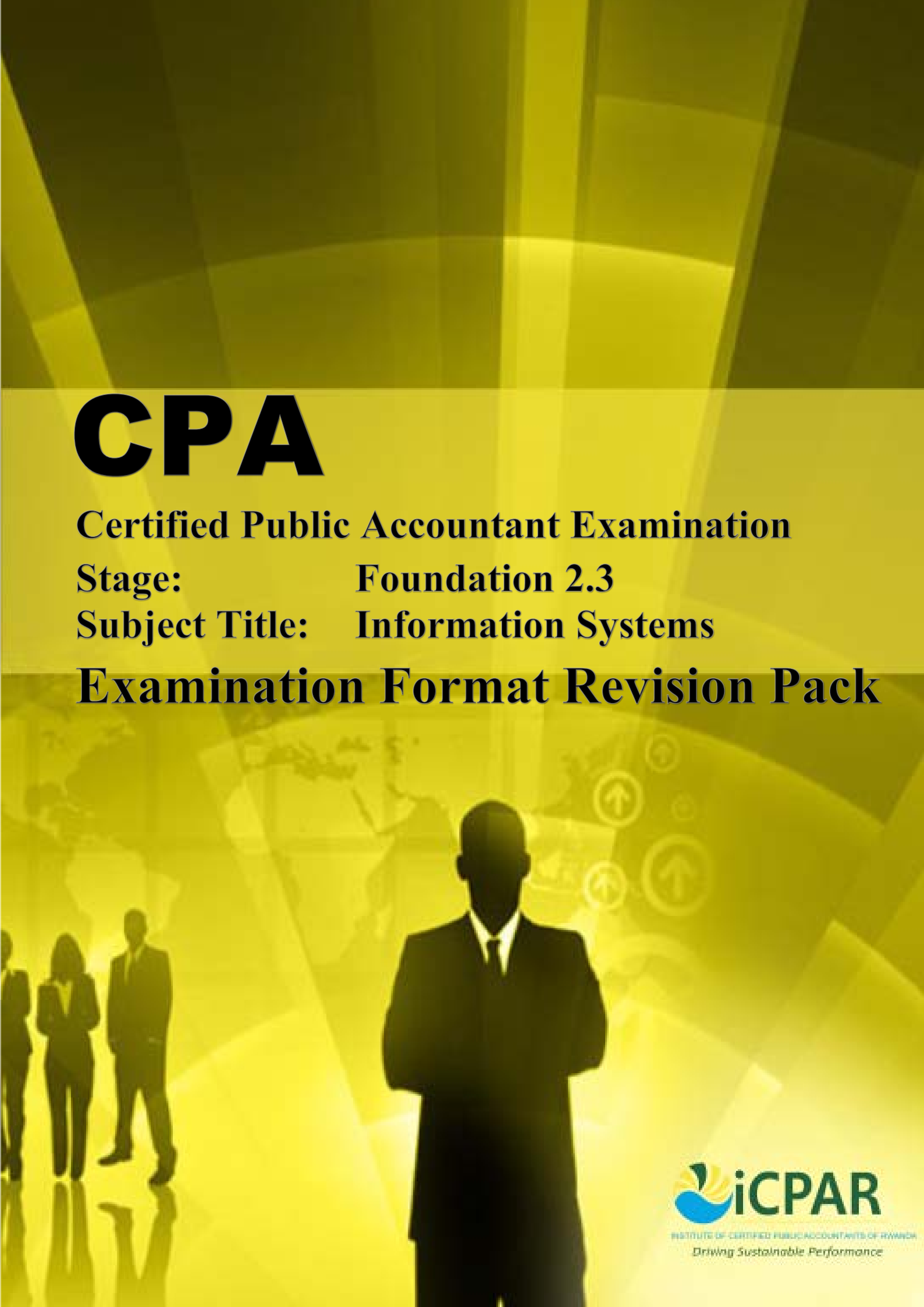
CPA

Certified Public Accountant Examination

Stage: Foundation 2.3

Subject Title: Information Systems

Examination Format Revision Pack



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Driving Sustainable Performance

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F.2.3 INFORMATION SYSTEMS

FOUNDATION 2

EXAMINATION FORMAT QUESTIONS & SOLUTIONS

NOTES

Section A - You are required to answer Questions 1 and 2.

Section B - You are required to answer any **three** out of Questions 3 to 6.
(If you provide answers to all of Questions 3 to 6, you must draw a clearly distinguishable line through the answer not to be marked. Otherwise, only the first answers to hand for these four questions will be marked.)

TIME ALLOWED:
3 hours, plus 10 minutes to read the paper.

INSTRUCTIONS:
During the reading time you may write notes on the examination paper but you may not commence writing in your answer book

Marks for each question are shown.

The pass mark required is 50% in total over the whole paper.

Start your answer to each question on a new page.
You are reminded that candidates are expected to pay particular attention to their communication skills and care must be taken regarding the format and literacy of the solutions. The marking system will take into account the content of the candidates' answers and the extent to which answers are supported with relevant legislation, case law or examples where appropriate.

List on the cover of each answer booklet, in the space provided the number of each question(s) attempted.

Time Allowed: 3 hours, plus 10 minutes to read the paper

SECTION A - These questions are COMPULSORY

1. HNA Ltd., a steel manufacturing company, purchased an information systems package over a decade ago. The system focuses on daily transaction processing of stock, sales and purchasing and provides regular user summaries. Unfortunately, the output does not provide much of the necessary management information and as a consequence a Co-ordinator downloads output onto spreadsheets which are then manipulated, enhanced and emailed to users. Managers and Senior Managers often complain that even this information is inadequate for their needs. In response, HNA Ltd has employed a business information consultancy firm to conduct a review of its information requirements. The consultancy firm reported that the existing system is outdated and much less functionally rich than more recent software on the market. The main issues and recommendations are summarised as follows:-

Purchase a new system

HNA ltd should purchase a system (called InfoTek) which provides more complete, relevant and timely information. The InfoTek system is easy to understand and navigate and would offer a more comprehensive analysis than the existing package provides, including historical statistics and comparison to prices charged by competitors. InfoTek also offers potential for further customisation to local needs through its display functions and flexible formats. Users (Senior Managers, Managers and Others) would be able to use the software efficiently straight away without additional training. Daily transaction processing routines would remain unchanged.

Implementation of the new system

The system should be implemented by direct changeover because HNA ltd network servers have insufficient capacity to support both new and old systems. The installation should take place over a weekend to minimise disruption. Once installed, systems maintenance should be minimal.

Redesign of Co-ordinator's role

This role should be redesigned so that the existing post-holder becomes responsible for validating InfoTek output, co-ordinating information enhancements and providing support and advice to users.

HNA Ltd Managing Director is familiar with InfoTek through past working experience and agrees that it is a worthwhile package. She is, however, unhappy about how the consultants have conducted their review. In particular, she is concerned that very few Managers, Senior Managers and other information users have been involved in discussions. She also believes that any job design needs to concentrate on the characteristics of the post in order to gain maximum motivation and job performance. She therefore treats the findings and recommendations of the consultants with caution. A fellow Director has advised her not to implement the consultants' recommendations without further reference to the workforce as this might lead to staff resistance.

REQUIREMENTS:

(a) Discuss the reasons why there may be user resistance to the introduction of the new system and explain the types of support that could be organised to help users utilise InfoTek efficiently.

(7 marks)

(b) Explain the issues HNA ltd should consider before successfully implementing the recommended system.

(9 marks)

(c) List and describe the options HNA Ltd has if they choose not to develop their software in house.

(9 marks)

(Total 25 Marks)

2. Write brief notes on ANY FIVE of the following. In each case your answer must include an illustrative example from a practical business situation.

