INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - APRIL 2019

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.
Should 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 three 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. **Please read each Question carefully.**

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 to pay particular attention to your communication skills and care must be taken regarding the format and literacy of your solutions. The marking system will take into account the content of your 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 attempted.

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

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

SECTION A

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

1. Dormin Ltd. (Dormin) operates a chain of 50 hotels across Ireland, Scotland and France. It operates in the competitive, 3-star market and is considering a substantial investment in Information Systems (IS) following a period of expansion. Claire Nesbitt, CEO, is keen to think strategically about how and where to invest:

'Our investment has to be aligned with our strategy. We need to invest in the right systems that help us achieve our strategy going forward'.

Each hotel has a number of revenue streams. Across the group, around 70% of revenues are generated by sale of rooms. In most Dormin hotels, occupancy rates and average daily rates (key metrics in the industry) compare favourably with their local market. However, the margin on room sales has fallen in recent years, as a result of increased competition and, in particular, customers' increased preferences for booking through comparison and travel websites such as Trivago and Booking.com. Dormin pays a substantial commission on such bookings (between 8 and 25%) and it has already tried to address this by re-launching an optimised website and loyalty scheme.

By contrast, the company sees greater potential to increase margin on sales of food and beverages, which currently represent 25% of revenue. It is currently rolling out a new restaurant concept which aims to attract additional passing trade in addition to hotel guests – with luxurious furnishings and higher quality, locally-sourced ingredients. However, initial indications of the success of these upgraded restaurants in increasing revenue and improving margin have been mixed, with some anecdotal evidence that these have struggled in Dormin's urban hotels.

The chain of 50 hotels includes 15 that have been purchased within the past two years, consisting of three independents and 12 hotels from the former Schlafen chain. These hotels are still using their legacy financial software, which lacks the ability to easily generate reports that are standard in other Dormin hotels. This has resulted in a highly manual reporting process in these hotels which is notably slower in reporting than in others. They are unable to complete internal daily reporting. Additionally, they are usually unable to meet the deadlines for standard weekly and monthly reporting to Head Office.

Almost all of the 50 hotels have been refurbished over the past three years to give a more consistent guest experience. Dormin's management believe this is critical to driving customer loyalty. Significant expenditure has been incurred in adding and upgrading gym facilities in each of the hotels, with management seeing this as a way to distinguish the group from its competition in the 3-star market. Some of these are open to the public on a membership basis. However, management are unsure if this would be beneficial in all hotels.

Payroll is the primary cost associated with each hotel – this includes guest-facing and back office staff. Guest-facing staff regularly complain that the aged Point of Sale (POS) software used at various points in the hotel (e.g. restaurant/café, gym) is slow in processing transactions and updating customer bills for check out. Furthermore, at the point of contact, it gives them very little information relevant to the customer or their stay. This software also records limited data on each transaction. This limits the ability to capture and analyse customer data.

Dormin's senior management are aware that it has not made a significant investment in the company's Information Systems for a number of years. It is further aware of the issues discussed above, and believes that the business would benefit from better information for decision making purposes at a range of levels across the organisation. These include guest-facing staff, function and hotel managers, head office staff and the senior management board.

REQUIREMENT:

(a) Discuss Claire Nesbitt's comment and the strategic value of the proposed Information Systems investment for Dormin.

(8 marks)

(b) Outline and explain four key improvements Dormin could make to their Information System, clearly explaining the strategic benefit of each to Dormin.

(12 marks)

(c) Explain the benefits of using XBRL-enabled software for Dormin. (5 marks)

[Total: 25 Marks]

2. Write briefing notes on any THREE of the following topics. In each case your note should include a summary of the main points relating to the topic.

(a) The Total Cost of Ownership (TCO) approach in evaluating an investment in a knowledge management system.

(b) Intellectual property rights and the internet.

(c) Prototyping in the development of organisation-specific software applications.

(d) Social Customer Relationship Management (CRM) for retailers.

(e) Transaction Processing Systems (TPS) in manufacturing organisations.

[Total: 15 Marks]

SECTION B

Answer **ANY THREE** of the four questions in this Section.

3.

(a) Discuss the potential for cloud computing to assist organisations in gaining competitive advantage over their rivals.

(8 marks)

(b) What factors should organisations consider in choosing between a private and public cloud? (6 marks)

(c) Analyse the ethical issues arising from storing customers' personal data in cloud environments. (6 marks)

[Total: 20 Marks]

4.

(a) Evaluate the importance of Supply Chain Management (SCM) systems, enhanced by internet technology, in increasingly global supply chains.

(8 marks)

(b) Assess the potential challenges in implementing such SCM systems. (6 marks)

(c) Outline the systems analysis and design activities that the organisation should undertake before purchasing SCM software.

(6 marks)

[Total: 20 Marks]

5.

(a) Explain how information needs and information systems requirements may differ between operational management, middle management and senior management.

(6 marks)

(b) Outline the potential usefulness of Decision Support Systems (DSS), and how these might fit into the overall business intelligence environment of large, geographically-dispersed organisations.

