

MANAGING COMPUTER SYSTEMS

TUTORS

These notes are designed to assist teachers of the course and are in a condensed format. Teachers should also consult the syllabus for this module and adapt these notes accordingly by using extra examples and by filling out this material with detail. Students will be expected to apply the material in a BUSINESS environment and with reference to the particular situation specified in the examination question. Repeating these or any other notes in a generalised form is unlikely to satisfy the required answers for any question.

STRUCTURE OF BUSINESSES

SMALL BUSINESS

One man in control in small businesses who can be in touch with all aspects. When a problem arises, that problem may dominate and mean other areas are neglected. If there is a business use of the web, this may mean further restructuring.

HIERARCHICAL

Business divided by type of work into different levels of skill/seniority. This leads to levels of management. This can impede progress through its bureaucracy. Tends to break down into strategic tactical and operational management.

Division By Product - common where different types of products require different processes e.g. pharmaceuticals, insurance. Some elements may still be separate such as finance. Effectively decentralised control. Experts in particular field grouped together but some competition between groups for resources

Division By Location - where company is dispersed geographically. Enables local needs to be met and local problems handled locally. There is a possible lack of central control. There is likely to be different service provisions for same product in different locations. Regional competitiveness promotes improved performance.

Division By Department - where companies are very large and effectively become sub-companies with main control within the department and loose control from centre. This leads to a longer chain of management, each setting its own targets.

Division By Function - typical in manufacturing where production is controlled separately but all staff come under central human resources control. The career structure is well defined but can produce conflict - each employee promotes his/her own function and not the central needs.

MATRIX

Business is effectively divided into separate projects and thus each needs a project manager but is subject to controls from central management through targets and funding. MATRIX = horizontal + vertical structure. Horizontal enables the project-basis and the vertical enables integration into a functional structure.

Project manager provides leadership and control identifying strongly with the project and team. Vertical manager provides organisational stability. The client has only to deal with project manager when a project is underway avoiding the need to consult several line managers.

This structure clarifies the reporting structure and team members are not at odds with the functional system. There could be some conflict of loyalties for team members

MATRIX is useful in large complex industries such as electronics/aerospace where highly specialised skills are involved and careful co-ordination is needed. It ensures adequate resourcing for each project. There can be collaboration between line and specialist managers - some are advisory, some have direct authority. One person can be responsible for a team. Large projects can be broken into smaller ones without loss of control. Larger companies could have fewer levels of management than smaller ones. The number of employees managed varies but the number of inter-relationships increases rapidly with number of employees.

CENTRALIZATION

This involves a small number of managers holding the majority of the control. For organisations that are physically separated, this can lead to a long decision process, one in

which management may not be in possession of the full facts. Top management must ensure that divisions are working towards the same aims. A consistent service is provided for all customers compared with local variations likely with decentralised control. Centralisation leads to a uniform practice, uniform standards, common use of resources, a corporate identity and increased loyalty. However there could be delays, initiative is not promoted and it demotivates staff. New ideas are difficult to implement and inefficiencies are hidden. Good senior managers needed.

DECENTRALIZATION

This is the spreading of authority. Specialism leads to decentralisation particularly in large organisations. The problem then is to decide how much control to delegate in the form of decisions and budgets. It frees top managers from operational decisions enabling them to concentrate on strategic needs of the organisation. Line managers therefore can take instant decisions without the need to refer back speeding up responses. Local conditions can be taken into account more readily. Local decisions give staff more responsibility and thus more motivation. Local awareness of cost-benefits and targets are increased. However, there could be longer chains of management. Overall control is needed to ensure local decisions are for the good of the whole organisation. This can lead to more rules and procedures, functions duplicated, loss of central control, non-uniform procedures across the company control monitoring is needed. It can be expensive to implement and suited only to large companies.

MANAGER FUNCTIONS

Planning - Forecasting long and short term. Plan for change to combat competition and because of changing circumstances such as legal requirements. Policies should be developed to take into account strengths and weaknesses.

Organising - Enable processing of inputs and resources. The aim is to provide services profitably and make efficient use of manpower and resources.

Controlling - Control changes and innovation by establishing standards, measuring performance and issuing corrective action.

Motivating - Promote employee morale and gain employee commitment. Need to convince employees and overcome resistance. Manager represents his/her own department's interests.

The manager must enable social contact, ensure fair pay, plan and provide training so employees are in control of the job. There must be opportunities for advancement, recognition of achievements and a means to measure progress/achievement. A team spirit must be developed where people know they have support from others. Managers must take an interest in their work, thank them and ensure the job is challenging with people working at their right potential. He must keep employees informed about matters that affect them.

MANAGEMENT BY OBJECTIVES

Integration of employee goals (personal development and job satisfaction) with company goals. The manager's personal goals are linked to success at work with emphasis on final results.

There is a need for strategic plans enabling tactical and operation plans to be developed. Job descriptions and targets must be identified with performance standards.

Advantages of this approach are that priorities are seen clearly, targets are set and progress is reported. Problems are identified and there is a sound basis for measurement and development needs/training

Disadvantages are that the process can become an end in itself where people go-through-the-motions to satisfy requirements. Extra organisation/management may be needed. Superiors can be overburdened with unrealistic targets. Ill feelings may arise. Appraisals can be personal with individual goals at expense of the organisation.