(a) Attributes of quality information
(b) Business uses of an Intranet
(c) Rapid Application Development
(d) XBRL
(e) Methods of systems changeover
(f) Internet Cookie
(g) Company's IT Acceptable Usage Policy

Note: Each part carries 3 marks
(Total 15 Marks)

SECTION B - Answer any 3 out of 4 questions.

3.

(a) What is knowledge management? What types of knowledge might a company such as a law firm have, and how could such an organisation benefit from knowledge management? **(9 marks)**

(b) Why are knowledge workers so important to the digital firm?

(5 marks)

(c) What is case-based reasoning? How does it differ from an expert system

(6 marks)

(Total 20 Marks)

4.

(a) What security problems can be created by employees?

(5 marks)

(b) Describe four types of Information Systems controls that could be employed by an organisation to make their systems more secure and assess how they provide business value.

(8 marks)

(c) Describe the role of an MIS Auditor and explain how MIS auditing can enhance the control process

(7 marks)

(Total 20 marks)

5.

(a) List and describe the stages in decision making

(5 marks)

(b) Distinguish between unstructured, semi-structured and structured decisions

(8 marks)

(c) Define and describe the main capabilities of an Executive Support System

(7 marks)

(Total 20 marks)

6.

(a) Discuss the reasons why it is necessary for businesses to invest so heavily in Information Systems and why there is such a high variability in the returns firms receive from their investment?

(6 marks)

(b) How can firms assess the value of information systems projects?

(7 marks)

(c) Describe the information system problems that result from poor project management.

(7 marks)

(Total 20 Marks)

END OF PAPER

SUGGESTED SOLUTIONS

SOLUTION 1

(a) Discuss the reasons why there may be user resistance and explain the types of support that could be organised to help users utilise InfoTek efficiently.

Identification of reasons for staff resistance (e.g. demotivation through exclusion, feelings of imposition, dispute of system benefits, lack of trust in consultants' judgement, group resistance through 'snubbing' of groups, etc.)

Discussion of each in a way that is relevant to the scenario.

Identify types of support (e.g. user manuals/quick reference guides, software embedded help feature, support structures, repositories of information, dedicated telephone support, support through regular communication, etc.)

Explain each in a way that is relevant to the scenario.

(Definition – 1 Mark +Any 3 reasons +
Any 3 supports similar to above x 1 marks each)
(7 Marks)

(b) Explain the issues HNA Ltd should consider before successfully implementing the recommended system.

Identify potential issues (e.g. financial, relative costs and benefits, alternative systems, developing a system specification, system functionality, behavioural, technical, etc.).

Explain each issue in turn within the context of the scenario.

Levels of answers may range as follows:-

Limited answer: Either listing of several issues with no explanation or one or two points only with limited explanation.

Pass standard answer: Some explanation of two or three issues relevant to the scenario. One mark per substantive point made.

Strong answer: Comprehensive explanation of several issues within the context of the scenario. One to two marks per substantive point made.

(1 Mark each approach x 6 + 3 Overall)
(9 Marks)

(c) List and describe the options HNA Ltd has if they choose not to develop the software in-house. Candidates should explain at least three of the following:-

- Outsourcing
- Bespoke external development
- Off-the-shelf
- Software as a Service (SAAS)

(3 Marks for each method x 3)

(Total 25 marks)

SOLUTION 2

3 Marks (2 Marks Definition, 1 Mark Business Value)

(a) Attributes of quality information

Quality information is that which, when used, `adds value'. Research suggests that information should possess numerous attributes. The attributes which `add value' and together underpin quality of information are examined below.

Relevant for purpose: Information should always be relevant to the issue being considered. It is often the case that memos, reports and schedules contain irrelevant sections, which can have an adverse effect on the understanding of the issue by the user.

Completeness: It is desirable that all information required for decision-making is made available. There must be close co-operation between the information provider and the end user.

Accurate for purpose: Managers rely on information to effectively manage their `value adding' activities. For example, to satisfy the VAT regulations, a VAT invoice must be accurate to the nearest penny.

Reputable source: For information to be used effectively by managers, the users must have confidence in its source. This would be supported by the fact that the source was reliable in the past and that there is a good and clear channel of communication between the provider and the user of the information.

(b) Business use of an Intranet

Increasingly, intranets are being used to deliver tools and applications, e.g., collaboration (to facilitate working in groups and teleconferencing) or sophisticated corporate directories, sales and CRM tools, project management etc., to advance productivity. Intranets are also being used as culture change platforms. For example, large numbers of employees discussing key issues in an online forum could lead to new ideas.

Other uses / benefits are:

1. Workforce productivity: Intranets can help users to locate and view information faster and use applications relevant to their roles and responsibilities. With the help of a web browser interface, users can access data held in any database the organisation wants to make available, anytime and - subject to security provisions - from anywhere within the company workstations, increasing employees' ability to perform their jobs faster, more accurately, and with confidence that they have the right information. It also helps to improve the services provided to the users.

2. **Time**: With intranets, organisations can make more information available to employees on a "pull" basis (i.e.: employees can link to relevant information at a time which suits them) rather than being deluged indiscriminately by emails.

3. **Communication**: Intranets can serve as powerful tools for communication within an organisation, vertically and horizontally. From a communications standpoint, intranets are useful to communicate strategic initiatives that have a global reach throughout the organisation. The type of information that can easily be conveyed is the purpose of the initiative and what the initiative is aiming to achieve, who is driving the initiative, results achieved to date, and who to speak to for more information. By providing this information on the intranet, staff have the opportunity to keep up-to-date with the strategic focus of the organisation.

4. Web publishing allows 'cumbersome' corporate knowledge to be maintained and easily accessed throughout the company using hypermedia and Web technologies. Examples include: employee manuals, benefits documents, company policies, business standards, newsfeeds, and even training, can be accessed using common Internet standards (Acrobat files, Flash files, CGI applications). Because each business unit can update the online copy of a document, the most recent version is always available to employees using the intranet.

5. **Business operations and management**: Intranets are also being used as a platform for developing and deploying applications to support business operations and decisions across the inter-networked enterprise.

6. **Cost-effective**: Users can view information and data via web-browser rather than maintaining physical documents such as procedure manuals, internal phone list and requisition forms.

7. **Promote common corporate culture**: Every user is viewing the same information within the Intranet.

8. **Enhance Collaboration**: With information easily accessible by all authorised users, teamwork is enabled.

9. **Cross-platform Capability**: Standards-compliant web browsers are available for Windows, Mac etc.

(c) Rapid Application Development

Rapid application development (RAD), is a software development process developed initially by James Martin in 1991. The methodology involves iterative development, and the construction of prototypes.

Traditionally the rapid application development approach involves compromises in usability, features, and/or execution speed. It is described as a process through which the development cycle of an application is expedited. Rapid Application Development thus enables quality products to be developed faster, saving valuable resources.

(d) XBRL

XBRL (Extensible Business Reporting Language) is an XML-based format to define and exchange business and financial information. XBRL is a standards-based way to communicate business and financial information. These communications are defined by metadata set out in taxonomies. Taxonomies capture the definition of individual reporting concepts as well as the relationships between concepts.

The XBRL format is governed and marketed by a international consortium (XBRL International Incorporated) of approximately 600 organisations, including, companies, regulators, government agencies, infomediaries and software vendors.

XBRL International is supported by its jurisdictions—independent bodies, generally organised on a countryspecific basis — that work to promote the adoption of XBRL and the development of taxonomies that define the information requirements of their particular domains. XBRL is being adopted around the world in order to migrate business information process from paper-based and legacy electronic proprietary formats more fully onto Internet oriented processes (both for external and internal reporting processes).

(e) Methods of systems changeover

Candidates may allude to any or all of the several types of adoption that can be used to implement a system.

