (1)
May use proprietary file formats that cannot be shared (1)
Upgrades may be hard to get hold of/ expensive (1)
Will the company still be around in the future to support/ develop the product? (1)
Etc.

Bespoke software - max 2 marks

Very long lead-time to completion of project (1)
Most expensive option c/w the others (1)
Problem needs defining unambiguously for the developers (1)
Quality of documentation/ support may not be of the required standard (1)
Etc.

Credit any advantages that are specific to development either in-house or by external consultants.

Criteria for selecting appropriate method (C marks)

*Company policy - does the company insist we **use** a certain method? (1)*
*Time constraints - how long do we have until we have to make **use** of the new software? (1)*
Cost constraints - how much can we afford to spend on this solution? (1)
*Personnel - do we have people with the skills available to purchase/ create/ **use** the new software? (1)*
Support issues - what support is available for this software/ how long will it be available for? (1)
Affect on the company - how will this solution impact on the rest of our business? (1)
Etc.

Credit any reasonable criteria that could be applied to choosing a method of solution.