INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - AUGUST 2020

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, only the answers to Questions 3, 4 and 5 will be marked.

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

INSTRUCTIONS:
During the reading time you may highlight text and write notes on the examination paper, however, you may not commence writing on the answer field until your Supervisor tells you to do so. Please read each Question carefully.

Marks for each question are shown. The pass mark required is 50% in total over the whole paper.

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.

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

INFORMATION SYSTEMS

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

1. Cyclexe manufactures bikes in the growing cycling market. The company was founded in 1990 by Bronwen Olney and began by making top-line, bespoke bikes for the niche mountain bike market. In the early 2000s, Cyclexe successfully diversified into making bespoke racing bikes, still firmly focussed at the top end of the market. These bikes are sold directly to the customer.

There was a management buyout of Cyclexe in 2005 and since then the company has further diversified into more mid-market mountain and racing bikes, sold through online specialist retailers and via wholesalers to cycle shops. The company has grown this part of the business quickly, with these bikes now accounting for 70% of company sales. However, this has also caused significant change in the business. This market is much more price sensitive, with discounting important to drive sales in slower months of the year. With much higher volumes, the workforce has increased significantly, including more low-skilled staff. This is due to very different production methods versus the top-line, bespoke bikes. These cheaper bikes use many more purchased components than the bespoke bikes, meaning that much of the production is assembly, rather than machining components. This has had an impact on procurement processes also, with these components sourced internationally and from many hundreds of suppliers. Inventory of components and finished bikes is substantial, and Cyclexe has opened two additional manufacturing facilities, in Belfast and Cork, to deal with demand.

In 2012, Cyclexe decided to enter the commuter bike market. Initially, they aimed to sell these bikes in the mid-market, but with little brand recognition outside the racing and mountain biking communities, they have struggled to achieve profitability on these bikes. The number of bikes sold has increased steadily, but substantial inventory is held and margins remain very low. In the hope of raising profile and further expanding this area of the business, Cyclexe bought Zipex, a French manufacturer of electric commuter bikes, in 2016. However, sales of the Zipex products have not been as successful as hoped, and Cyclexe has struggled with the availability of information from Zipex's information system.

Despite their rapid growth in the last 15 years, the business has not invested significantly in its information systems over that time, and any investment has been patchwork and unstrategic in nature. This has led to some areas of the system relying heavily on manual and spreadsheet-based work, for example in the management of accounts payable, while inventory is managed through an aged database that can only be accessed by staff in the production department. Cyclexe's auditors have been noting concerns about the reliability of some aspects of the system for some time. Senior managers, and managers of the various divisions regularly complain about the difficulty of getting reliable information in a timely fashion.

However, the management team is split on the need for investment in the information systems at this time. Brian Jones, the Finance Director, has suggested that the business needs to seriously consider implementing an Enterprise Resource Planning (ERP) system:

''We're a growing business, we want to continue that growth and so we should invest now to give us the right information and systems to act as a platform for that growth''.

This view was challenged by Angela Johnston, Deputy Chief Executive, who commented that:

"It's exactly because we're trying to grow that we should look at investing our resources elsewhere, maybe buying another company, or developing new product lines. This looks like a big potential expenditure, and I'm really struggling to understand why this is a good use of our resources."

Chen Zeng, the Operations Manager, suggested a conversation about Cyclexe's strategic objectives was overdue:

"In what direction should we grow, and what will we need to make that happen? It seems that we have two parts of the business with different strategies. Our top-line bespoke bikes are low volume, high margin, and focussed on a differentiated product and customer loyalty. Our mid-market bikes are high volume, low margin (and with some specific issues in the commuter lines) but what's the strategy there – do we still have a differentiated product or are we trying to compete on price?"

REQUIREMENT:
Based on a critical evaluation of the case study, candidates are asked to address the following:

(a) Explain what is meant by the term Enterprise Resource Planning (ERP) systems. (3 marks)

(b) Discuss the potential benefits and challenges of implementing an ERP system for Cyclexe. (8 marks)

(c) Discuss how investment in information systems (and specifically in an ERP) could enable the achievement of Cyclexe's various business objectives, as set out by Chen Zeng, the Operations Manager.

(6 marks)

(d) Identify, outline and contrast two strategies that Cyclexe can use to assess the financial value of the investment in the new ERP system.

(8 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) Business process management (BPM) in information systems change.

(b) Executive Support Systems (ESS) in deciding to diversify product offering.