(8 marks)

(c) Explain the business benefits of enterprise-wide Knowledge Management Systems, giving examples of the tools used in such systems.

(6 marks)

[Total: 20 Marks]

6.

(a) Explain what is meant by the terms data, information, knowledge and wisdom, giving examples of each.

(4 marks)

(b) Discuss what is meant by the term 'Database Management Systems (DBMS)' and the usefulness of such DBMS in storing customer data.

(6 marks)

(c) Discuss what is meant by the term 'data warehouse' and the usefulness of such data warehouses in comparison to alternatives, such as Hadoop, in storing customer data.

(6 marks)

(d) Suggest four potential risks relating to data storage. (4 marks)

[Total: 20 Marks]

END OF PAPER

SUGGESTED SOLUTIONS

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - APRIL 2019

SOLUTION 1

Tutorial Notes: -
Purpose: To examine the candidates' understanding of: the strategic value of information systems and IS improvements, XBRL enabled software.
Links: No major links to other topics or papers.
Options: Candidates must answer all parts of the question. Answers should not vary significantly from those given below.
Essential components: Candidates must be able to show a depth of understanding of the areas identified above (under Purpose).

(a) Discuss Claire Nesbitt's comment and the strategic value of the proposed Information Systems investment for Dormin. (8 marks)

A number of approaches to this question would be acceptable.

One approach would link to Porter's competitive forces model or generic strategies, indicating how this would be suitable in the context of this case. Examples include:

Low-cost leadership: securing competitive advantage by keeping costs low – key in the lower margin room sales. IS can assist in a range of ways, including: providing real-time, accurate information that facilitates cost monitoring and control; reducing processing times with increasing automation. Other relevant suggestions and examples are acceptable.

Product differentiation: securing competitive advantage by differentiating products (room sales, food and beverage or gym) from the offerings of competitors. IS can assist by, for example: using stored information to develop a more personalised, or faster, check in/check out experience for customers; using proprietary technology to enhance the guest experience. Other relevant suggestions and examples are acceptable.

Focus on market niche: securing competitive advantage by serving a target market better than competitors. IS can assist by using (perhaps data mining) stored information on the target market to: develop a more personalised, or more efficient guest experience; facilitate targeted marketing; utilise Customer Relationship Management software; engage in customer profitability (or risk) analysis; or to answer questions indicated in the case, such as whether to roll out gym access/new restaurant concept. Other relevant suggestions and examples are acceptable.

Alternative approaches might include discussing strategic objectives as they relate to the case, including operational excellence, customer intimacy, new products/markets, or might place this in the context of an extended value chain.

Up to 8 marks for answer clearly linking strategy and IS to the detail of the case

(b) Outline and explain four key improvements Dormir could make to their Information System, clearly explaining the strategic benefit of each to Dormir. (12 marks)

Again a range of potential answers would be acceptable, with each to be explained in appropriate detail, with a clear link to the case and the strategic benefits.

Possible improvements include:

- Upgrading transactions processing systems (TPS) including POS – faster recording and better information for other systems
- Upgraded, consistent financial software across the business (XBRL enabled ideal, also integrated payroll) – deals with legacy system issues, faster consolidation and reporting.
- Enterprise Resource Planning (ERP) applications – integration of data across different functional areas
- Customer Resource Management (CRM) software – improving guest experience and generating better customer data for analysis
- Business intelligence – utilising (increased, improved) data
- Systems such as Decision Support Systems, Executive Support Systems – right information to decision makers at the right time.

4x3 marks for good suggestions, well explained with clear strategic benefit to Dormir.

(c) Explain the benefits of using XBRL-enabled software for Dormir. (5 marks)

eXtensible Business Reporting Language (XBRL) is an XML-based markup language used to communicate financial and business data electronically. Software is used to 'tag' the data contained in financial statements with contextual information such as scale (€m, €000) date (as at 31.12.18) and nature (for example, non-current assets – freehold property). When such tagged data is read by XBRL-enabled software, it can be quickly and accurately sorted, classified and analysed.

XBRL can be useful for external parties analysing financial statement data – for example, by investment advisors, regulators or tax authorities, because financial data tagged with XBRL saves time and cost by preventing re-keying by the analysing organisation. Dormin may be required to provide information in XBRL format and using XBRL software speeds this process.

XBRL can be useful internally in large complex organisational structures, particularly where different parts of the business operate different systems (such as Schlafen's legacy systems), or operate under different accounting and tax regulations, or even use different languages (Ireland, Scotland, France). Companies within the organisation can produce their statements in XBRL-enabled format saving time and cost by preventing re-keying at Head Office. Where this has been done correctly and consistently across the organisation, the process of consolidation is made significantly easier and faster. Preparing tax returns may also become easier and faster. Financial results can be more quickly and easily compared across the organisation. This also leads to improved accuracy and reliability of data and the analysis. Regardless of the native language, or systems used to produce the financial data, that data can be more easily and reliably analysed. As such, it allows greater focus on analysis (rather than data entry) potentially improving and speeding decision making by Head Office.

Up to 5 marks for clear explanation of XBRL and business benefit for Dormir.