MANAGING STAFF

- Reward good work.
- Give staff opportunity to discuss problems.
- Ensure annual reviews are carried out.
- Provide share schemes.



- Encourage participative management with work councils set up and employee representation on the board.
- Provide suggestion boxes.
- Provide regular machine maintenance to ensure work can run smoothly.
- Monitor staff.
- Keep staff busy without them being overburdened.
- Set up good office layout, reduce paperwork.
- Time analysis charts can lead to better work.

DELEGATION

- There must be clear objectives with the expected outcomes identified.
- Standards should be set for performance.
- Grant appropriate authority to carry out the task with adequate staff, equipment, time and budget.
- Make the reporting arrangements clear.
- Encourage team members to seek help when needed.
- Thank staff for good efforts.
- Early mistakes should be treated as learning opportunities rather than a means to apportion blame.

TEAMWORK

- Set clear objectives.
- Be open with staff.
- Support and trust them.
- Provide co-operation.
- Set sound procedures, appropriate leadership, regular reviews and individual development.
- Promote strong inter-group relations.

KEEPING STAFF INFORMED

- Newsletter to all staff
- Departmental meeting to inform staff as early as possible about development plans and how it will affect them
- Explain training that will be provided
- Invite questions and answer honestly

STAFF PROBLEMS

- Overcome feelings of inadequacy by giving reassurance.
- Recognise dysfunctional behaviour early and with strong control, prevent it spreading. It may be necessary to move or dismiss an employee to set an example.

TIME WASTAGE

Employees can waste time through:

- Idle chatter
- Cigarette breaks although international moves towards banning smoking is reducing this problem.
- Producing unnecessary paperwork – excessive or personal emails
- Interruptions from other employees/external sources
- Lengthy/unnecessary meetings.

DISMISSAL

It may be necessary to dismiss staff because:

- Employee is not capable of fulfilling job requirements
- Changes in legal requirements
- Employee's conduct is unsatisfactory - antisocial
- Dishonest
- Health

- Age – many countries now have legislation to prevent dismissal purely on age grounds
- Redundancy due to falling orders, take-over by another company, change in structuring,
- Change in company direction, company moving site

UNFAIR DISMISSAL

Some reasons why employees may be dismissed unfairly

- Pregnancy - Industrial Relations Acts prevent this in some countries
- Disputes where others were treated differently
- Refusing to join a union

INFORMATION

Definition : Information is data or facts to which meaning or structure has been added.

DATA is input to a computer system and INFORMATION is output – it is not quite as simple as this but this is a good starting point to discuss the difference

What Makes Good Information?

- A It should be Accurate
- C and Complete
- C It should be Communicated appropriately – in the right form and channels
- U It should be User-friendly – easy to understand
- R It must be Relevant – unrelated data can get in the way
- A Information should be Authoritative – users are sure of its reliability
- T It must be Timely – arriving too late may make it useless
- E It must be Easy to use

In addition, information may be unhelpful if it is lengthy. A manager may only need certain parts of the information and may ignore a document if it contains information he does not need (although somebody else may be using that same document for a different purpose).

CLASSIFICATION OF INFORMATION

Questions in the examination are usually targeted at particular business situations and require more than general statements covering all businesses. The following suggestions need to be APPLIED to the applications in question.

Strategic

Typically used by senior managers in head office to plan company objectives. It is likely to be summarised information and statistics. It may contain:

- Competitor pricings
- Market research
- Legal requirements
- Profitability/funding information about the company or particular departments.
- Manning information
- Tactical information passed up from below (give examples)

Typically used by middle management for overall running of departments. It may include:

- Productivity incentives
- Budget control
- Departmental manning levels
- Work schedules for a lengthy period (next 3 months)
- Sales figures and trends
- Problem areas in the department
- Strategic information passed down from above (give examples)
- Operational information passed up from below (give examples)

Operational

Typically used by the lowest management/supervisors and employees performing their jobs. It is likely to be more specific data related to a small part of the company operations. It could contain:

- Day to day sales and customer information – individual orders/transactions
- Employee work schedule information and payroll details
- Work schedules for short periods (1 month/week) including holiday rotas
- Tactical information passed down from above (give examples)

QUESTIONS THAT MIGHT BE ASKED AT EACH INFORMATION LEVEL

Strategic

- What market is the organisation in or should be?
- What markets will it be in the future?
- What products can we provide for our customers?
- What new resources do we need?
- What new resources will we need?
- How will future improvements/developments be financed?
- What do customers want now?
- What will customers want in the future?
- What do our shareholders want?
- Who are our competitors?
- What advantage do we have over them?
- What advantages do they have over us ?
- What are our financial objectives? Are we meeting our objectives financially?

Tactical

- Can we meet current orders?
- What services can we provide for our customers ?
- Is our marketing campaign effective?
- What resources do we need?
- How will we market these services/products?
- What staffing will be needed over the next month in the department including holiday cover?
- Are our standards high enough and how can be improve them?
- Have we sufficient stocks?

Operational

- Do we have enough of product X to satisfy a given order? Shall I re-order?
- Who will be working in the team this week?