(c) Transaction processing systems (TPS) in retail organisations.

(d) Business models unique to internet-based providers.

(e) Tools and technologies to facilitate collaboration within multinational organisations. **[Total: 15 Marks]**

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

3.
(a) Discuss the extent to which Customer Relationship Management (CRM) systems can assist a large retailer in maintaining competitive advantage. In your answer, you should clearly explain your understanding of CRM systems and competitive advantage.

(10 marks)

(b) To what extent might social CRM offer further benefits to a retailer? (4 marks)

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

[Total: 20 Marks]

4.

(a) Outline three organisational features that might affect an organisation's use of internet-based technologies.

(6 marks)

(b) Giving relevant examples, discuss the impact of internet-based technologies on manufacturers' value chains.

(8 marks)

(c) Explain why Information Systems that make use of internet-based technologies may be vulnerable to destruction, error and abuse, giving examples.

(6 marks)

[Total: 20 Marks]

5.

(a) Explain the term "business intelligence" and outline the main elements of the business intelligence environment.

(8 marks)

(b) Outline three business intelligence and business analytics tools that could be used in a retail organisation.

(6 marks)

(c) Evaluate the potential for knowledge management to add value for large firms. (6 marks)

[Total: 20 Marks]

6.

(a) Assess the implications of the trend towards mobile digital platforms, including 'bring your own device'.

(6 marks)

(b) Discuss the potential implications for a company of adapting towards 'big data'. (8 marks)

(c) In relation to systems change discuss three possible strategies that managers can employ to increase user involvement and overcome user resistance.

(6 marks)

[Total: 20 Marks]

END OF PAPER

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - AUGUST 2020

SOLUTION 1

Tutorial Notes: -To examine the candidates' understanding of: ERP, business objectives, benefits and challenges, strategies to assess value of IS investments.

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 what is meant by the term Enterprise Resource Planning (ERP) systems, and the options available to an organisation deciding to acquire and implement an ERP system. (5 marks)

Enterprise Resource Planning (ERP) systems are systems which integrate business processes in manufacturing and production, finance and accounting, sales and marketing, human resources and others as necessary into a single software system and comprehensive data repository. This can be contrasted to the traditional approach where these functions each have their own, unintegrated systems. While each business process has its own module within the software, data is stored in a centralised database and can be used by multiple business processes. When data is entered by one process (such as the accounting function) it is immediately available to other business processes.

ERP software is usually purchased from a software vendor, and examples include SAP, Oracle, IBM and Microsoft. Companies would choose which business processes they wished to include in the ERP and map their business processes to the software. Where these are not a comfortable match the software can be customised, however this is difficult given the complexity of these systems, and can create risks that the performance of the new systems and the information and process integration intended might be compromised. Sometimes business processes need to change to fit the system, which can be resisted.

ERP software is increasingly available as cloud –based software, particularly for small and medium sized organisations (e.g. SAP's Business One on Demand). It is also increasingly available as open source products at no or lower cost, but with less functionality and support, and this is unlikely to be appropriate for Cyclex.

ERP is not usually developed in-house except for very large complex organisations (and in which case it is usually developed with consultants), reflecting the complexity of such systems, the importance of the integrations and the risks of such integrations not working effectively.

2 marks for explanation, 3 marks for sources

(b) Discuss the potential benefits and challenges of implementing an ERP system for Cyclex. (8 marks)

Potential benefits:
- Increased operational efficiency by providing managers across business processes with timely, accurate and relevant information to aid in their decision making – important in a growing business, and identified as a concern for Cyclex
- ERP can facilitate other enterprise systems including CRM and SCM, both potentially beneficial for Cyclex
- Reduction in staff costs if present manual processes can be automated with improved software/system capability
- Greater sharing of information, standardisation of information and reports can assist senior managers in reviewing performance and taking action as the business grows, including in making decisions as to the appropriate strategy for Cyclex/its divisions and whether that strategy is being achieved
- Better information is available to create more accurate sales and production forecasts, minimising costs and the risks of stock outs/holding large quantities of stock – important for any growing business (avoiding overtrading), and particularly relevant due to the need to purchase components internationally, which can lead to long lead times and a tendency towards bulk orders
- Cyclex can respond more quickly to customer requests for information or products, for example having better

stock information available or easier/faster production scheduling – especially important for the bespoke bikes
- Better information on manufacturing or procurement processes which will change as the business grows can be used to identify inefficiencies, control weaknesses or other areas for improvement – relevant given substantial changes to production processes indicated in the case study
- With linkages between ordering, manufacturing and delivery information, better decisions can be made about the whether to make or buy components, levels of production, timing of production and stockholding leading to cost savings and greater efficiency