SOLUTION 2

Tutorial Notes: -

Purpose: Responses for each question are expected to include a summary of the main facts relating to the topic, and relevant to a given context.

Links: No major links to other topics or papers.

Options: Candidates should answer three of the five parts/sub-questions

Essential components: Each sub-question has an aspect that allows the candidate to show what they know about a broad topic. Each also provides an opportunity for candidates to show they understand the relevance of the broad topic in a specific context. In general, 5 key points are expected on each sub-question for the 5 marks. 4 of these could be general points but must be relevant

(a) The Total Cost of Ownership (TCO) approach in evaluating an investment in a knowledge management system

The total cost of ownership (TCO) model focusses on the direct and indirect costs of owning technology. It includes the cost of acquiring and installing hardware and software, as well as ongoing administration and maintenance costs, upgrades, technical support, and costs of housing and powering the technology, as well as costs relating to maintaining network connections. It should also include such items such as employee training, ongoing technical support and lost productivity if hardware or software failures cause the system to be unavailable for processing end user tasks. Crucially, this model seeks to identify the true, total cost of ownership of an IS investment so that this can be compared to the expected (or actual, if applied retrospectively) benefits of the investment, such as increases in productivity and efficiency. These may be more difficult to predict than costs.

In the context of a knowledge management system, it might be particularly important to consider that these are general purpose firm-wide efforts to collect, store, distribute and apply digital content and knowledge. They include capabilities for: searching for information; storing both structured knowledge (explicit knowledge that exists in formal documents, as well as formal rules that organisations derive by observing experts) and semi-structured/unstructured knowledge (information in folders, messages, emails, graphics, videos, etc.). As such focus might be on the costs of IT infrastructure for significant data storage, the need for 24/7 access to data, technical support etc.

(b) Intellectual property rights and the internet

Intellectual property is a result of someone's effort at creating a product of value based on their experiences, knowledge, and education. It is intangible property created by individuals or corporations which is subject to a variety of properties. These include copyright, patents and trade secrets.

Copyright is a legal term which describes the rights given to authors/creators of certain categories of work. It applies to all sorts of written and recorded materials from software and the internet to drawings, photography, films and music. A patent confers upon its holder, for a limited period, and in a specific location, the right to exclude others from exploiting (making, using, selling, importing) the patented invention, except with the consent of the owner of the patent. It is a form of 'industrial property', which can be assigned, transferred, licensed or used by the owner. A trade secret is a specific set of information (data, design, process, formula) which is not generally known and by which its owner or licensee can derive economic advantage over its competitors.

The Internet poses severe challenges to intellectual property rights and the protection of those rights. Copyright laws and intellectual property rights still apply, however digital media are particularly impacted upon by their ease of replication, ease of copying and re-distribution, and ease of alteration. It is often difficult to establish uniqueness – this is particularly so with software programs. The proliferation of technologies that enable widespread digital copying, combined with file-sharing software and peer-to-peer networks that are easily accessible via high-speed Internet connections, have led to increased concerns about distribution of unauthorised copies of copyrighted media. In particular, the movie and music industries continue to search for technical and regulatory solutions to combat digital piracy – while others have developed different business models to secure payment for access (e.g. Spotify, Netflix).

(c) Prototyping in the development of organisation-specific software applications

Prototyping consists of building an experimental system rapidly and inexpensively for end users to evaluate. It is often described as a four-step model:

1. Identify the users' basic requirements
2. Develop an initial prototype
3. Use the prototype
4. Revise and enhance the prototype (repeated until users are satisfied).

Prototyping is suggested as a more flexible approach to developing systems and software than the traditional systems development life cycle approach. Prototyping is an iterative process, with steps being repeated over and over again until users are satisfied, actively promoting system design changes. It is argued that this approach replaces unplanned rework with planned iterations, with each version more closely matching user requirements.

It may be particularly useful in organisation-specific software applications because of the focus on user requirements: with prototyping encouraging intense end-user involvement throughout system development, it is more likely to fulfil user requirements. This may be particularly the case where there is uncertainty about requirements or design solutions. However, care needs to be taken that prototyping is not rushed through, without consideration of important steps in the process or failure to appropriately engage with relevant end users.

(d) Social Customer Relationship Management (CRM) for retailers

Social CRM tools enable a business to connect customer conversations and relationships from social networking sites to CRM processes. For example, SAP, Salesforce and Oracle CRM products feature technology to monitor, track and analyse social media activity in Facebook, LinkedIn, YouTube, Twitter and other sites. Employees who interact with customers via social networking sites are often able to provide customer service functions much faster and at lower cost than via phone or email.

Social CRM can be combined with social media analytics to test and optimise marketing campaigns, or to aim social media campaigns directly to existing or potential customers.

Customers increasingly expect organisations to use these channels to respond – however there is a possible reputational effect of customer complaints being so publicly visible, particularly if these are not responded to in an appropriate or timely way.

(e) Transaction Processing Systems (TPS) in manufacturing organisations

Transaction processing systems (TPS) exist across a number of business functions, including production, order processing, sales records, payroll, accounts payable, and employee record keeping. This includes both primary and secondary business processes including the accounts function, HR etc.