MEANS OF PROVIDING INFORMATION TO A MANAGER

- Memorandum or email
- Written report
- Chart – graph, barchart, piechart
- Table of data
- Telephone message
- One-to-one meeting in the manager's office (by appointment)
- Departmental meeting of all staff

PAPER FORM DESIGN

Consider each of the following in designing the form

- Purpose – title to identify to show where it has come from
- Size of paper – Standard sizes are suited for filing and mailing

- Colour of paper – Different colours give an instant visual difference. e.g. the same form could be used for staff travel claims but use Blue for Full-time staff, Green for Part-time staff
- Quality paper – Some forms may be used in adverse conditions
- Order of the data – This assists the form filler and later keyboard input
- Help given – Some help can reduce errors but should not be excessive – e.g. date formats
- Serial number – If each form is unique, perhaps to place in numerical order for handling. Uniqueness of each form identifies missing forms
- Space per item – Should be adequate but not excessive
- Font – Use a clear font and size for easy readability – users may not want to have to put on spectacles to read it.
- Accuracy needed – e.g. Number of decimal places – fixed sized boxes makes this clear
- Filling in – Note on the medium to be used – Black ink for photocopying?
- Orientation – Should it be landscape or portrait?
- Official use – Named space for official use to record progress of processing
- Existing form - Is there an existing form which could be used for a dual purpose or adapted for this use?
- Where to send – This avoids confusion. The path of the document could be shown
- Where to obtain more copies – when the pile of forms is low.
- Internal/external use? – This could dictate the way it is filled in or used
- Growth – To avoid the need to redesign if there is massive growth in this area
- Frequency – How often the form is generated – frequent or once a year?
- Duplicates – Are multiple copies needed?
- Prepunched ? – Holes for filing
- Cost – Not usually an issue if the form is needed

INFORMATION OUTPUT ON A SCREEN

- Should be simple - not excessive/unneeded
- Well spaced for readability - double spaced?
- In an appropriate order – as the user requires it with identification data first (e.g. customer name/number)
- Grouped into related sections
- Using a standard format across all applications
- Using colours to highlight or differentiate sections or backgrounds - reverse video to highlight
- Ability to go backwards or forwards (scrolling)
- Suitable font and size
- Alignment for tabular data for easy of reading and locating
- Boxes where appropriate, of the correct size, for data input forms

EFFECT OF ERRORS IN FORMS

- Time lost in chasing up the correct information
- Expense of this follow-up
- Incorrect data entered to a computer system could mean the data has multiplied and needs to be corrected in different places.
- Where similar data is held in different places either manually or computer files, one set will not tally with the other if errors. It may be difficult to identify which is the correct set.

BUDGET

Is a financial statement of the desired performance of a section of an organisation in setting limits of expenditure. There are many types of budget:

- Sales budget
- Production
- Capital expenditure
- Cash budget
- Departmental budgets
- Period budget

- Master budget = profit and loss
Can be set out and controlled easily using a spreadsheet model.

FORECASTING

This is the process of trying to predict future usage/costs using existing data. If sales have been improving by 10% for each of the last 5 years, a reasonable starting point for next year's sales would be 110% of this year's sales.

A "WHAT-IF" model can be generated using a spreadsheet. The purpose of a WHAT-IF model is:

- a) to vary factors involved within a business area
- b) to see the effect of each on final results
- c) WITH A VIEW TO FINDING THE BEST SITUATION – the aim of this method.

e.g. A company makes product X. This involves

- i. raw materials, machinery and manpower costs
- ii. packaging, storing, transportation costs
- iii. advertising costs
- iv. profits arising from the difference between costs in selling

The packaging could be simplified (cheaper) or the products could be sold in different quantities (10's instead of 5's reducing packaging and handling costs). Advertising could be changed to a different medium. The transportation could change from road to rail. Each of these could be changed and varied with a view to determining an appropriate selling price in the light of changing demands. A raised price could result in a fall in demand.

Another variation on this is BREAK-EVEN where a manufacturing company can vary the above component costs and a view to determining how many must be made before the company can offset the set-up and manufacturing costs and make a profit.

EXECUTIVE INFORMATION SYSTEMS

This provides summary information for strategic planning. Its features include A REPORT GENERATOR to provide standard reports, GRAPHICS to present data, ANALYSIS TOOLS to enable comparisons of budgets etc and SEARCH to enable detail to be extract from a higher level.

DECISION SUPPORT SYSTEM

This makes use of a spreadsheet (What-if) or an expert system (see below) to answer unstructured queries for which specialist programs have NOT been written. The system provides information so that the manager can then make his own decision. A user interface is required to access the system. It is likely to be networked to all elements of the organisation.

MAKING DECISIONS

First define the problem, collect the relevant data, develop alternative solutions and assess the consequences of the solutions. Select the optimum solution including the effects on others. Implement the solution, measure the effects and then modify if necessary.

EMPLOYEES IN THE DECISION PROCESS

They can participate in consultative bodies with an elected employee represented on the board. They are limited by proportion to prevent a majority decision. It is more complicated where companies are run by a consultative board with a smaller executive board.

In Co-operatives, workers control all aspects of the organisation through committees and are shareholders.

A job is enriched by allowing limited decision making by individuals with annual reviews to revise and appraise performance. Works councils can have powers to decide on the working conditions with decisions taken by consensus rather than vote.

Union participation allows discussion on working conditions. Negotiations with management are designed to produce compromises and agreements. An agreement procedures needs to be defined. However, collective bargaining gives no real participation for the ordinary rank-and-file employee.

EXPERT SYSTEM

This is a program to access a wide amount of specialised data. The user keys in symptoms and the program returns a diagnosis or probable course of action.