Possible challenges:
- ERP implementation can have fundamental effects on how a business operates. This may be particularly problematic for a business that is growing significantly and therefore may already be undergoing significant upheaval, and indeed continues to grow
- Difficulties in integrating the ERP with existing software, either within Cyclex or Zipex – particularly if this is legacy or proprietary software. This may require either replacement of existing software or significant customisation of the ERP (increasing cost and risk)
- ERP implementation, including conversion, testing, and training of staff is time consuming and costly. Is this where this growing business should focus attention/invest at this time?
- Staff buy-in is crucial – can appropriate consultation and training be achieved at this time? Senior management is presently split, can this be addressed?
- Lack of in-house expertise – as a growing company, we do not know the size/expertise of the IT function, and given the noted lack of investment it may be unlikely that staff have relevant experience
- ERPs often require costly support both in implementation and on an ongoing basis (customer support, updates, adding new modules/software changes as business grows – these costs increase with the level of customisation) and the organisation becomes 'tied' to the provider as switching costs are high – can the organisation commit to these costs now and in the future?

8x1 marks for suggesting and briefly outlining challenges/benefits

(c) Discuss how investment in information systems (and specifically in an ERP) could enable the achievement of Cyclex's various business objectives, as set out by Chen Zeng. (6 marks)

Low-cost leadership: securing competitive advantage by keeping costs low. ERP 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; minimising stock-holding by enabling better forecasting and replenishment.

Product differentiation: securing competitive advantage by differentiating products from the offerings of competitors. ERP can assist by, for example: using stored information to develop a more personalised, or faster, shopping experience for customers (combined with Customer Relationship Management software); using proprietary technology to enhance the product design/buying experience in relation to the bespoke bikes; utilising data to make improvements or changes to production processes for the mid-market bikes.

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 faster, shopping experience for customers; facilitate targeted marketing; utilise Customer Relationship Management software; engage in customer profitability (or risk) analysis.

Alternate answer: Strengthening customer and supplier intimacy: securing competitive advantage by developing loyalty with customers and suppliers. ERP/IS can assist by: using stored information as suggested above; facilitating Electronic Data Interchange between the organisation and its customers and suppliers (for example, allowing suppliers access to production schedules and stock levels); utilising Customer Relationship Management or Supply Chain Management software (affecting switching costs).

3x2 marks, other relevant suggestions and examples are acceptable.

(d) Identify, outline and contrast two strategies that Cyclex can use to assess the financial value of the investment in the new ERP system. (8 marks)

The competitive forces model for IT infrastructure investment suggests six factors that can be used to address the question of how much an organisation should spend on its IT infrastructure. These include:

1. Market demand for your firm's services: identify the services provided to customers, suppliers and employees and identify whether these services currently meet their needs and expectations.
2. Your firm's business strategy: what is the firm's medium to long-term business strategy, and what services and capabilities will be needed to achieve the objectives set?
3. Your firm's IT strategy, infrastructure and cost: examine existing IT plans and their alignment with business strategy; evaluate total infrastructure costs
4. Information technology assessment: where is the company's IT in relation to current trends?
5. Competitor firm services: what technology services are competitors offering their customers, suppliers and employees, and compare these to your firm
6. Competitor firm IT infrastructure investments: benchmark IT expenditures against competitor firms

Completing such an assessment may be time consuming and costly, and it may not be possible to adequately answer all of the questions posed: for example, it may be particularly difficult to identify how much your competitors spend on IT. However, the merit in the model, as compared to TCO, is that it acknowledges that firms do not exist in a vacuum, and that the appropriate level of IT infrastructure investment is a function not only of internal matters but also environmental factors. It provides a framework to explore whether present or suggested levels of IT infrastructure are placing the organisation at a competitive advantage or disadvantage by comparison to competitor firms.

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 TCO 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.

Benefits of this model include that it focusses managers' attention on the full range of possible costs associated, not merely with costs of hardware acquisition and initial implementation costs. Many of these costs can be estimated from data the organisation already has (e.g. the costs of staff time) rather than requiring extensive external data (a criticism of the competitive forces model).