The types ‘big bang’, ‘parallel adoption’ and ‘phased adoption’ form the main types that are used to adopt a system. The big bang relates to the cosmological theory (Big bang) where the start of the cosmos happened at one moment in time. This is also the case with the big bang adoption type where the new system is adopted on one date.

In case of parallel adoption the old and the new system are running parallel so all the users can get used to the new system, but still can do their work using the old system. Phased adoption means that the adoption will happen in several phases, so after each phase the system is a little closer to be fully adopted by the organisation

(f) Internet Cookie

HTTP cookies, sometimes known as web cookies or just cookies, are parcels of text sent by a server to a web browser and then sent back unchanged by the browser each time it accesses that server. HTTP cookies are used for authenticating, tracking, and maintaining specific information about users, such as site preferences or the contents of their electronic shopping carts. The term "cookie" is derived from "magic cookie," a well-known concept in UNIX computing which inspired both the idea and the name of HTTP cookies.

Cookies have been of concern for Internet privacy, since they can be used for tracking browsing behavior. As a result, they have been subject to legislation in various countries such as the United States and in the European Union. Cookies have also been criticised because the identification of users they provide is not always accurate and because they could potentially be a target of network attackers. Some alternatives to cookies exist, but each has its own uses, advantages and drawbacks.

Cookies are also subject to a number of misconceptions, mostly based on the erroneous notion that they are computer programs. In fact, cookies are simple pieces of data unable to perform any operation by themselves. In particular, they are neither spyware nor viruses, despite the detection of cookies from certain sites by many anti-spyware products.

Most modern browsers allow users to decide whether to accept cookies, but rejection makes some websites unusable. For example, shopping baskets implemented using cookies do not work if cookies are rejected.

(g) Company I.T Acceptable Usage Policy

An acceptable use policy (AUP; also sometimes acceptable usage policy) is a set of rules applied by network and website owners which restrict the ways in which the network or site may be used. AUP documents are written for corporations, businesses, universities, schools, and website owners often to reduce the potential for legal action that may be taken by a user, and often with little prospect of enforcement.

Acceptable use policies are also integral to the framework of information security policies; it is often common practice to ask new members of an organisation to sign an AUP before they are given access to its information systems. For this reason, an AUP must be concise and clear, while at the same time covering the most important points about what users are, and are not, allowed to do with the IT systems of an organisation. It should refer users to the more comprehensive security policy where relevant. It should also, and very notably, define what sanctions will be applied if a user breaks the AUP. Compliance with this policy should, as usual, be measured by regular audits.

SOLUTION 3

(a) Knowledge management is the set of processes developed in an organisation to create, gather, store, disseminate, and apply the firm's knowledge. A taxi company's knowledge might include explicit knowledge, such as maps and routes between destinations. Tacit knowledge would include the experience of drivers, such as the best alternate routes between destinations or passenger needs. A taxi service might benefit from a system that gave drivers guides on routes that included alternate routes drivers had found. It might benefit from a learning management system that trained drivers for locations, destinations, and alternate routes.

9 Marks (4 Marks – Definition, 3 Marks – Types, 2 Marks - Benefits)

(b) Student answers will vary, but should include an understanding of the three main functions of knowledge workers. An example answer is:
Knowledge workers create new products or find ways to improve existing ones. Without them, the firm would stagnate and become less competitive in an environment that is always changing and is increasingly more competitive. In the modern economy, knowledge is truly power. The three major functions of knowledge workers are: keeping the organisation up-to-date in knowledge as it develops in the external world; serving as internal consultants regarding their areas of knowledge and its opportunities; and acting as change agents as they evaluate, initiate, and promote new projects. The most important of these is to develop new knowledge as it applies to the making of products or services, as offering products and services is the mainstay of the corporation.

(5 Marks – Definition & Benefits)

(c) Case-based reasoning (CBR) uses descriptions of past experiences of human specialists, representing them as "cases" and storing them in a database for later retrieval when the user encounters a new case with similar parameters. The system searches for stored cases similar to the new one, locates the closest fit, and offers the solution to the old case for use with the new case. If the new case fits the solution, it is added to the case database. If not, the case will be added with a new solution or explanations as to why the solution did not work. CBRs differ from expert systems in that they capture the knowledge of the organisation rather than a single expert, and the knowledge is captured as cases rather than if-then rules.

Also, expert systems work by applying IF-THEN-ELSE rules against a knowledge base whereas CBR represents knowledge as a series of cases. With case-based reasoning, the knowledge base is continuously updated by the users.

(3 Marks – Definition - 3 Marks – Differences to Expert Systems)

SOLUTION 4

(a) What security problems can be created by employees?

The largest financial threats to businesses actually come from insiders, either through theft and hacking or through lack of knowledge. Malicious intruders may sometimes trick employees into revealing passwords and network access data through social engineering.

Employees can also introduce faulty data or improperly process data. This is also known as administrative error. Administrative error is difficult to deal with because it isn't caught until too late, and the consequences may be disastrous. Also, administrative error can occur at any level and through any operation or procedure in the company.

Not following security procedures in relation to receiving external information, emails, internet use etc.

(5 Marks)

(4 Points x 1 Mark + 1 Mark overall)

(b) Describe four types of information systems controls that could be employed by an organisation to make their systems more secure and assess how they provide business value.

For protection, a company must institute good security measures, which will include firewalls, investigation of personnel to be hired, physical and software security and controls, antivirus software, and internal education measures. These measures are best put in place at the time the system is designed, and careful attention paid to them. A prudent company will engage in disaster protection measures, frequent updating of security software, and frequent auditing of all security measures and of all data upon which the company depends. Full protection may not be feasible in light of the time and expenses involved, but a risk analysis can provide insights into which areas are most important and vulnerable. These are the areas to protect first:

- Input controls check the data for accuracy and completeness when they enter the system. There are specific input controls for input authorisation, data conversion, data editing, and error handling.
- Processing controls establish that data are complete and accurate during updating. Run control totals, computer matching, and programmed edit checks
- Output controls ensure that the results of computer processing are accurate, complete, and properly distributed.

Specifically, candidates may refer to :

- Firewalls prevent unauthorised users from accessing internal networks. They protect internal systems by monitoring packets for the wrong source or destination, or by offering a proxy server with no access to the internal documents and systems, or by restricting the types of messages that get through, for example, e-mail. Further, many authentication controls have been added for Web pages as part of firewalls.
- Intrusion detection systems monitor the most vulnerable points in a network to detect and deter unauthorised intruders. These systems often also monitor events as they happen to look for security attacks in progress. Sometimes they even can be programmed to shut down a particularly sensitive part of a network if it receives unauthorised traffic.
- Antivirus software is designed to check computer systems and drives for the presence of computer viruses. Often the software can eliminate the virus from the infected area. To be effective, antivirus software must be continually updated.

(8 Marks)
(4 X 2 Marks each types + Business Value)

(c) Describe the role of an MIS Auditor and explain how MIS auditing can enhance the control process.

An MIS audit identifies all of the controls that govern individual information systems and assesses their effectiveness. To accomplish this, the auditor must acquire a thorough understanding of the operations, physical facilities, telecommunications, control systems, data security objectives, organisational structure, personnel, manual procedures, and individual applications of the company.

The auditor usually interviews key individuals, who use and operate a specific information system, concerning their activities and procedures. Application controls, overall integrity controls, and control disciplines are examined. The auditor traces the flow of sample transactions through the system and performance tests, using, if appropriate, automated audit software.