It is a computer system which imitates a human expert. It has the following features.

Knowledge acquisition program – to learn new rules and facts.

Knowledge base – defines the rules and how components are related

Inference engine - allocates weighting to parts of the model to determine which rules apply.

PROLOG, declarative programming language, is used to define the rules.

User interface – enables a user to phrase an enquiry.

USES: Credit assessment of a borrower or customer. In law to identify previous rulings with conflicting issues

THE IT FUNCTION IN AN ORGANISATION

Computer systems enable data to widely accessed and not contained in particular areas (decentralisation) although local control is still possible. There is more inter-departmental communication.

A manager can use the services of non-attached IT personnel as part of his department to relieve top management of local decisions and enable flexibility at local level.

IT ROLE

The Computer department may be totally independent of all other aspects of the organisation. It is responsible for IT purchases. Client manager (other departments) must be able to

1. talk to technical IT staff who must be familiar with the potential of IT.
2. use IT for management information and decision making
3. be aware of his own employees working methods
4. be able to do some work at home using computer resources
5. access confidential data in a controlled manner
6. be aware of the software own staff use and need for software updates

REPORTS

can take the following forms:

- Printout tables for use in meeting etc
- Regular reports
- Demand reports for progress chasing
- Summary reports for quick reference
- Balance sheet to check profitability
- Graphical reports to show weekly/monthly changes in sales/ stock/ profitability
- Bar chart to show sales of specific goods over weeks
- Pie chart to identify profits by department

PROJECT CONTROL

Originally this was implemented entirely by manual means to ensure that a project was under control and running as expected. It enabled planning to ensure that the appropriate resources (manpower/machinery/space) was available to the right time and not wasted by waiting periods. The process involves:

1. Identifying every single task (**activity**).
2. Estimating the time (**duration**) needed for each (days/weeks) and manpower/machinery/space/money (**resources**) needed. NOTE that it is usually easier to estimate the time taken for a single task than the full project but it must be emphasised that the results depend on these estimates being reasonable. An underestimate in one single task can have a major knock-on effect of others and the whole project.
3. Identifying the dependencies between the activities. e.g. laying the foundation for a house must clearly precede the actual laying of bricks for the walls which precedes the fixing of the roof.
4. Draw a network to show these results – modern software can perform this task.

The major reason for producing a network diagram is

1. to give a visual image to the project controller of the activities and how they are related
2. to determine the **critical path**.

Critical path is a sequence of activities from beginning to end of the project which determines the minimum total project duration. Any delays in any of the activities along the

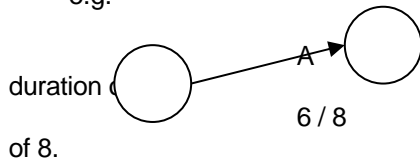
critical path will delay the project completion time. Any delays in activities NOT on the critical path may not delay the project but could result in the critical path changing to include these activities (and possible lengthening of the project time).

NETWORK DIAGRAMS

In the examination, candidates could either be asked to analyse a given diagram to determine the critical path OR to draw a network diagram from a table of activities (10 to 12) and then determine the critical path.

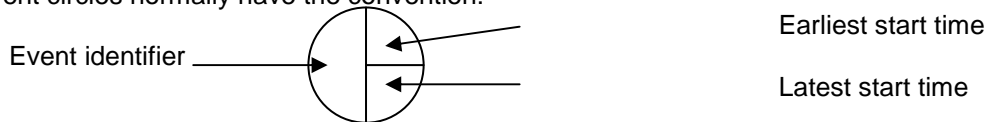
Conventions

- Activities are indicated by arrowed lines always assumed to be running left to right although many will be angled up or down. Activity must NOT cross each other – this would lead to confusion. Each activity will be marked with a name (or code to shorten it) and will show resources needed. In the examination, only ONE resource will be considered. e.g.



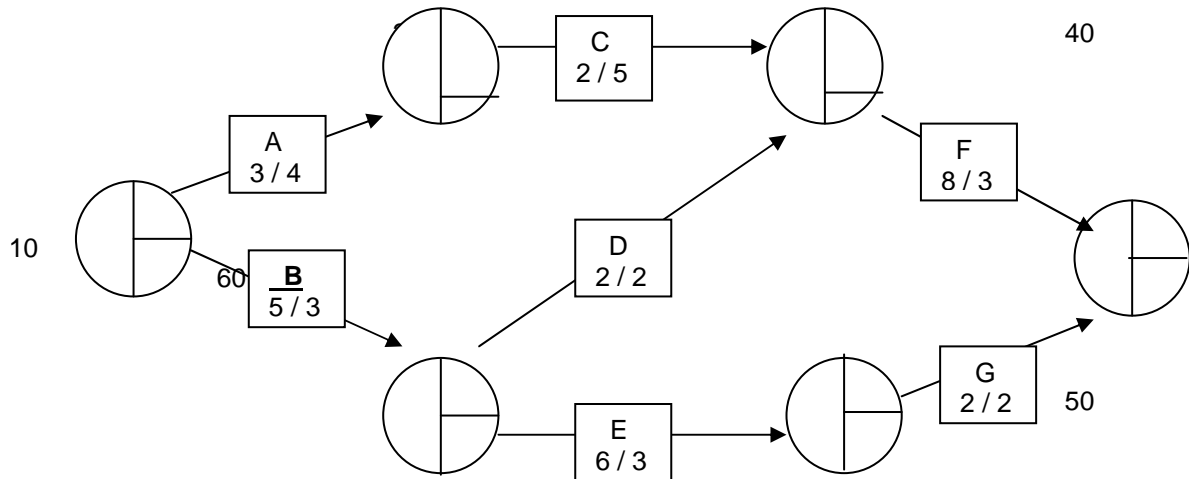
This is activity A with estimated 6 days/weeks and needing manpower of 8.