TPS exist to record the routine transactions that take place in everyday operations, and as a result they contain a lot of detailed data – for example, data on production times, materials usage, stoppages, reject rates, plus information from secondary processes.

Information provided by TPS is reasonably limited in nature and is focused on the needs of operational users and operational management – for example, last week's production figures by factory/region, inventory on hand.

However, data from TPS and other systems are often combined in data warehouses to form the basis of business intelligence and knowledge management systems. Information from these systems is often provided in a summarised form to higher level management, for example through Executive Support Systems.

SOLUTION 3

Tutorial Notes: -

Purpose: To examine candidates' understanding of: cloud computing; competitive advantage; business benefits of private vs. public clouds; related ethical considerations.

Options: Candidates must answer all parts of the question. Answers should not vary significantly from those given below.

Essential components: Candidates must be able to show a depth of understanding of the areas identified above (under Purpose) and ability to apply this to the given context.

(a) Discuss the potential for cloud computing to assist organisations in gaining competitive advantage over their rivals. (8 marks)

Generally speaking, the main advantages of cloud computing are:

- On-demand self-service: they can obtain computing capabilities such as server or network storage on demand.
- Ubiquitous network access: They can use standard network and Internet devices, such as mobile platforms, to access cloud-based services.
- Location independent resource pooling: Computing resources are pooled to serve multiple users, with different virtual resources dynamically assigned according to user demand. The user generally doesn't know where the resources are located.
- Rapid elasticity: computing resources can be rapidly provisioned, increased or decreased to meet changing user demand.
- Measured service: charges for computing resources are based on the amount actually used.

Candidates may also discuss the specific benefits of particular types of cloud computing, such as:

Benefits of IAAS include: saving a large initial investment in servers (moving costs from fixed to variable) and an overall potential cost reduction. Greater flexibility in capacity where data storing/processing peaks at certain times of the year or due to other events.

Benefits of PAAS include the ability to develop own applications at a lower cost than without the infrastructure and programming tools supported by the cloud service provider. Benefits would vary depending on the application created, but at a general level developing own applications can lead to acquisition of more relevant data, production of more useful information, more efficient data gathering, communication etc.

SaaS benefits include minimising a range of costs including the costs of multiple licenses, installation and maintenance. The organisation may benefit from regular upgrades, patches and fixes by the software provider without the disruption of upgrading individual machines – this is also potentially a considerable cost saving, reducing internal IT requirements. Taking data and software offsite may be safer in event of a disaster.

Candidates are expected to discuss these benefits in the context of competitive advantage, and could do so by linking these benefits to strategic objectives including operational excellence; new products, services, and business models; customer and supplier intimacy; improved decision making; competitive advantage; and survival.

Candidates could also discuss the possible use of the value chain model to identify areas where changes to information systems (in this case cloud computing) will improve business processes. They can also benchmark their business processes against their competitors or others in related industries, and identify and implement industry best practices. Taking the suggested benefits of cloud computing, value chain analysis can be used to identify where such benefits might be particularly important: for example, to increase the availability of information, to utilise information, to speed processes, to reduce costs, or to mitigate identified risks or areas of poor performance relative to competitors.

4 marks for discussing possible benefits of cloud computing, 4 marks for discussing competitive advantage.

(b) What factors should organisations consider in choosing between a private and public cloud? (6 marks)

A public cloud is owned and maintained by a cloud service provider, such as Amazon Web Services, and can be used by the general public or businesses to securely store their data (a public cloud does not mean data is publicly available). A private cloud is operated solely for an organisation. It may be managed by the organisation or a third party and may exist on-premise or off-premise. Like public clouds, private clouds are able to allocate storage, computing power, or other resources seamlessly to provide computing resources on an as-needed basis. In terms of costs, while the usage of public clouds is on a per-use basis (usually involving monthly billing or subscription), private clouds are owned by the organisation and they bear all relevant costs, including the costs of building and maintaining this facility, in particular the possibly significant upfront costs of hardware and software.

Factors to consider include:

- Nature of data, in particular its sensitivity and whether it is subject to regulatory requirements
- True cost of each option – for example, the full cost of pay per use at an expected level of usage, plus some sensitivity analysis should be carefully compared against the cost of implementing a private cloud (for example, on a total cost of ownership basis)
- Expected levels of usage, and stability of these – pay per use options become much more expensive if usage suddenly increases
- Scale of expected fluctuations in usage
- 'Locked-in' costs may be a factor if the business is growing or changing but may differ substantially in their nature
- Availability of money to invest in building a private cloud
- Organisational importance of 'guaranteed' access/risks of downtime
- Existence of organisation-specific IT infrastructure, which can be difficult to integrate with existing public clouds.