However, this model places the focus on costs, rather than the benefits that will be achieved from the investment. Acknowledging that such benefits are often difficult to estimate, having a clear understanding of whether the benefits will exceed costs is critical to making a decision about whether to invest. The model also focusses internally on the organisation, rather than considering what is happening in terms of technological changes, in the market or with competitors (a suggested benefit of the competitive forces model).

4 marks for each

SOLUTION 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)   Business process management (BPM) in information systems change

Business process management (BPM) is a continuous cycle of process redesign and process monitoring.

1.   Identify processes for change: decide which business processes are to be improved
2.   Analyse existing processes: processes are modelled and documented, noting particular issues such as bottlenecks, labour intensive tasks and other time delays
3.   Design the new process: produce a detailed specification of the new process
4.   Implement the new process: implement the new process and accompanying technologies and systems, making necessary changes and revisions
5.   Continuous measurement: once implemented, continue to measure the process: is it working effectively, is it still appropriate or is further change needed?

BPM may be appropriate for information systems change where the existing process is weak and needs to be replaced in its entirety: a much more significant organisational change than automation or rationalisation of procedures. It can lead to dramatic gains in productivity and efficiency. However, need for change is at a process, rather than an organisational level (that is, it is not requiring a paradigm shift). The advantages of BPM over business process redesign include the recognition of a constantly changing environment and the building in of behaviours that continually check the continuing appropriateness of the process/need for change. Possible challenges in implementing BPM include the resistance of employees to change, the costs of process redesign and risks in the design and implementation of new processes.

(b)   Executive Support Systems (ESS) in deciding to diversify product offering

Executive Support Systems are information systems at the organisation's strategic level, designed to address unstructured decision making through advanced graphics and communications. Their purpose is to provide executives with information to help them to make their decisions (not to provide executives with ready made decisions), because such decisions normally require judgement, evaluation and insight. Such an evaluation could be made of the decision to diversify product offerings, which will require executives to combine the information provided with their own experience, expertise, risk preferences and understanding of the organisation and its business environment in making their decision.

Such systems are designed to be flexible, to cope with unstructured data from a range of sources, including internal and particularly external to the organisation. In this context, they may draw on information from internal management information systems and decision support systems to provide information on the past performance of these existing products, or the performance of other products the organisation already sells in these new territories.

The ESS may also store and present external information, such as information on new territories (demographics, key competitors etc.) or new products. A key aspect of the provision of information through ESS is ensuring information is clearly presented - this could be provided at a summary level rather than risk information overload, yet also provide the capacity to drill down (possibly using business analytics tools) to more specific information.

Another approach is to provide a digital dashboard, which provides, at a glance, a real-time view of key performance indicators for the business. Executives using this type of information, provided the information provided is accurate, reliable and provided in real-time (or in a timely fashion), may be able to make more informed and better decisions on whether and how to diversify existing product offering.

(c) Transaction processing systems in retail 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 quantities of items sold, prices at which items are sold, returns, discounts, 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 sales figures by individual/store/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.

(d) Business models unique to internet based providers

Transaction broker: saves users money and time by processing online sale transactions and generates a fee each time. Examples include Expedia.

Market creator: provides a digital environment where buyers and sellers meet, search for and display products, and establish prices for those products. Can serve consumers or B2B e-commerce, generating revenue from transaction fees. Examples include eBay, Etsy.

Content provider: creates revenue by providing digital content, such as digital news, music, photos, or video over the Web. The customer may pay to access the content, or revenue may be generated by selling advertising space. Examples include iTunes, timesonline.com.

Community provider: provides an online meeting place where people with similar interests can communicate and find useful information. Examples include Facebook, Google+, Twitter.

Portal: provides an initial point of entry to the Web along with specialised content and other services. Examples include Google and Bing.

Service provider: provides web 2.0 applications such as photo sharing and user-generated content as services. Other services may include online data storage and back-up. Examples include Dropbox, Google Apps.

(e) Tools and technologies to facilitate collaboration within multinational organisations

Virtual meeting systems: videoconferencing and web conferencing, or telepresence (an integrated audio and visual environment that allows a person to give the appearance of being present).

Cloud collaboration services: online tools and services that allow file storage and synchronisation including cloud storage, file sharing and collaborative editing (examples include Google Drive) or cyberlockers – online file-sharing that allows users to upload files to a secure location for access by others (for example, Dropbox, Microsoft OneDrive). Some services such as Google+ offer 'social' aspects where users create a profile and can organise into 'circles' for specific sharing and collaboration, or 'hangouts' where users engage in group video chat.