The audit itself lists and ranks all control weaknesses and estimates the probability of their occurrence. It then assesses the financial and organisational impact of each threat. It includes a section for notifying management of such weaknesses and for management's response. Management is then expected to devise a plan to counter the significant weaknesses

(7 Marks)
(4 Marks – Requirements & Role + 3 Marks – Audit)

SOLUTION 5

(a) Candidates should list explain the various stages to decision making in business. There may be more or less depending on the breakdown of the functions of each stage. The main stages are:-

1. Problem analysis
2. Data Collection
3. Analysis and Evaluation of data
4. Formulate and test alternative strategies
5. Implement the decision
6. Evaluate the decision

(5 Marks)
(5 stages x 1 Mark each)

(b) Distinguish between unstructured, semi-structured and structured decisions.
Unstructured decisions are those in which the decision maker must provide judgment, evaluation, and insights into the problem definition. Each of these decisions is novel, important, and non-routine, and there is no well understood or agreed-on procedure for making them. Structured decisions are repetitive and routine, and decision makers can follow a definite procedure for handling them to be efficient. Many decisions have elements of both and are considered semi-structured decisions, in which only part of the problem has a clear-cut answer provided by an accepted procedure. In general, structured decisions are made more prevalent at lower organisational levels, whereas unstructured decision making is more common at higher levels of the firm. Semistructured decisions are decisions in which some aspect of the problem are structured and others are unstructured.

(8 Marks)
(2 Marks each Definition + 2 Marks for relevant examples)

(c) Define and describe the main capabilities of an Executive Support System.

Executive support systems (ESS) help managers make unstructured and semi structured decisions. ESS focus on the information needs of senior management and combine data from both internal and external sources. The ESS creates a generalised computing and communications environment that can be focused on and applied to a changing array of problems. The ESS can help senior executives monitor organizational performance, track activities of competitors, spot problems, identify opportunities, and forecast trends.

(7 Marks)

(3 Marks – Definition + 4 Marks – Capabilities)

SOLUTION 6

(a) Discuss reasons why businesses have invested so heavily in Information Systems and explain why there is such a high variability in the returns firms receive from their investment.

Information systems are a foundation for conducting business today. In many industries, survival and even existence without extensive use of IT is inconceivable and IT plays a critical role in increasing productivity. Although information technology has become more of a commodity, when coupled with complementary changes in organization and management, it can provide the foundation for new products, services, and ways of conducting business that provide firms with a strategic advantage. Information technology has become the largest component of capital investment for firms in the United States and many industrialized societies.

In summary, information systems can:-

- Achieve operational excellence through higher levels of efficiency and productivity;
- Create new products, services and business models;
- Increase customer and supplier intimacy that can reduce costs and increase profits;
- Improve decision making for employees and managers;
- Increase the competitive advantage of a firm;
- Ensure the firm survives in a changing environment.

Specifically, candidates should address some of the following issues:-

- The emerging concept of the digital firm
- Business relationships digitally enabled
- Organisational & management flexibility – time and space shifting
- Electronic commerce
- Interrelationship between corporate strategy and information technology
- Strategic objectives – eg. Operational excellence, new products and models, customer intimacy, survival

(3 Reasons to Invest x 1 Mark each)
(3 Marks)

Candidates should explain the following in terms of the high variability in ROI that firms achieve:-

- The right Business model
- Organisational dimension – structure, process design etc
- Management dimension – support of management – incentives to management etc
- Complimentary assets
- Organisational investments, Managerial investments and Social investments

(3 Reasons for Variability X 1 Mark each)
(3 Marks)

(b) How can firms assess the value of Information Systems Projects?
Costs can be divided among five system components: hardware, software, telecommunications, personnel, and services. Some of the tangible benefits include increased productivity, lower operational costs, and a reduced workforce. Among the intangible benefits are improved organizational planning, more timely information, improved decision making, and increased job satisfaction.

Tangible benefits can be quantified and assigned a monetary value. They include: Increased productivity, lower operational costs, reduced workforce, lower computer expenses, lower outside vendor costs, lower clerical and professional costs, reduced rate of growth in expenses, reduced facility costs, and increased sales.

Intangible benefits cannot be immediately quantified but may lead to quantifiable gains in the long run. They include: Improved asset utilization, improved resource control, improved organizational planning, increased organizational planning, increased organizational flexibility, more timely information, more information, increased organizational learning, legal requirements attained, enhanced employee goodwill, increased job satisfaction, improved decision making, improved operations, higher client satisfaction, and better corporate image.

Appropriate strategies, such as real options pricing models (ROPM), can be applied to evaluate and value the information system when the benefits cannot be established in advance. Real options pricing models apply the same techniques for valuing financial options to systems investments and can be useful to help managers think about the potential value of highly uncertain IT investments. ROPM allows managers to systematically take into account the volatility in the value of IT projects over time, the optimal timing of the investment, and the changing cost of implementation as technology prices fall over time. The disadvantages of this model are primarily in estimating all the key variables, especially the expected cash flows from the underlying asset, and changes in the cost of implementation.

The value of systems from a financial perspective essentially revolves around the issue of return on invested capital. Does this particular information system investment produce sufficient returns to justify its costs?

Costs include the costs of hardware, telecommunications, software, services, and personnel.

The tangible benefits of information systems can be quantified and assigned a monetary value. Intangible benefits, such as more efficient customer service or enhanced decision making, cannot be immediately quantified but may lead to quantifiable gains in the long run.

Total cost of ownership (TCO) is designed to identify and measure the components of information technology expenditures, but does not take into account benefits, cost categories such as complexity costs, and "soft" and strategic factors

Capital budgeting is one of several techniques used to measure the value of investing in long-term capital investment projects. Information systems are considered long-term capital investment projects. To determine the financial basis for an information systems project, a series of financial models helps determine the return on invested capital. The principal capital budgeting models for evaluating information technology projects are:

- The **payback method**: Measures the amount of time required to pay back the initial investment of a project.
  It is calculated by dividing the amount of the original investment by the annual net cash inflow generated by the investment.

- The **accounting rate of return on investment** (ROI): Calculates the rate of return from an investment by adjusting cash inflows produced by the investment for depreciation. It gives an approximation of the accounting income earned by the project. The net benefit is divided by the total initial investment to arrive at the rate of return (ROI).

- The **net present value**: The amount of money an investment is worth, taking into account its cost, earnings, and the time value of money. (Present value is the value in current dollars of a payment or stream of payments to be received in the future.)

- The **internal rate of return** (IRR): The rate of return or profit that an investment is expected to return, taking into account the time value of money. IRR is the discount (interest) rate that will equate the present value of the project's future cash flows to the initial cost of the project.

In some cases, not all of the benefits of making this investment can be established in advance.

Real options pricing models (ROPMs), which apply the same techniques for valuating financial options to systems investments, are useful for evaluating highly uncertain information system investments. In real options theory, the value of the IT project (real option) is a function of the value of the underlying IT asset (present value of expected revenues from the IT project), the volatility of the value in the underlying asset, the cost of converting the option investment into the underlying asset, the interest rate at which the company could invest the same amount of money as the investment without any risk, and the options time to maturity (length of time the project can be deferred).

The disadvantages of this model are primarily in estimating all the key variables, especially the expected cash flows from the underlying asset, and changes in the cost of implementation.

Financial models assume all relevant alternatives have been examined, that all costs and benefits are known, and that these costs and benefits can be expressed in terms of money. These assumptions are rarely met in the real world.

Limitations

Only tangible benefits can be quantified and assigned a monetary value. Intangible benefits cannot be immediately quantified, but perhaps may lead to quantifiable gains in the long run. These models can be selectively used to support political decisions made for organisational reasons having nothing to do with the cost and benefits of a system.

Financial models do not always express the risks and uncertainty of their own cost and benefit estimates. They also fail to consider the fact that costs are usually up-front, while benefits tend to be back-loaded. No financial model can adjust for the fact that information technology can easily change during the course of the project.

In addition, firms can invest in capital projects for many non-economic reasons that are not captured by financial models. They may be undertaken to support strategic considerations, to meet government requirements, or to satisfy some non-market public demand.