Up to 6 marks for relevant points that indicate clear understanding of private v public

(c) Analyse the ethical issues arising from storing customers' personal data in cloud environments. (6 marks)

Ethical issues might include:

- Compliance with the letter and spirit of relevant Acts and Regulations (Data Protection Act/General Data Protection Regulations (GDPR))
- Protection of data from loss, corruption or theft (may include, but not limited to, compliance with the Data Protection Act/GDPR)
- Use of the data for the purpose for which it was given (may include, but not limited to, compliance with the Data Protection Act/GDPR)
- Consideration of appropriate use of automated decision making systems
- Protection of the right to privacy
- Communications mechanisms and frequency
- Sustainability and environmental concerns
- Protection of vulnerable individuals, social concerns

Up to 3x2 marks each for the discussion of relevant ethical issues

SOLUTION 4

Tutorial Notes: -

Purpose: To examine the candidate's understanding of: the role of Supply Chain Management (SCM) systems in global supply chains; challenges; system analysis and design for purchased software.

Links: No major links to other topics or papers.

Options: Candidates must answer all parts of the question. Answers should not vary significantly from those given below.

Essential components: Candidates must be able to show a depth of understanding of the areas identified above (under Purpose).

(a) Evaluate the importance of Supply Chain Management (SCM) systems, enhanced by internet technology, in increasingly global supply chains. (8 marks)

Supply chain management software is classified as either software to help businesses plan their supply chains (supply chain planning) or software to help them execute their supply chain steps (supply chain execution).

Supply chain planning systems enable the business to model its existing supply chain, generate demand forecasts for products, and develop optimal sourcing and manufacturing plans. Such systems can help companies make better decisions such as determining how much of a specific product to manufacture in a given period; establishing inventory levels for raw materials, intermediate products and finished goods; determining where to store finished goods; and identifying the transportation mode to use for product delivery.

Supply chain execution systems manage the flow of products through distribution centres and warehouse to ensure that products are delivered to the right locations in the most efficient manner. They track the physical status of goods, the management of materials, warehouse and transportation operations and financial information involving all parties.

Both types of systems may assist organisations facing increasingly global supply chains. While global supply changes may have significant advantages – including lower cost production and an increased range of materials, components or finished goods, difficulties also arise. These include spanning greater geographic distances and time differences, giving rise to additional logistical considerations. Performance standards may vary from region to region or nation to nation. Cultural differences and different regulatory environments may impact.

Internet technologies can help in managing many aspects of global supply chains, including sourcing, transportation, communications and international finance. By using web interfaces, or electronic data interchange, difficulties in sharing information with external supply chain partners arising from their use of incompatible technology platforms and standards can be overcome. Information can flow more smoothly between the disparate internal supply chain systems of these and other organisations. Examples include managers using web interfaces to access suppliers' systems to determine whether inventory and production capabilities match demand for the firm's products. Business partners use web-based supply chain management tools to collaborate online on forecasts. Sales representative access suppliers' productions schedules and logistics to monitor customers' order status.

3 marks for explaining SCM systems, 2 marks for discussion of global supply chain, 3 marks for discussion of use of internet technologies.

(b) Assess the potential challenges in implementing such SCM systems. (6 marks)

These are complex pieces of software that are expensive to purchase and implement, and often involve a lengthy implementation time.

SCM software is often linked not only to technological changes, but also to fundamental changes in the way that businesses operate. Employees must accept new job functions and responsibilities, and learn how to perform a new set of work activities, which may lead to resistance to the change if not handled appropriately.

SCM systems require multiple organisations to share information and business processes – each organisation may have to change some of the processes and the way it uses information to create a system that best serves the supply chain as a whole.

SCM systems may introduce 'switching costs' – once applications are installed it becomes very costly to switch providers, and the organisation becomes dependent on the provider to upgrade and maintain the software provided.

SCM systems require a very clear understanding of exactly how data is used in the organisation and how it would be used in the SCM system. Some data cleansing work may be required.

Other relevant suggestions and examples are acceptable, up to 6 marks for discussing possible challenges

(c) Outline the systems analysis and design activities that the organisation should undertake before purchasing SCM software. (6 marks)

Systems analysis:
This consists of defining the need, specifying the solution, and identifying the information requirements. It also includes identifying the primary owners and users of data, existing company systems; examining procedures; observing system operations; and interviewing key users of the proposed SCM system.

Systems analysis identifies the information requirements that must be met by the selected solution. This involves identifying who needs what information, where, when, and how. It should include a feasibility study to determine whether the proposed solution is feasible/achievable from a financial, technical, and organisational standpoint.

This system analysis should involve evaluation of specific SCM software packages. The criteria include the functions provided by the package, flexibility, user friendliness, hardware and software resource needed, installation & maintenance efforts, documentation, vendor quality and cost.

A systems proposal report should be produced describing the costs and benefits, advantages and disadvantages of each alternative. It is up to management to determine which mix of costs, benefits and organisational impacts represents the most desirable alternative.

System design:
Systems design normally provides the overall plan or model for the system, which includes system specifications with details of how the functions identified during systems analysis will be delivered.

Since the SCM system will be based on purchased software, design efforts will focus on customising the purchased software, and making changes to existing software/procedures in order to meet the identified requirements of the system (as opposed to, for example, developing software 'from scratch').