Microsoft SharePoint – browser based collaboration and document management platform combined with a powerful search engine and installed on corporate servers. It has a web-based interface and is closely integrated with Office desktop.

IBM Notes – collaborative software system with capabilities for sharing calendars, email, messaging, collaborative writing and editing, shared database access and electronic meetings.

Enterprise social networking tools – specialised tools for supporting social aspects of business e.g., Yammer and IBM Connections – employees are connected to each other through profiles, updates and notifications similar to Facebook features.

SOLUTION 3

Tutorial Notes: -

Purpose: To examine the candidates' understanding of: customer relationship management (CRM) systems; the potential for CRM to lead to competitive advantage; social CRM and ethical considerations.

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 the extent to which Customer Relationship Management (CRM) systems can assist a large retailer in maintaining competitive advantage. In your answer, you should clearly explain your understanding of CRM systems and competitive advantage. (10 marks)

CRM systems capture and integrate customer data from all parts of the organisation. They consolidate the data, analyse it and distribute the results to the various systems and customer touch points across the enterprise. Well-designed CRM systems provide a single enterprise view of customers that is useful for improving sales and customer services.

There are three elements of CRM: sales, marketing and service. CRM include aspects linked to sales (including sales force automation – helping staff increase their productivity by focussing sales efforts on the most profitable customers), service (providing information and tools to increase the efficiency of call centres, help desks and support), and marketing (supporting direct marketing by providing capabilities for capturing prospect and customer data, scheduling and tracking direct marketing etc.).

The functions of CRM include operational or analytical functions. Operational CRM includes all customer-facing applications, such as sales force automation, call centres, and marketing automation. The analytical CRM uses data from the operational CRM, customer touch points and other sources, this is organised into data warehouses and used for data analysis including data mining and OLAP. This analysis provides managers with information to identify buying patterns, create segments for targeted marketing and pinpoint profitable and unprofitable customers.

Competitive advantage refers to the suggestion that some businesses are stand-out firms, that do things better than most others in their industry. CRM systems may particularly assist in helping an organisation achieve competitive advantage through strategies such as low cost leadership, product differentiation, focussing on market niche.

Low-cost leadership: securing competitive advantage by keeping costs low. CRM can assist in a range of ways, including: providing real-time, accurate information for customer-facing staff, and that facilitates targeted marketing (reducing overall marketing costs). Other relevant suggestions and examples are acceptable.

Product differentiation: securing competitive advantage by differentiating products from the offerings of competitors. CRM can assist by, for example: using stored information to develop a more personalised, or faster experience for customers; identifying what aspects of product/service are valued/not valued by customers and should be retained/promoted or changed. 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 customer experience; facilitate targeted marketing; utilise Customer Relationship Management software; engage in customer profitability (or risk) analysis. Other relevant suggestions and examples are acceptable.

Up to 5 marks for definition of SCM systems, 5 marks for competitive advantage specifically linked to CRM.

(b) To what extent might social CRM offer further benefits to a retailer? (4 marks)

Social CRM tools enable a business to connect to 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 known 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. 2x2 marks

(c) Analyse the ethical issues arising from storing customers' personal data in CRM systems. (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 candidates' understanding of: organisational features that impact on information systems change; value chain; internet-based technologies, and vulnerabilities associated with internet-based technologies.

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 three organisational features that might affect an organisation's use of internet-based technologies. (6 marks)

Any three from:

Routines and Business Processes: Organisations develop efficient routines for producing goods and services. When used effectively, such routines can reduce costs and generate competitive advantage. However, if these routines and processes become so ingrained that they don't allow people to change their routines and processes as they should, this can have a negative effect – for example, making individuals and organisations resistant to the changes in routines and processes that internet-based technologies often require.

Organisational Politics: Each person comes into an organisation with different concerns and perspectives. These differing viewpoints lead to struggles for resources and control, and to conflict. Significant changes in information systems – like embedding internet-based technologies – often require significant organisational change and create new struggles for resource, control and conflicts. Resistance on this basis can impact significantly on the success of implementation.

Organisational Culture: organisations have bedrock, unassailable, unquestioned assumptions that define their goals and products – organisational culture encompasses this set of assumptions. These are rarely announced but are taken for granted. If assumptions are commonly shared, agreement on procedures and practices is more likely. Where proposed change – such as a move to internet-based technologies - appears to threaten underlying assumptions, that change will be resisted. When this occurs, information systems implementation is generally stalled until the organisational culture adjusts.