(2 Marks x 3 methods + 1 mark overall)
(7 Marks)

(c) When an information system fails to work properly or costs too much to develop, companies may not realize any benefit from their information system investment, and the system may not be able to solve the problems for which it was intended. Good project management is essential for ensuring that systems are delivered on time, on budget, and provide genuine business benefits.

(7 Marks)

END OF SOLUTIONS

F.2.3 INFORMATION SYSTEMS

FOUNDATION 2

EXAMINATION FORMAT QUESTIONS & SOLUTIONS

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SECTION A

Answer BOTH Question 1 and Question 2 in this Section. (Both Compulsory)

1. Speedworks[1] is the world-leading manufacturer of top of the range bicycles, apparel, footwear and accessories, with dealers and distributors in more than 66 countries. Its supply and distribution chains span the globe, and the company must co-ordinate manufacturing, assembly, and sales/distribution sites in many different countries. Speedworks produces more than 100 different bicycle models, 60% of these each year are newly introduced to meet ever-changing customer preferences.

   Speedworks offers both made-to-stock and made-to-order models. A typical bicycle requires a 150-day lead time and a four week manufacturing window, and some models include over 50 parts. In fact Speedworks must manage more than 30,000 different individual parts (including backup parts) from different suppliers for its full range of bicycles. Some of these come from specialist vendors with even longer lead times and limited production capacity.

   Managing parts availability in a constantly changing product line impacted by volatile customer demand requires a great deal of manufacturing flexibility. However, that flexibility is missing. Speedworks has an old legacy material requirements planning (MRP) system for planning production, controlling inventory, and managing manufacturing processes. This can only produce reports on a weekly basis. Furthermore, the company is often forced to substitute parts in order to meet demand, and sometimes it loses sales. Added to this is the problem that it does not communicate as well as it should with its customers or potential customers.

   Speedworks management is of the view that the company now needs a solution or set of solutions that can track the flow of parts from its suppliers more accurately, support its manufacturing processes, and help it to communicate effectively with customers, while working with its existing business systems.

[1] The Speedworks here is fictional and not related to Speedworks (M) Sdn Bhd of Petaling Jaya, Malaysia

REQUIREMENT:

(a) Explain how a supply chain management (SCM) system would (i) help Speedworks to streamline its processes and (ii) give it a competitive advantage?

(8 Marks)

(b) Describe the business value of integrating the SCM system and other data sources into a business intelligence (BI) environment at Speedworks.

(8 Marks)

(c) Outline the types of problems that Speedworks might encounter when implementing a BI system with integrated SCM. Identify what should be done to avoid these problems, or to reduce the risk of them occurring.

(9 Marks)
(Total: 25 Marks)

2. Describe briefly what is meant by **ANY FIVE** of the following:
   (a) Enterprise Resource Planning (ERP) systems
   (b) Web 2.0
   (c) E-government
   (d) Net Marketplace (e-Hub, Digital Marketplace or Online Marketplace)
   (e) Encryption on the Web
   (f) Tacit and explicit knowledge in an organisation
   (g) Disruptive technologies

Note: Each part carries 3 marks.
(Total: 15 Marks)

SECTION B

Answer ANY THREE of the four questions in this Section.

3.

a) Explain how the concepts of responsibility, accountability and liability apply in relation to the ethical use of information systems.

(6 Marks)

b) Discuss the main ethical issues that need to be taken into consideration when using a customer relationship management system to collect, store and use customer data.

(8 Marks)

c) Outline the type of controls that a company should have in place to avoid misuse of its information assets?

(6 Marks)

(Total: 20 Marks)

4.

a) Identify and briefly explain six dimensions of information that affect the quality of decision making in an organisation.

(6 marks)

b) Explain decision support systems, giving examples of how they might be used in an Irish business context.

(6 marks)

c) Outline the main business benefits of collaboration, and explain how social networking can be used to help achieve some or all of these benefits. Illustrate your answer with practical examples.

(8 marks)

(Total: 20 Marks)

5.

a) Explain information asymmetry and how the Internet has reduced this. Give an example of where and how it has been reduced from a consumer's point of view

(6 marks)

b) Describe four e-commerce revenue models and how they work, with examples of each.

(6 marks)

c) Outline an appropriate approach to take when planning a new e-commerce website for a business, and explain the main decisions involved in building the website.

(8 marks)

(Total: 20 Marks)

6.

a) Explain what is involved in a total cost of ownership (TCO) analysis of an organisation's technology assets. **(7 marks)**

b) Define cloud computing, giving its main characteristics. Explain the different types of services it consists of, and the main benefits it offers to companies.

(7 marks)

c) Outline the concerns companies might have in relation to the use of cloud computing services.

(6 marks)

(Total: 20 Marks)

END OF PAPER

SUGGESTED SOLUTIONS

SOLUTION 1

(a) Explain how a supply chain management (SCM) system would (i) help Speedworks to streamline its processes and (ii) give it a competitive advantage? **(8 Marks)**

Candidates are expected to provide the general benefits of an SCM system – i.e. it helps Speedworks to model its existing supply chain, optimise sourcing and manufacturing plans, have better decision making around inventory levels, manage product flows, track finished goods, link processes from procurement through to consumption, and communicate better with suppliers, distributors and customers. Also SCM provides management with more accurate information about what to order and produce. It will help match supply to demand, improves delivery service, and speed up product time to market. This will reduces cost and improves sales.

Candidates should explain why Speedworks in particular would benefit from an SCM system e.g.:

- Speedworks has a complex upstream supply chain, with up to 50 different parts per model. This can be managed more effectively with an SCM system. Inefficiencies and delays can be responded to in a more timely manner through informed decision making.

- Goods are made to order and to stock at Speedworks. For made-to-order, Speedworks would benefit from a pull-based or demand-driven model. An SCM system would help them implement and manage the combination of push type and pull type required for made to stock and made to order.

- SCM can help them to improve their stock control levels. It will help them avoid stockouts and overstocks, both of which are inefficient and costly.

- Can improve lead times. At present Speedworks has a 150-day lead time or more, and a 4 week manufacturing window. An SCM system can help to reduce this by eliminating delays. Speedworks can use it to coordinate with suppliers on matters of scheduling, supply continuity, etc.

- An SCM system can help Speedworks to identify and deal with supply chain uncertainties and unforeseen events more quickly. It would enable them to avoid the current problem of lost sales resulting from delays incurred looking for substitute parts. If delays were unavoidable these could be communicated earlier to customers which would also help to avoid loss of sales.

- The Speedworks supply chain is global. This brings extra complexities such as time differences, the possible need for inventory buffers, etc) which SCM will manage.

- Flexible reporting to provide better decision-making support (even more so if SCM is integrated with BI).

Expect candidates to make reference to models for competitive advantage (such as Porter's). They should explain that from a competitive advantage point of view:

- SCM could help Speedworks reduce costs (perhaps even implement a cost leadership strategy) by eliminating inefficiencies from the supply chain and lower distribution costs

- 60% of models produced each year are new. SCM would enable Speedworks to develop and produce these new products more easily.

- SCM helps to develop stronger ties with suppliers and customers.

- Overall SCM gives a holistic view of demand, supply, and finance that would help Speedworks drive profit.

Marks: Up to 4 marks for general SCM benefits, 2 relating directly to Speedworks streamlining of processes and 2 relating specifically to Speedworks' competitive advantage.

(b) Describe the business value of integrating the SCM system and other data sources into a business intelligence (BI) environment at Speedworks. **(8 Marks)**

Marks will be allocated for the following points:

- The primary reason for using BI is to aid management decision making at all three levels of the organisation (strategic/senior, middle and operational).