2x3 marks, for explaining systems analysis and design with relevant examples

SOLUTION 5

Purpose: To examine the candidates' understanding of: differing use of IS across organisational levels; Decision Support Systems (DSS) in the business environment; knowledge management systems.

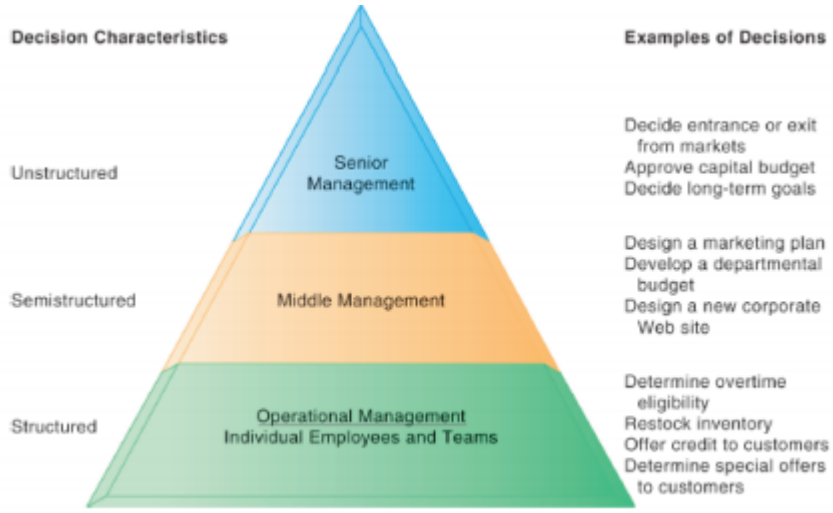
Links: No major links to other topics or papers.

Options: Candidates must answer all parts of the question. Answers should not vary significantly from those given below.

Essential components: Candidates must be able to show a depth of understanding of the areas identified above (under Purpose).

(a) Explain how information needs and information systems requirements may differ between operational management, middle management and senior management. (6 marks)

Candidates might sketch out or discuss three levels of management, together with their decision characteristics and examples of their decisions, as in this diagram from the Laudon & Laudon textbook:



Operational managers make mostly structured decisions – repetitive and routine decisions with a definite procedure for handling them – often linked to resources, schedules and personnel decisions for specific projects. For the most part, they get their information from transaction processing systems. But, more and more, they are accessing management information systems (MIS) for a broader look at organisational performance.

Middle management's decisions may be semi-structured – a combination of structured and unstructured decisions – unstructured decisions are those where the decision maker must provide judgement, evaluation or insight to solve the problem, and where each decision is novel and non-routine, so that there is no well-understood or agreed-upon procedure for making them. These decisions affect resource allocation, short-range plans and performance of specific departments, task forces, teams, etc. They use decision support systems (DSS) that rely on historical and current data from internal information systems and external sources of data. DSS are a business intelligence tool that can crunch large amounts of data and have easy-to-use interfaces. Common spreadsheet software like Microsoft Excel can also help managers review data in two dimensions using tools like pivot tables.

Senior management make mostly unstructured decisions based on internal business information but also external industry and society changes. Decisions affect long-term, strategic goals and the firm's objectives. They use executive support systems (ESS) to enable them to focus on important performance information that affects the overall success of the organisation. Information may be provided through balanced scorecards and key performance indicators. These rely on data supplied by the organisation's enterprise applications, as well as external data.

1 mark for each decision-making group; 1 mark for explaining IS used for each

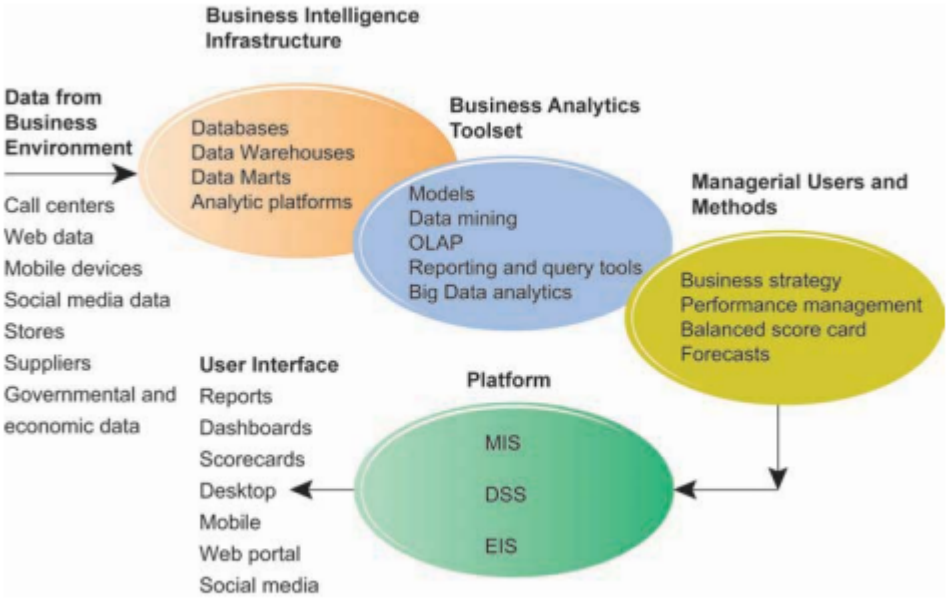
(b) Outline the potential usefulness of Decision Support Systems (DSS), and how these might fit into the overall business intelligence environment of large, geographically-dispersed organisations. (8 marks)

Decision-support systems (DSS) are used at the tactical (middle) management level of a firm as a business intelligence delivery platform, with the ability to support semi-structured decision making. 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. A DSS may present information graphically and may include an expert system or artificial intelligence. It may be aimed at middle management or some other group of knowledge workers – particularly those who want to create their own reports, use more sophisticated analytics or models to find patterns in data, to model alternative scenarios or test specific hypotheses.