- Each activity line starts and ends on an **event** circle. An **event** is an instant in time. Above, the **left hand** event circle represents the time when activity A can start. It also represents the instant when ALL activity lines ending on that circle have been completed. The **right hand** event circle is the instant in time when A (and any other activities ending on this circle) is completed.
- Event circles normally have the convention:



Event identifiers are normally numbers increasing in 10's (to allow for inserted changes later). They should be numbered from left to right on a diagram so that every activity ALWAYS has a lower start event number than its end event number.

- Part of a network diagram might look like:



****KAREN** – The numbers 10 to 60 to the left of each circle above need to go into the left hand side of each circle. No idea how to do this in WORD other than using a text box and this would be too big!! I could tab the numbers onwards but editing would change this.

Calculating the Critical path involves first filling in the top right quadrants of each event circle (earliest start time) and then the bottom right quadrants (latest start time). At this stage, we are only interested in durations and will ignore the manpower figures.

EARLIEST START TIMES first – work from left to right in the order of event numbers.

- 10 Enter 0 = the start of the project
- 20 Enter 3 = activity A is the only activity into this circle and takes 3 days
- 30 Enter 5 = activity B is the only activity into this circle and takes 5 days
- 40 Event 20 plus 2 days for C would mean reaching event 40 after $3 + 2 = 5$ days.
HOWEVER, D also feeds into 40. Event $30 + D = 5 + 2 = 7$ days.
By definition, an event is the instant in time when ALL activities into it have finished so we must choose the LARGER value. Enter 7 for event 40.
- 50 Enter 11 = event $30 + E = 5 + 6 = 11$.
- 60 Event $40 + F = 7 + 8 = 15$. Event $50 + 2 = 11 + 2 = 13$. Enter the larger 15 for event 40
We have now determined the minimum time that the project will take → 15 days.

LATEST START TIME – work RIGHT to LEFT using an opposite approach from the above.

- 60 Enter 15 = Earliest start time above.
- 50 Enter 13 = Event $60 - 2$ for G = $15 - 2 = 13$
- 40 Enter 7 = Event $60 - 8$ for F = $15 - 8 = 7$
- 30 There are two activities D (2) and E (6) back into this circle. Event $50 - 6 = 13 - 6 = 7$.
However, Event $40 - D = 7 - 2 = 5$. Choose the LOWER of these values and enter in event 30.
- 20 Enter 5 = Event $40 - C = 7 - 2 = 5$
- 10 Again two activities A (3) and B (5) back into event 10. Event $20 - A = 5 - 3 = 2$.
Event $30 - B = 5 - 5 = 0$. Chose the lower and enter in event 10.
If event 10 latest start time does not finish at zero, then a mistake has been made.

CRITICAL PATH ? Notice that some event circles have the SAME earliest and latest start time. This is saying that if you want to finish the project as early as possible, your earliest and latest start times must be the same. So, activities that start and end on these event circles give the critical path. In this case, event circles are 10 , 30, 40, 60 identifying activities B, D and F as the critical path.

Float

Any event circle where the start times are different are not on the critical path and provide some respite for the planner. e.g. Looking at event circle 20, the difference between the two times is $5 - 3 = 2$. This means that IF A starts on the first day of the project AND is completed in the estimated 3 days, activity C COULD be started 2 days later without any delay in the project. It must finish in time so that Activity F can begin on time. Activity C therefore has a **float** of 2 days. Float represents spare capacity and gives the project planner some flexibility in which activities to concentrate on.

ADVANTAGES OF USING A COMPUTER

1. Very large projects have hundreds of activities which are not easily managed on paper.
2. Each activity is entered just once and can be edited. e.g. change of estimated duration or start date.
3. Automatic determination of the critical path and its changes as project progresses.
4. As an activity is completed this can be entered into the project package as a fact – all other data is estimated and subject to possible changes. The software will automatically update the estimated start dates for other activities and may adjust the critical path and project completion date.
5. Enables the planner to move resources to deal with activities on the critical path.
6. Prediction of start and finish times for scheduling of manpower.
7. Identify times when plant needs to be hired.
8. A large number of different print outs assist the planner E.G Gantt Chart (below).
9. Resource loading can be identified.
10. Rescheduling needs can be identified to level the resource loading (Gantt Chart)
11. The whole project can be monitored with more confidence.
12. Holidays can be automatically included in the time schedules.
13. Costing for the project can be predicted.

DISADVANTAGES

1. Progress needs to be fed in regularly for results to be meaningful.
2. Needs a sophisticated program for complex projects with interrelated areas.
3. Not suitable for projects which are:
 - a) small - because of the overheads in defining everything.
 - b) linear – where most activities follow on from the last and little cross-dependence. Such a project might be broken down into several linear projects.
4. The use of a computer might add an extra layer of complexity.