- Operational and middle management make structured or semi-structured decisions and need to be able to produce routine reports based on data extracted and summarised from the firms underlying information systems. These data cover customers, suppliers, competitors and other aspects of the business environment. A company such as Speedworks can therefore gain even greater advantage from a SCM system if it is integrated into a BI environment.

- In addition some managers may want to create their own reports for performance monitoring or decision making – BI solutions enables them to do this.

- Note that lack of frequent or ad-hoc reporting is a problem in Speedworks.BI would address that through the availability of more extensive and ad hoc reports, dashboards, scorecards, drill-down, as well as forecasting and scenario analysis.

- For senior management, BI would help to facilitate Speedwork's strategic plan by focusing on measurable outcomes (such as lead time), and tracking key performance indicators (for example reducing the lead time).

- BI provides capabilities for Executive Support Systems to perform drill-down if more detailed views of the data are required (for example to see where the lead time problems are).

- Also BI and ESS can help senior executives to monitor organisational performance, track activities of competitors, recognise changing market conditions and identify problems and opportunities. This ultimately enables Speedworks to gain competitive advantage by responding more quickly to a changing environment.

(c) Outline the types of problems that Speedworks might encounter when implementing a BI system with an integrated SCM. Identify what should be done to avoid these problems, or to reduce the risk of them occurring. **(9 Marks)**

Candidates should refer to typical problems with large IS projects (including project management issues), and specific issues relating to the integration of the two separate systems (SCM and BI) in this case study.
Better candidates will identify examples of all these and will classify the types of problems and/or solutions.
There is a variety of ways in which this could be done - for example problems could be broken down into technical, organisational and managerial.

Potential problems with large IS projects – and what should be done to avoid/reduce risk:

- Unrealistic timeframes leading to delays in project completion. Need competent and focused management control including a good project manager and a supportive steering committee/planning group. Have the project plans reviewed by all participants to see if they are realistic; all reservations should be articulated and addressed. Project should be broken into manageable parts.

- Scope-creep – new requirements during the project cause delays to completion and/or increased cost (including additional resources). It is important to ensure the scope of the project does not expand as the project proceeds, or if it is likely to do so Speedworks should use methodology that copes well with changes to requirements (such as agile project management/development). Also ensure early end-user involvement.

- Organisational objectives not properly met by the system. This can be avoided by determining the company's organisational needs – for example by identifying critical success factors.

- Resistance to organisational change and/or lack of commitment to the new system if benefits are not recognised by everyone. To avoid this, all stakeholders, including users, should be involved in the process as early as possible.

Potential problems implementing and integrating new SCM and BI systems:

- Note that this challenge is particularly difficult since it involves the implementation of 2 systems and their integration; need for good oversight of the objectives and planning of both.

- Data conversion from legacy MRP system. Need to choose appropriate conversion strategy.

- May have problems with the existing data during/after conversion. Data will need to be cleaned.

- Business processes may be changed to accommodate BI; this could have adverse effects. Need to plan and manage the changes; top management support is essential.

- Technical problems relating to the integration of SCM and BI products. These need to be addressed early (during design). Ensure appropriate technical expertise is available - probably doesn't exist in-house at Speedworks.

Marks will be allocated for general problems/solutions (5) and specific (4).

SOLUTION 2

(a) Enterprise Resource Planning (ERP) systems

Enterprise Resource Planning (ERP) systems are based on a suite of integrated software modules and a common central database. The database collects data from many different divisions or departments in an organisation, and from a large number of business processes. This is done using ERP software that supports financial and accounting, human resources, manufacturing and production and sales and marketing processes. Data from all of these are made available for applications that support most of the organisation's internal business activities. When information is entered in one process it is immediately available to others throughout the organisation.

Benefits include improved management reporting and decision making, a unified information systems technology platform, more efficient operations, and customer-driven business processes.

(b) Web 2.0

The term Web 2.0 is associated with web (browser-based) applications that facilitate participatory information sharing, interoperability and collaboration. A further feature of these applications is their user-centred design.

Web 2.0 applications are typically provided free of charge. They are interactive and user friendly, and this encourages users to contribute their knowledge and experience. User participation is greatly increased in a social or business context as a result of web 2.0 applications, and this in turn encourages innovation. Examples include social networking services, blogs, wikis, video and photo sharing sites, mashups, hosted services, and web applications.

A Web 2.0 website allows users to interact and collaborate with each other in a social media dialogue, rather than being passive consumers or viewers of information.

(c) E-government

This is the application of the Internet and networking technologies to enable government and public sector agencies relationships to relate digitally with citizens, businesses and other arms of government.

E-government improves the delivery of government services as well as making government operations more efficient. It empowers citizens by giving them easier access to information and the ability to network electronically with other citizens. Citizens have easy access to forms necessary in many e-government programs such as tax payments. Rather than waste time standing in line for say vehicle or business registration forms or other type of licence, people can complete these kinds of tasks on the Internet. Finally e-government has opened the lines of communications between citizens and elected officials and made access to information easier and timelier.

(d) Net Marketplace (e-Hub, Digital Marketplace or Online Marketplace)

A Net Marketplace (or e-hub) is a B2B (Business to business) e-commerce website where multiple buyers can purchase from multiple sellers. It reduces buyers' costs by allowing them to shop around for the lowest prices. It reduces sellers' costs by allowing them to reach a greater number of potential buyers.

The types of net marketplaces available for B2B e-commerce are divided between vertical markets that serve specific industries (for example automotive), and horizontal markets that provide good and services for various functions across all industries. Some net marketplaces sell direct goods, which are goods used in production processes, while others sell indirect goods like office supplies or products for maintenance and repair.

Net marketplaces may support contractual purchasing based on long term relationships with designated suppliers, or short term spot purchasing (i.e. goods are purchased to meet immediate needs).

(e) Encryption

Encryption is the process of encoding data or information in such a way that only the person or computer with a key can decode it.

Businesses use encryption to protect digital information that they store, transfer or transmit over the Internet. It is encrypted using a secret numerical code known as the encryption key that transforms plain data into unreadable or undecipherable data. This must be decrypted by the recipient.

There are two methods for encrypting network traffic on the Internet. One is Transport Layer Security (or Secure Sockets Layer); this enables client and server computers to manage encryption and decryption activities as they communicate during a "secure" web session. The other is Secure Hypertext Transfer Protocol (S-HTTP or more commonly HTTPS – supported by MicroSoft and Netscape) which encrypts individual messages sent over the Internet.

There are two methods of encryption: symmetric key encryption and public key encryption. With the former, the sender and receiver establish a secure connection by creating a single encryption key and sharing it. The latter (public key encryption) is more secure and uses two keys – one which is shared (public) and the other which is private. The keys are mathematically related so that data encrypted with one key can be decrypted with the other.

(f) Tacit and explicit knowledge in an organisation

Tacit knowledge is knowledge that is possessed only by an individual and is difficult to define and transfer to another person. People are not often aware of the tacit knowledge they possess or how it can be valuable to others. Tacit knowledge is not easily shared and its effective transfer within an organisation generally requires extensive personal contact and trust.

With knowledge management, organisations strive to capture tacit knowledge. One of the main reasons is so that processes previously requiring skilled employees can be automated for greater efficiency and consistency at lower cost.

Explicit knowledge is knowledge that has been or can be articulated, codified, and can be more easily stored in knowledge management systems. Examples in an organisation include structured documents and databases, as well as unstructured forms like emails, video clips, etc.

(g) Disruptive Innovation/Technology

A Disruptive Innovation (formerly technology) creates a new market or system which will lead to theremoval of an existing technology from the market. They are new innovations that are different from what is already available.