There are six elements of the business intelligence environment, including:

- •Data from the business environment – structured and unstructured data from a range of internal and external sources
- Business intelligence infrastructure – the databases, data warehouses etc. that capture and store such data
- Business analytics toolset – a range of software tools used to analyse organisations' captured data
- Managerial users and methods – how managers engage with and use the information provided
- Delivery platform – including DSS and ESS – results of business intelligence and analytics as delivered to managers
- User interface – managers interface with the systems e.g. data visualisation tools, or access to reports etc. on a range of devices

FIGURE 12.3 BUSINESS INTELLIGENCE AND ANALYTICS FOR DECISION SUPPORT



Business intelligence and analytics requires a strong database foundation, a set of analytic tools, and an involved management team that can ask intelligent questions and analyze data.

Laudon and Laudon's Figure 12.3 (reproduced below) may be helpful:

Up to 4 marks for discussion of DSS usefulness, 4 marks for situating these in the BI environment

(c) Explain the business benefits of enterprise-wide Knowledge Management Systems, giving examples of the tools used in such systems. (6 marks)

Enterprise-wide knowledge management systems are general purpose firm-wide efforts to collect, store, distribute and apply digital content and knowledge. They include capabilities for: searching for information; storing both structured knowledge (explicit knowledge that exists in formal documents, as well as formal rules that organisations derive by observing experts) and semi-structured/unstructured knowledge (information in folders, messages, emails, graphics, videos, etc.); and locating employee expertise within a firm.

Enterprise content management systems help organisations to manage structured and semi-structured data, including corporate repositories of documents, reports, presentations and best practices, and in some cases external sources of information such as news feeds and research. Business benefits include structured storage, defined access rights to stored information, ease of access where authorised, and information security.

Learning management systems provide tools for management, delivery, tracking and assessment of various types of employee learning and training. Business benefits include a structured approach to managing investment in the workforce, and compliance with mandatory training requirements where applicable.

Increasingly, enterprise-wide knowledge management systems include supporting technologies such as portals, search engines, collaboration and social business tools (e-mail, instant messaging, wikis, blogs, etc.).

3 marks for business benefits, 3 marks for examples. Candidates are not expected to discuss knowledge work systems or intelligent techniques (other types of knowledge management systems) however credit may be given.

SOLUTION 6

Tutorial Notes: -

Purpose: To examine candidates' understanding of: data; DBMS and their usefulness; data warehouses and their usefulness; risks of data storage.

Options: Candidates must answer all parts of the question. Answers should not vary significantly from those given below.

Essential components: Candidates must be able to show a depth of understanding of the areas identified above (under Purpose) and ability to apply this to the given context.

(a) Explain what is meant by the terms data, information, knowledge and wisdom, giving examples of each. (4 marks)

Data is collection of symbols or facts. It can be a flow of events or transactions which, by itself is only useful for transacting, for example: temperature readings, list of sales orders.

Information is data that has been given meaning by processing, organising, structuring and presenting the data into categories of understanding, for example: monthly sales reports / regional sales reports.

Knowledge is the appropriate collection of information such that its intent can be useful. It may be an individual attribute, or a collective attribute of the firm. To create knowledge resources must be expended to discover patterns, rules and contexts where the knowledge works. Examples include tacit knowledge – residing in the minds of employees, and explicit knowledge – that which is documented.

Wisdom is the collective and individual experience of applying knowledge to the solution of problems. Wisdom involves knowing where, when and how to apply knowledge, for example, applying knowledge of how to perform a review of suppliers by identifying when such a review is required, what information is sought etc.

4 x 1 marks

(b) Discuss what is meant by the term 'Database Management Systems (DBMS)' and the usefulness of such DBMS in storing customer data. (6 marks)

A Database Management System (DBMS) is software that permits an organisation to centralise data, manage them efficiently, and provide access to the stored data by application programs. It acts as an interface between application programs and physical data files. When an application program calls for a data item, the DBMS finds that item in the database and presents it to the application program. In this way, the user of the application program does not need to understand where and how data are actually stored (the physical view), seeing only a logical view (and with different users seeing different logical views depending on their needs). A DBMS includes tools for organising, managing and accessing information in the database.