Organisational Environments: Organisations must adapt to changes in their environment, such as new technologies, new products, changing public tastes, legislative changes, etc. Organisations can also shape and even change their environment through the use of information technology and systems. An example is the radical change caused by the introduction of a "disruptive technology" to the marketplace. For many businesses, the move to internet-based technologies by their competitors and customers is an example of such a disruptive change.

Organisational Structure: The type of information systems used in organisations often reflects the type of organisational structure. For example, in large bureaucratic organisations there may be parallel systems operated by different departments, while small, entrepreneurial businesses may have more ad hoc systems that have been implemented in a rush. The extent of control, distribution of control and strength of the existing structure are all factors that can promote or inhibit the likely success of information systems changes, such as the move to internet-based technologies.

3x2 marks each for each feature identified and explained

(b) Giving relevant examples, discuss the impact of internet-based technologies on manufacturer's value chains. (8 marks)

The value chain model depicts the series or chain of basic activities that add a margin of value to a firm's products or services. It highlights primary activities (those most directly related to the production and distribution of the firm's products and services, which create value for the customer) and support activities (those that make primary activities possible).

Primary activities include:

Inbound logistics: receiving and storing materials for distribution to production. Possible IBT usage: automated warehousing systems are crucial for efficient stock management (for example, in reducing spoilage) and good customer service through accurate inventory levels.

Operations: transforming inputs into outputs. Possible IBT usage: cloud-based production planning applications.

Sales and marketing: promoting and selling the firm's products. Possible IBT usage: online sales and marketing applications (if selling to individuals), internet-based EDI systems (if selling to retailers), cloud-based CRM.

Service: maintenance and repair of goods and services. Possible IBT usage very dependent on the goods and services involved, in this example may include customer service fora, social media.

Outbound logistics: storing and distributing finished products. Possible IBT usage: cloud-based automated shipment scheduling systems and online parcel tracking.

Support Activities include:

Administration and Management: organisational infrastructure associated with managing the organisation as a whole. Possible IBT usage: range of cloud-based or internet-enabled decision-support systems providing timely and reliable information to management.

Human resources: employee recruiting, training and hiring across all primary and support activities. Possible IBT usage: cloud-based HR applications, workforce planning systems; off-site confidential storage of employee data.

Technology: improving products and the production process. Possible IBT usage: cloud-based or internet-enabled computer-aided design systems; decision support systems to monitor the efficiency of various processes and activities.

Procurement: purchasing inputs. Possible IBT usage: cloud-based SCM, internet-enabled EDI systems.

4 marks for identifying the value chain activities, 4 marks for relevant examples of use of internet-based technologies.

(c) Explain why Information Systems that make use of internet-based technologies may be vulnerable to destruction, error and abuse, giving examples. (6 marks)

When large amounts of data are stored in electronic form, they are vulnerable to many more kinds of threats than when they existed in manual form. Through communications networks, information systems in different locations are interconnected – and the potential for unauthorised access, abuse or fraud can occur at any access point in the network.