The car, personal computer and cloud computing are all examples of disruptive inovations. Disruptive innovations tend radically to change the business environment. In some cases they are substitute products that perform well or better than anything currently available. For example the car replaced the horse-drawn carriage, and digital photography replaced process film technology. These types of disruptive technologies can put entire industries out of business or reduce them to small but highly specialised operations.

In other cases, disruptive innovation (technology) simply extends the market, using at much lower cost than existing products. These eventually turn into low cost competitors to what was there before. Businesses need to be able to adapt to cope with – and if possible to create – disruptive innovations.

SOLUTION 3

a) Explain how the concepts of responsibility, accountability and liability apply in relation to the ethical analysis of information systems **(6 Marks)**

Responsibility in this context is generally taken to mean that individuals or organisations accept the potential costs, duties and obligations for the decisions they make in relation to the use and management of information.

Accountability is the state of having to justify one's decisions or actions and here would mean that mechanisms are in place to determine who took responsible action, and who is responsible. A failure to put these in place means that the actions taken may not be ethical.

Liability extends the concept of responsibility into the area of law. A body of laws exists that permits individuals (or organisations) to recover damages done to them by other organisations, systems or other actors.

Marks: 2 each for responsibility, accountability and liability

b) Discuss the main ethical issues that need to be taken into consideration when using a customer relationship management system to collect, store and use customer data. **(8 Marks)**

Candidates are expected to have a knowledge of Data Protection Acts, and should be able to apply them in relation to this question.

Ethical issues around the collection of customer data for CRM are related to secure collection methods and to the verification of the information. Ethical companies ensure that sensitive information is obtained and processed fairly, collected in a secure environment and transmitted back to the databases securely. During data collection, it is critical to verify the identity of the customer and the accuracy of the information being submitted. High security for these functions is costly but ethically necessary.

Once customer data are stored in a company database, the company should adhere to the following principles regarding storage.

- the data is kept only for one or more specified, explicit and lawful purposes, and is only used and disclosed in ways that are compatible with this;
- it is kept safely and securely;
- it is kept accurate, complete and up-to-date;
- the stored data is relevant and not excessive;
- it is retained for no longer than is necessary;
- a copy of a customer's data must be given to them on request.

The ethics behind these principles are that the data belongs to the customer and the customer must be able to control his/her data. Customer data should therefore only be stored with the agreement of the customer. Customers should be able to view their data and change it (or ask for it to be changed), and can ask for it to be erased. Companies may not divulge the personal data of customers to a third party, except in ways that are "compatible" with the specified purpose. A key test of compatibility is whether they use and disclose the data in a way in which the customers that supplied it would expect it to be used and disclosed.

Given that much of the customer data for CRM is sensitive, companies must ensure the data is kept private to the maximum extent possible. To achieve this, a company should store the data in a form or in a location that is not generally accessible. The data must only be consulted when necessary for the fulfilment of a CRM task, and only those employees who handle the data to complete the task should be able to access the data.

Marks: Marks allocated for each major point outlined above. Reference to the requirements of the Data Protection Act are essential.

a) Outline the type of controls that a company should have in place to avoid misuse of its information assets? **(6 Marks)**

Companies should have a range of controls in place including the following:

- Physical controls - ensure computer hardware is physically secure, including the physical security of the building. Provision must also be made for maintaining service (preventing malfunction, backups, etc.)
- Software controls - monitor the use of system software and prevent unauthorised access to programs/applications (like a CRM system);

- Data security controls: ensure that the use and storage of data is not subject to unauthorised access, change or destruction, and is compliant with Data Protection Acts (and Freedom of Information if it is a State organisation).
- Computer operations controls – these are to ensure that procedures relating to the storage and processing of data are adhered to. Generally apply to the work of the IT department.
- Implementation controls: audit the systems development process to ensure it is properly controlled and managed
- Administrative controls: standards, rules, procedures etc. are formalised to ensure that the company's other controls are properly executed and enforced.
- Management controls: ensure adequate internal control structures and procedures are in place for information use and reporting (in particular financial reporting);
- Application controls (input controls that check for data accuracy and completeness when it is being entered, processing controls that establish that the data is accurate and complete during updating, output controls which ensure that reports and other results of data processing are accurate, complete and properly distributed)

Candidates may differentiate between general and application controls in their answer. If they do, they must identify the different types of each.

Marks: One mark each for identifying up to 6 of the above.

SOLUTION 4

a) Identify and briefly explain six dimensions of information that affect the quality of decision making in an organisation **(6 Marks)**

Any 6 of the following:

- **Accuracy**: the extent to which the information represents reality
- **Integrity**: the structure of data and relationships between entities and attributes should be consistent
- **Consistency**: all the data elements should be consistently defined
- **Completeness**: all the necessary data should be present
- **Validity**: the data should be within defined and acceptable ranges
- **Timeliness**: must be available when needed
- **Accessibility**: must be accessible by those who require it, as well as being comprehensible and usable

(Marks: 1 mark x 6)

b) Explain decision support systems, giving examples of how they might be used in a Rwandan business context. **(6 Marks)**

Decision-support systems (DSS) are used at the tactical (middle) management level of a firm. They support management decisions when these decisions are unique, rapidly changing, and not specified easily in advance. They have analytical modelling and data analysis capabilities and often draw on information from external as well as internal sources such as transaction processing systems & management information systems.

The following are examples of the type of information that a DSS might gather and present:

- Comparative sales figures between one week and the next
- Projected revenue figures based on assumptions about new product sales
- The impact of a doubling of sales orders on production schedules
- The consequences of different decision alternatives, given past experience

A DSS may present information graphically and may include an expert system or artificial intelligence. It may be aimed at business executives or some other group of knowledge workers.

(Marks: 4 for explanation; 2 for examples)

c) Outline the main business benefits of collaboration, and explain how social networking can be used to help achieve some or all of these benefits. Illustrate your answer with practical examples. **(8 Marks)**

There are five main business benefits of collaboration. These are:

- **Productivity**: people working together can complete a complex task faster than the same number of people working in isolation. This can lead to a reduction in buffers and time delays among production units.
- **Quality**: People working collaboratively can communicate errors and correct actions faster than people working in isolation. There are likely to be fewer errors as a result. Particularly important across locations.
- **Innovation**: people working collaboratively in groups can come up with more innovative ideas for products and services.
- **Customer service**: People working together in teams can solve customer queries and complaints faster and more effectively than if they are working in isolation from each other.
- **Financial performance**: As a result of improvements in productivity, quality, etc. organisations that support collaboration can achieve higher sales and better overall financial performance.

Social networking platforms are now being used more extensively by corporations to share ideas and collaborate within the enterprise. This can increase productivity – for example knowledge workers can use wikis or blogs to share articles, case studies, videos, podcasts, etc. that can lead to faster solutions.

Business social networking platforms enable connections between employees across dispersed locations (for example in global corporations). This cultivates informal learning within the organisation and drives up the levels of innovation.

Innovation can also be extended to glean ideas from customers and others. For example Microsoft Connect is a social networking community site for users to suggest features, report bugs and enter into discussions with Microsoft product managers and developers.

Externally, social networking sites are used to engage customers and partners and to identify critical professional networks. Sites like LinkedIn are providing networking services to business professionals.

Niche sites serve specific professional interests.

Financial savings can also be assisted by encouraging cost savings and revenue generating ideas through internal company social media platforms.

Marks: 4 marks for business benefits & explanations.
2 marks for explanation of how social networking can help;
2 for appropriate use of examples.

SOLUTION 5

a) Explain information asymmetry and how the Internet has reduced this. Give an example of where and how it has been reduced from a consumer's point of view.

(6 Marks)

Information asymmetry exists when one party in a transaction has more information that is important for the transaction than the other party. That information helps to determine their relative bargaining power.
In digital markets, consumers and suppliers can "see" the prices being charged for goods, and in that sense digital markets are said to be more "transparent" than traditional markets.