In terms of potential usefulness:

- DBMS useful in reducing data redundancy and inconsistency that would result if the data was stored in separate files for use by specific application programs, for example, holding data on customer addresses or credit terms in various different files.
- Data are uncoupled from the processes that use this data, meaning that the data can be secured and does not need to be specified in detail for every new application program, or modified with program updates.
- Access and availability of information is increased as ad hoc queries can be performed without writing complex code. It can be more easily shared between departments, application programs and individuals - e.g. sales and credit control.
- Data can be centrally managed, which can assist in data maintenance, granting access and securing the data - particularly important for personal information.
- A file-based environment may be more appropriate where the costs or risks of giving greater access to data outweigh the potential benefits of doing so – again, particularly important for personal information.

3 marks for a good definition of DBMS, 3 marks for relevant comments on their usefulness

(c) Discuss what is meant by the term 'data warehouse' and the usefulness of such data warehouses in comparison to alternatives, such as Hadoop, in storing customer data. (6 marks)

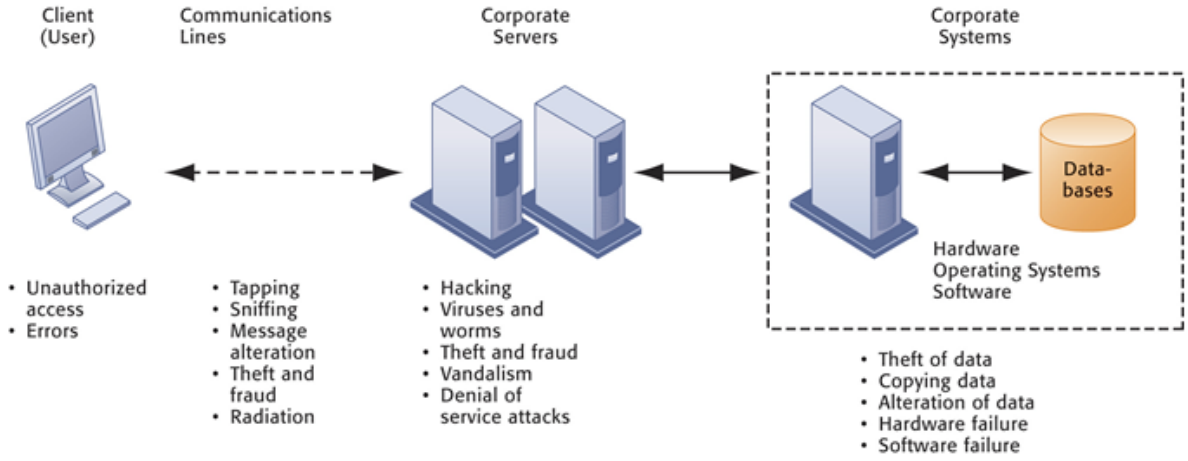
A data warehouse is a database that stores current and historical data, originating from core operational transaction processing systems, and extracted from those systems into the data warehouse. This is structured data. This data is then transformed by correcting inaccurate or incomplete data and restructuring data for management reporting before being loaded into the data warehouse. Some specific forms of external information may also be added. The data warehouse makes the data available for anyone to access as needed, but it cannot be altered. A data warehouse system also provides a range of ad hoc and standardised query tools, analytical tools and graphical reporting facilities and can be linked to other analytical tools. It is useful for customer data that has been generated from the transaction processing systems of the organisation.

However, if the customer data includes data from sources such as Facebook feeds and Twitter, this data may be semi-structured/unstructured and in huge volumes. Data warehouses are not well suited for organising and analysing big data (datasets with huge volumes, often comprised of unstructured and semi-structured data). Hadoop, on the other hand, can handle structured, semi-structured and unstructured data in large quantities. It enables parallel processing of huge amounts of data across inexpensive computers. It does this by splitting a big data problem into sub-problems, distributes them around thousands of inexpensive computer processing nodes, and then combines the result into a smaller data set that is easier to analyse. It can process a range of data including structured transactional data, loosely structured data such as Facebook and Twitter feeds, complex data such as web server log files and unstructured video and audio data. It runs on a cluster of inexpensive servers, with processors added or removed as needed.

3 marks for a good definition of data warehouse, 3 marks for relevant comments on usefulness.

(d) Suggest four potential risks relating to data storage. (4 marks)

Laudon & Laudon summarise the technical threats to each component of a typical network in the figure below:



Key areas where systems are most vulnerable include: hardware or software failure and errors; personnel actions; terminal access penetration; fire or electrical hazards; user errors; theft of services, data, and equipment; program changes; and telecommunications problems. Examples of specific vulnerabilities include: internet vulnerabilities (every point of entry into the Internet network is a point of vulnerability); vulnerabilities related to the use of wireless networks (easy to scan); malicious software; viruses; worms; Trojan horses; spyware; hackers; spoofing and sniffing; and denial of service attacks.

Additionally, purposeful and accidental problems, such as programming and data errors, can occur. Hardware and software can fail. The effects of an event such as a hardware malfunction, power outage, or fire can be extensive. Underinvestment, poor system design, failure to plan for disasters/contingencies are potentially significant risks.

4x1 mark for each relevant risk – a wide range of answers (beyond these described) would be acceptable.