Information systems are vulnerable to technical, organisational, and environmental threats from internal and external sources. The weakest link in the chain is poor system management. If managers at all levels don't make security and reliability their number one priority, then the threats to an information system can easily become real. Laudon & Laudon summarise the threats to each component of a typical network in the figure below:
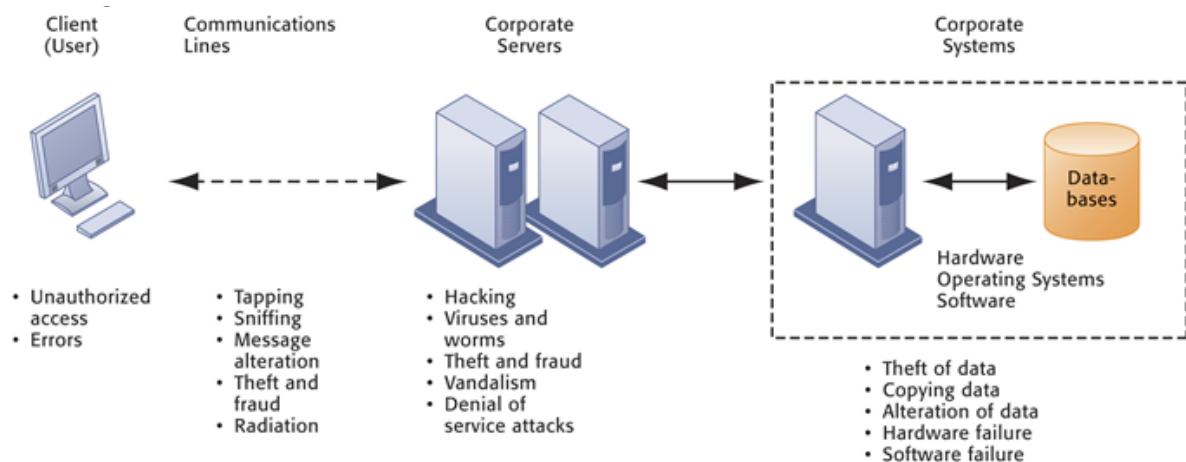
Key areas where systems are most vulnerable include: hardware or software failure and errors; personnel actions; terminal access penetration; fire or electrical hazards; user errors; theft of services, data, and equipment; program changes; and telecommunications problems. Examples of specific vulnerabilities include: internet vulnerabilities (every point of entry into the Internet network is a point of vulnerability); vulnerabilities related to the use of wireless networks (radio frequency bands are easy to scan); Malicious Software: Viruses, Worms, Trojan Horses, and Spyware; Hackers and Computer Crime; Spoofing and Sniffing; and Denial of Service Attacks. 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 more extensive. An organisation's entire record keeping system could be destroyed.

Candidates may make a number of points for 1 mark, or discuss some points in more detail for a maximum of 2 marks per point, to a maximum of 6 marks.

SOLUTION 5

(a) Explain the term business intelligence and outline the main elements of the business intelligence environment. (8 marks)

Business intelligence is a vendor defined term used to describe the infrastructure for warehousing, integrating, reporting and analysing data that comes from the business environment, including big data. The infrastructure collects, stores, cleans, and makes relevant information available to managers, and may include databases, data warehouses, data marts, Hadoop and analytic platforms.

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

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

FIGURE 12.3 BUSINESS INTELLIGENCE AND ANALYTICS FOR DECISION SUPPORT
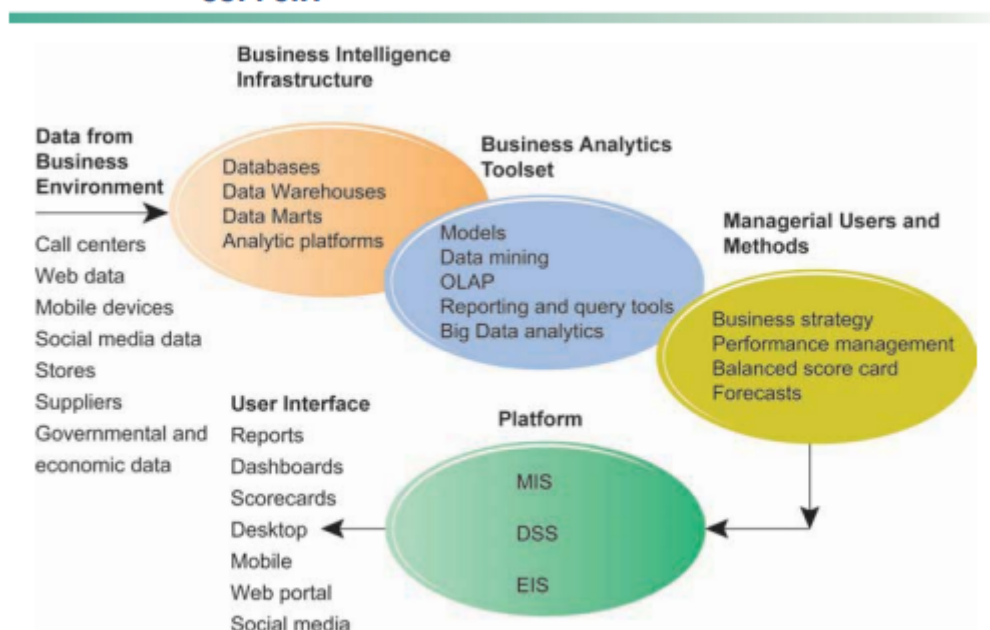
Business intelligence and analytics requires a strong database foundation, a set of analytic tools, and an involved management team that can ask intelligent questions and analyze data.