Examples will vary but should be along the following lines:

Until car trading sites appeared on the web, there was an information asymmetry between car dealers and customers. Only the dealers knew the manufacturers' prices, and it was difficult for consumers to shop around for the best price. Dealers' profit margins depended on this asymmetry of information. Today's consumers have access to many websites providing competitive pricing information, as more and more people go online to look for a car. Thus, the Internet (web) has reduced the information asymmetry surrounding car purchasing.
The Internet has also helped businesses seeking to purchase from other businesses to reduce information asymmetries and locate better prices and terms.

Marks: 2 for explanation; 2 for how Internet has reduced it; 2 for example(s)

b) Describe four e-commerce revenue models and how they work, with examples of each. **(6 Marks)**

Revenue models:

- *Advertising revenue*: Advertisers are charged for the right to place ads on a site. This is the most widely used method of generating revenue. Fees usually depend on the number of visitors to the website and/or how long they stay on the website.
  A large percentage of Google and Yahoo's income is generated from advertisement fees. Small companies and websites can also provide advertising space for interested parties.

- *Sales revenue:* The sale of products, information or services directly to users. This requires a viable, secure payment system that is capable of processing the monetary transactions.
  Examples: Dell generate sales revenue from its computers & accessories; Amazon.com sells books; iTunes sells digital content, ...

- *Subscription revenue*: An ongoing fee is charged for content or services like magazines and newspapers already do offline. Content that users perceive as worth the cost (which is not freely available elsewhere) must be provided.
  Example: Irish Times yearly online subscription

- *Transaction Fee revenue*: A fee is charged for enabling or executing a transaction. Service provider doesn't have to physically own the service or content – they just act as the middleman. Commission is based on the volume of transactions, or on a fee-per-transaction basis.
  Example: e-Bay (C2C) earns a fee for every successful sale made

- *Affiliate revenue:* A referral fee or percentage of sales is received each time a customer is referred to an affiliated site.
  This is becoming quite popular for blog sites nowadays. Another example is the Amazom.com Associates affiliate programme.

- *Free/Fremium revenue*: Provide basic content or services free but charge a premium for special features. The idea is to entice users to a website with freebies and then convert them to paying customers. Because so much content on the Web has been free for so many years, it's difficult to get people to pay for what they think they should get without charge.
  Example: any product that can be downloaded for free for a fixed period of use only, or one that can be downloaded for free and upgraded to a version with more functionality.

(Marks: 1 mark x 6)

c) Outline an appropriate approach to take when planning a new e-commerce website for a business, and explain the main decisions involved in building the website.

(8 Marks)

Candidates can take many different approaches to answering this question.

They should refer to the development lifecycle. There are a number of options here (prototyping, rapid application development, etc.) – they should identify a suitable one (with justification).

Should highlight the importance of identifying business objectives (capabilities) of the site. This involved understanding what it can do for the business; ensure that business decisions and strategy drive the technology, and not the reverse.

Types of decisions to be made in terms of building the website are:

- functionalities (capabilities required to implement the business objectives – for example a shopping cart) and information requirements (the information elements that the system must produce in order to achieve the business objectives);
- the technologies and infrastructure to provide the information system capabilities and to meet the information requirements;
- design: ease of use, navigation, browser support, personalisation, …
- performance issues relating to expected usage, number of visitors, etc.;
- hosting: can use a web server in one's own facility or in a vendor's physical facility; Alternatively can have it hosted in a cloud computing centre. Note TCO implications;
- what type of analytics are required? What data is collected about website visitors? (need to have appropriate policies and controls in place)
- decide if the development is done in house or out-sourced. Choices are to use a pre-built template with limited options for customisation, build the website oneself using tools like Dreamweaver or a Content Management System; or engage an external vendor/developer to build the website.

(Marks: 4 for approach; 4 for decisions)

SOLUTION 6

a) Explain what is involved in a total cost of ownership (TCO) analysis of an organisation's technology assets. **(7 Marks)**

The TCO model is used to analyse both direct and indirect costs of owning technology. It includes the cost of acquiring and installing hardware and software, as well as on-going administration and maintenance costs, upgrades, technical support, and costs of housing and running the technology. However it should also include such items such as employee training, their ability to perform necessary functions given the network configuration, and lost productivity when the network is down. The TCO should also include the amount of money spent on communications wiring (telephone wires, fibre-optic cables, service charges, etc.) and security and access issues.

The following table (from Laudon & Laudon) helps to determine the TCO cost components an organisation needs to consider.

Total Cost of Ownership (TCO) Components

Infrastructure Component	Cost Components
Hardware acquisition	Price of hardware, including computers, terminals, storage and printers
Software acquisition	Software or licence for each user
Installation	Installation of hardware and software
Training	Provide training for information systems specialists and end users
Support	Technical support, help-desks etc.
Maintenance	Maintain and upgrade hardware- and soft-ware
Infrastructure	Acquire, maintain and support related infrastructure such as networks and specialist equip't such as back-up storage etc.
Downtime	Cost of lost productivity when something goes wrong and the system(s) is/are unavailable
Space and energy	Costs of buildings and providing utilities.

Marks: 2 marks for explanation of direct & indirect costs; 5 x 1 marks for examples of indirect costs.

b) Define cloud computing, giving its main characteristics. Explain the different types of services it consists of, and the main benefits it offers to businesses.

(7 Marks)

Definition should be along the following lines:

- Cloud computing provides the IT infrastructure and environment to develop, host and/or run services and applications on demand over a network, with pay-as-you-go pricing, as a resilient service (i.e. an acceptable level of service is always provided and maintained in the face of faults and challenges to normal operation). Services can be scaled up or scaled down to meet the user's needs.

OR (from Laudon & Laudon)

- Cloud computing is the provision of computer processing, storage, software and other services as a pool of virtualised resources over a network (primarily the Internet). These resources are made available to users on an on-demand basis, irrespective of their location or the location of the resources.
  Resources can be rapidly provided, increased or decreased to meet changing user demand.

  The key point is that it is on-demand processing, storage and/or applications. It enables businesses to get their applications up and running quickly, with easy manageability and little or no maintenance. Cloud users don't need to know or understand the computing infrastructure.

  Cloud computing can be public or privately owned. Public clouds are usually free to use or operate a pay-per-usage model. Private clouds are operated solely for a single organisation; these can be managed internally or by a third-party and hosted internally or externally

There are three types of cloud computing services:

- Cloud infrastructure as a service: Allows customers to process and store data, and use networking and other resources available from the cloud.
- Cloud platform as a service: The service provider offers infrastructure and programming tools to customers so they can develop and test applications.
- Cloud software as a service: The vendor provides software programs on a subscription fee basis.

The main benefit of cloud computing for businesses is that they do not have to purchase and install hardware and software themselves. There are also cost savings in relation to support and maintenance of hardware and software.

Marks: 3 for definition/characteristics; 2 for services and 2 for benefits

c) Outline the concerns companies might have in relation to the use of cloud computing services. **(6 Marks)**

Concerns include the following:

- potential security risks relating to the fact that critical business data are controlled by an outside vendor (open to hacking, phishing and other potential threats)
- concerns over system reliability
- potential dependency on one cloud computing service provider. They might go out of business or have a complete breakdown of service
- contract lock-in might make a move difficult
- downtime – how to manage business if there are service outages. Also cloud-based applications don't work when you are disconnected (offline).
- Legal and privacy concerns. There may be legal limits to where your data in the cloud can be stored, based on the physical location of a server. For instance, European customer data can't easily be stored in the US. It's also possible that data in a cloud may be less protected by search warrants than data on the organisation's premises.
- Customisation – it is often easier to customise on-premises versions.

(Marks: 1 mark for each concern identified)

END OF SOLUTIONS