GANTT CHARTS

These are effectively bar-charts. Normally a Gantt Chart is drawn as a horizontal bar chart - there are usually far more activities than time periods and so this arrangement is more suited for screens and paper than vertical bars. The above small project might be shown as:

ACTIVITY \ DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A		4	4	4											
B			3	3	3										
C					5	5	+	+							
D							2	2							
E							3	3	3	3	3				
F								3	3	3	3	3	3	3	3
G												2	2	+	+
MANPOWER	7	7	7	8	8	5	5	6	6	6	6	5	5	3	3

In the chart above, numbers (representing manpower needs each day) have been used instead of the usual blocks. If the column is added for each day, the total daily manpower requirements are given. Adding up these totals for this small project, 87 man-days are required over 15 days giving a daily average of just under 6. Suppose a total of 7 men are available each day and could work on any of the activities, then on days 4 and 5 there will be a problem.

Note that activity C (and A before it) as well as G (and E before it) are not on the critical path. The symbol “+” is used to show that activities C and G have **float**. Float is a period of time into which an activity can be delayed without lengthening the project time. It follows that if C is delayed by 2 days, then A before it could also be delayed 2 days – OR each could be delayed 1 day. The same applies to E and G in this case. This tallies with the conclusions above from drawing the network diagram and completing the event circle figures.

RESOURCE LEVELLING

There are many resource types – manpower, equipment, workshop space, electrical power needed etc. Only manpower has been considered here. The start of an activity has already been shown to depend on completion of other activities. It could also depend on resources which may have their own restrictions.

- In many cases, the FULL manpower must be used on an activity - so an activity with duration of 3 days and requiring 4 men could not instead be changed to 6 days with only 2 men. This would have released 2 men for other activities for 6 days. Specialist technicians may not permit this - bricklayers could not suddenly become electricians.
- Often an activity must be completed in one stage – not broken into two or more time periods. This is obvious if specialist manpower or equipment is brought into the project just for this activity. It may not also be economical to reuse a workshop for some other activity because of the additional delays caused by moving equipment etc in and out of the workshop.
- Delaying an activity because of insufficient resources may then bring that activity into a second critical path or even delay the project.

In the above project, given 7 men only are available each day, the float could be taken to move activities where the manpower needed is above this maximum of 7. By moving activity

C on two days, the problems on days 4 and 5 are removed. However, this merely delays the problem until days 6 and 7. By moving activity E on two days also, the problem is solved for ALL days.

The overall effect is that both C and G now become critical and the project controller will now have to watch the progress of these activities as well as B, D and F which are already on the critical path. Float is now transferred to A, the only float left which now makes the project vulnerable to extensions if there are any delays in all activities except A.

ACTIVITY \ DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	4	4	4	+	+										
B	3	3	3	3	3										
C						5	5								
D						2	2								
E								3	3	3	3	3	3		
F								3	3	3	3	3	3	3	3
G														2	2
MANPOWER	7	7	7	3	3	7	7	6	6	6	6	6	6	5	5

It must be stressed again that all these figures are based on estimated duration and resource requirements for each activity. If these are inaccurate, then the critical path could lie along a completely different path. A real project would have considerably more activities than this simple example.

IT PERSONNEL

- Early computing had personnel in clearly defined roles that were similar across different organisations. This came about because the computing power was provided by mainframe systems. This structure has changed dramatically with the advent of personal computers and even more so by networked systems.
- Where a large organisation had a distinct computer department, now the tendency is for each department to purchase its own machines, probably through a centrally organised source, and that maintenance is provided by a central group of technicians. Major maintenance might be controlled centrally.
- The organisation's LAN could be the major feature of a central IT department.
- Although this suggests a central department controlling computing, in fact the departments would have far more control over which software they used and total control over the data they generated and used.
- The departments would own the machines they use whereas the old mainframe was effectively owned by the Computing Department.

DPM (Data Processing Manager) or IT Manager or Computer Manager

Responsible for:

- All staff in his department/section – scheduling staff
- Providing maintenance for computers across the organisation
- Obtaining external maintenance contracts where it is appropriate
- Arranging bulk buying deals for computer and media
- Recruiting new IT specialists in the department and possibly in other departments
- Chairman of any cross-organisation IT committees
- Reporting IT developments which might affect the organisation or which the organisation should consider
- Providing systems analysis and programming for the whole organisation
- Reports to Board

NETWORK SUPERVISOR/CONTROLLER

Responsible for:

- Security of the network
- Setting up and updating network facilities
- Installing new software

- Issuing passwords and putting in processes to ensure passwords are changed regularly
- Monitoring usage
- Training across the organisation for network usage
- Reports to IT/Computer Manager

SYSTEMS ANALYST

There could be many, each with specific areas of responsibility and under the leadership of a senior/chief analyst. For more detailed information see Notes for Systems Analysis

PROGRAMMER

Programming work breaks down into three distinct types.

Database programming – Many business tasks can be achieved within a database management system. This could be achieved by an IT expert within any department or provided centrally. Less technical expertise is needed and by creating **prototype** programs, less traditional systems work is needed because the users can inspect and test early versions and make suggested amendments. This type of development leads to the combination of systems and programming aspects in the guise of Analyst Programmer.

Traditional programming – using traditional programming languages. There are now fewer people performing this task in organisations and tends to be reserved for software houses producing standard packages.

Internet programming – providing programs for web sites and online sales.

Notes on traditional programming can be found in Notes for Programming.

END USERS/DATA CLERKS

Responsible for:

- Entry of Online sales orders
- Entry of Telephone orders
- Payroll data entry
- Service data entry. e.g. logging details of new residents in an area with regards health, schooling etc.
- Report to immediate departmental manager or supervisor

RECRUITING NEW STAFF

New jobs could be filled by:

External appointments

1. This is a lengthy process involving advertising and selection.
2. Despite an extensive selection process, the organisation can never be fully aware of the character, strengths and weaknesses of a new appointee.
3. The new appointee will not know the organisation from the inside.
4. External candidates may want higher pay.
5. There is a settling down period when the new appointee finds his way around the systems and buildings. He/she may be new to the area.
6. Experienced IT staff may still need training if their experience is with different software and hardware.

Internal appointments

1. The strengths and weaknesses of the candidate will probably be known.
2. A policy of internal appointing can encourage loyalty because the staff know they could be rewarded. However, there could be resentments if one person is appointed to a position above a former colleague who was formerly of the same status.
3. Internal appointments do not bring in new ideas/methods into the organisation. They may have fixed ideas how everything should work.
4. It may then be necessary to recruit for the successful candidate's old job.

FILLING A VACANCY

The manager will need to:

1. Write or amend a job description
2. Write candidate specification
3. Determine conditions of employment from Human Resources Department
4. Obtain permission to fill the post.
5. Consider reorganising the department which may result in a different post being advertised
6. Consider possibility of an internal appointment.
7. Agree deadlines for the recruitment process.
8. Agree a method of application.
9. Agree the method of advertising and circulate if internal
10. Identify how the applications will be initially vetted and the criteria for the short list
11. Make arrangements for the assessment day
12. Inform candidates of the procedures
13. Take up references
14. Follow up queries on applications/references
15. Draw up a short list of preferred candidates
16. Inform internal staff of their part in the assessment process
17. Prepare rejection letters. Arrange for meals/travel etc for candidates

WHERE TO RECRUIT

- National Computing organisations.
- Local recruiting agencies, especially for more junior/trainee jobs
- Personal contacts could be advantageous
- Contact training establishments directly

APPLICATIONS

Initially by letter or by completing form or by CV alone.

Assess by:

- interview
- a presentation (with pre-notification)
- performing standard exercise
- a computer aptitude test
- psychometric tests
- team tests to show the candidate's ability to work with others, not to bully or be dominated by others

In practice, for an IT job, assessment will usually be by a combination of these.

RECRUITING IT

1. Demand is higher than supply
2. High specialism means many are not qualified
3. Computing moves very fast and it may be difficult to find somebody with state-of-the-art knowledge and ability.
4. Each new system likely to be different from the one the candidate has used
5. Reluctance of employers to provide training to raise expertise in recruiting.

JOB DESCRIPTION

1. Job title
2. Status and salary
3. Location and hours. holidays
4. Name/title of immediate superior
5. The number of subordinates
6. Overview of the job and its responsibilities. Limits of responsibility.
7. General working conditions. e.g, pension facilities.

INTERVIEW PROBLEMS

1. Interviewers not trained to interview. Lack of expertise in selecting. Interviewers may not always be at the right level for the job advertised.
2. There could be the wrong emphasis in interview.

3. Lack of preparation by interviewers. As a result, candidate may not have to prove their competence in the area of the job.
3. The candidate may be allowed to control the interview by discussing what he/she wants/knows about. IT staff will always have a project they could talk about.
4. Alternatively, the candidate may not be given the opportunity to speak
5. The candidate's claimed strengths and weaknesses are not checked. A single area might be covered in too much detail at the expense of others.
6. Too much attention is paid to the hypothetical rather than real situations.

PART-TIME APPOINTMENTS

Improves flexibility of company by not having a fixed staffing level. However, the appointee may not be in when specifically needed. IT work often tends to be unpredictable.

USE OF EXTERNALLY CONTRACTED IT STAFF

Advantages

1. Reduces company overheads – better for budgeting
2. Can negotiate best contract and hence change contractors
3. Most flexible in allowing for market variations
4. Could reduce the training needed
5. Expertise available from experts with a track record

Disadvantages

1. Charging is likely to be expensive
2. Contractors may be able to pull out at short notice – no loyalty to the company.

TRAINING

Managers need different training from operational staff BUT the manager is responsible for planning and ensuring that his/her staff has the necessary IT training.

Workers – need a detailed understanding of using specific software, creating/amending data.

Managers – need a wider understanding of the whole system - extracting summarised data.

METHODS OF TRAINING FOR STAFF

1. They need early warning of future changes- staff meeting to explain what is planned and why – how it will affect the staff – the specific training they will be given. Regular newsletters should keep the staff informed.
2. Nearer the time, demonstrations might be given on particular package (which might still be in incomplete stages if written in-house). Hands-on training of **prototypes** could be tested with response from user for suggested improvements/changes.
3. A small group of staff may be trained on new software. Other staff could have 1:1 **shadowing** or be trained by a **cascade** process using the already trained staff.
4. Half/Full day courses may be necessary with some staff taken off their normal work. This might be staggered so that not all staff from a section are missing at the same time. This could be attempted at less busy times and there will be a need to have temporary measures to fill the gaps in the organisation left by these staff. It is NOT reasonable for staff to be trained in their own time unless they agree to it and are paid.
5. Computer-based training on CD might be an option but on the same conditions as the short courses in 4 above. This could be difficult in a new system where new machines need to be installed and it is unlikely that training software would be available before the software itself.
6. When the new system is operational, there will need to be support to oversee staff in action and help with problems that arise. This approach is effectively learning on the job.
Buddy training means that two or three members of staff are grouped together and help each other
7. There must always be a means for staff to ask for help without feeling inadequate. Hidden problems will only create bigger ones later. Manuals must be readily available. In-house instruction manuals could be produced for ongoing training as new staff join.

Previous examination answer scripts have tended to list ways of training without considering the specific situation. Newspapers are often quoted. They can be useful in creating a general awareness of computing and its potential but will never be able to provide training in specific software especially if it has only just been commissioned by the organisation – nobody out in

the real world has ever used it! The staff may actually need to know which keys to press and why.

MANAGER TRAINING

1. One-day seminars, remote from the organisation may give a good overview of the use and potential of a new system or software.
2. **Standard software** – the manager will probably not need to know how to perform all the various minor tasks that his staff will use. He needs to know the type of work they are doing.
3. **In-house/Commissioned software** – One:One training with the company trainer or systems analyst (who may have developed the system) might be a means. This might be easier to schedule in with the manager's other tasks.
4. **Managerial information** – Managers will need to be able to extract data from a system rather than putting it in. This data may be summarised in a table/graph/chart. e.g. A sales clerk will enter details of a particular sale. The manager may want to know which products are the best/worst sellers or who are the best customers.
5. **Problems** – Managers do have a department to manage and generally cannot be away from the main job for lengthy periods of time. A manager may find it difficult to be fully away from his desk and could be on-call during the training process which interferes with the training.

NEW SYSTEMS

Managers will be involved from the outset with a new system. The system may come from:

- problems reported by staff where the manager initiates the call for a new system.
- wider requirements for the organisation where the manager's department is affected. Initial discussions with department managers will be needed
- to identify what is needed
- agree a process how it can be done

ANALYSIS STAGE.

The manager will liaise with systems analysts regarding the investigation process. He will identify:

- the main processes that occur in the department.
- the departmental structure with individual responsibilities of each staff member
- the key members of staff, particularly those with a wide experience or long service – these staff could be used for cascade training of others.

He will discuss and agree with the analyst

- how questionnaires and interviews will take place
- time scales for all investigations – how individuals will be affected
- the need for any background IT training before using specific software – e.g. switching on, general keyboard usage, filing systems, using the printer, database features, operating system concepts, security etc. NOTE: word processing and spreadsheets do not normally form a part of the work of staff who deal with raw data from customers/suppliers etc.
- the documentation used by the department
- the general movement of data in and out of the department.

IMPLEMENTATION STAGE

- He will form part of the presentation to all staff when the new system approaches operation.
- Assist with any training programme although will probably not perform any of this training.
- Support his staff throughout the training process and arrange for remedial action in the case of any major problems reported to him.
- Where a new system is an upgrade of the existing one, it may be possible to circulate notes showing the differences and the implications. A seminar may be enough to overcome this change.

TRAINING PROBLEMS

- Training may be on a different machine to the one that will be used or perhaps one that the user already operates.
- Staff may find the training not specific enough or too detailed too early.
- Some may not understand and be afraid to say. The manager should see his staff regularly and individually asking how the training is going and encouraging each to voice any difficulties.
- Differing abilities and attitudes of staff will lead to differing speeds of progress which in a group could antagonise those with the problems (because the training is too fast for them) or those who master the work quickly (because the training is too slow for them).
- Some staff may be against the changes and express their opinions aloud. This is less likely to happen where the staff have been well prepared for the new system over a period of time from its early development.

PRIVACY AND SECURITY

See Notes for Information Processing for definitions and differences.

MANAGING SECURITY

In this module, the emphasis is on managing security. It is unlikely that a manager will actually perform ANY of the security measures but must ensure that they are put in place and are effective. He will therefore designate responsible people to perform these tasks and set up a mechanism for checking that they ARE done. It is not possible to give precise rules for setting up security because this will depend totally on the layout of the organisation and the work it does.

General Security Policy – Convene a meeting of section heads and decide a policy for security. Identify who is responsible for each aspect of security. Name the method of regular reporting on its success and of notification of problems/failures. Identify the hierarchy for reporting problems across ALL staff.

Physical security of access – Identify who has access to keys and is responsible for locking/unlocking doors. Request a list of all hardware items, their location and their main designated users. Appoint one person responsible for checking the inventory (monthly?) and reporting back. Discuss ways of preventing outsiders from entering secure areas.

Environmental Security – Call for a security report including checks for location of sprinklers etc. Report on fire/water/weather/temperature/humidity.

Data Security – Call for a report on back-up systems, frequency and their location. Require that all back-up copies should be regularly checked as working. Identify if there is any sensitive data requiring special security (Data Protection Act). Define a “need-to-know” policy with different levels of access to data. Nominate a person to be responsible for allocation of passwords and for checking that they are changed regularly. Ask when virus checking occurs and when the virus checking programs were last updated. Ask how illegal software on computers is identified. Could computers have diskette drives removed? Is there a block on internet use to prevent access beyond the company’s normal usage?

Software Security – Call for all software to be logged including version numbers and locations,

The manager must ask the questions, must be seen to be asking the questions and must be seen to be checking that people in positions of responsibility are performing security checks as required.