2 marks for term business intelligence, 6 marks for business intelligence environment

(b) Outline three business intelligence and business analytics tools that could be used in a retail organisation. (6 marks)

Any three from:

Production reports: These are pre-defined reports which are specific to the industry and to a functional area of the business, for example, for a retail organisation these might include reports on sales and logistics including stock outs etc.

Parameterized Reports: users enter several parameters as in a pivot table to filter data and isolate impacts of parameters. An example might be identifying changes in sales by store/channel and date/season, which might lead to remedial action being taken.

Dashboards/Scorecards: visual tools for presenting performance data defined by users. Such dashboards/scorecards could be used to give users, particularly senior managers, an overview of the most important metrics for the business.

Ad hoc query/search/report creation: functions that allow users to create their own reports based on queries and searches, i.e. not just to run the reports predefined by the vendor or at the time of installation. These would normally be run by managers or business analysts in response to their specific queries such as, for example, investigating margin or stock turnover on a particular product line.

Drill down: the ability to move from a high-level summary to a more detailed view. For example, to be able to see sales by region, then to drill down into sales by store, of different products etc. to see more detail and to compare to targets, previous periods etc.

Forecasts, scenarios, models: these include the ability to perform linear forecasting, what-if scenario analysis, and analyse data using standard statistical tools. Predictive analytics use statistical analysis, data mining techniques, historical data and assumptions about future conditions to predict future trends and behaviour patterns. Variables that can be measured to predict future behaviour are identified, and a collection of such predictors is combined into a predictive model for forecasting future probabilities with an acceptable level of reliability. One possible use might be to model sales of a new product based on information from existing products, to inform purchasing/production decisions.

<div align="right">2 marks per suggestion, well explained and with a clear example</div>

(c) Evaluate the potential for knowledge management to add value for large firms. (6 marks)

Knowledge management refers to the set of business processes developed in an organisation to create, store, transfer and apply knowledge. Effective knowledge management increases the ability of the organisation to learn from its environment and incorporate knowledge into its business processes.

Effective knowledge management can assist in:
- Reducing costs by leveraging what is known in the organisation (not reinventing the wheel) – leads to increased profitability.
- Promoting organisational learning so that mistakes are not repeated – leads to improved products and/or services (competitive advantage).
- Improving speed of response (for example in a call centre) as a result of better knowledge access and application.
- Better relationship management through knowing customer/supplier/employee needs.
- Driving innovation including through collaboration in physical and virtual teams, with knowledge workers driving the process of new knowledge creation.

<div align="center">Up to 2 marks for each relevant point, satisfactorily explained, up to a maximum of 6</div>

SOLUTION 6

Tutorial Notes: -

Purpose: To examine the candidates' understanding of: hardware trends of mobile platforms and BYOD, implications of big data, and strategies to overcome resistance to systems change.

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)   Assess the implications of the trend towards mobile digital platforms, including 'bring your own device'. (6 marks)

Mobile digital platforms: These have emerged as alternatives to PCs and larger computers. Smartphones and tablets have taken on many functions previously done by larger devices, including the transmission of data, accessing the Web, displaying digital content and exchanging data with corporate systems. These devices are increasingly used for business computing as well as for consumer applications.

Consumerisation of IT and BYOD (bring your own device): this means employees using their own smartphones and tablets (rather than those supplied by the company) to access organisational systems and data. It means that the company has to consider not just providing and controlling its own devices as in the past, but also the accessibility and security of company data being available on devices it does not own/control.

Advantages include access to job-related information from anywhere – this may be especially important in services organisations that rely on having the correct information to deal with the client in real time – either in providing the service or responding to queries. This creates better customer relationships. More up-to-date information may lead to better decision making more generally. Using employees' own devices lowers the upfront costs of purchasing hardware.

However, drawbacks include security concerns. Mobile devices are more easily lost or stolen. It may be more difficult to ensure these have up to date antivirus software, are locked, and have encrypted data transmission – especially where these are the employees' own devices, rather than the organisations. There are implications for software also – moving away from software installed on devices to either apps (usually with a narrower range of functions) or cloud-based software, only requiring the device to have a web browser.

2 marks for explanation of the trend, up to 2 marks each for positives and negatives

(b)   Assess the implications of the trend towards 'big data'. (8 marks)

Big data is generally characterised by the attributes volume, velocity and variety. Volume refers to the quantity and scale of data. Velocity refers to the rate at which data are being created. Variety refers to the diversity of data created. In addition to more "traditional" formats, semi-structured and unstructured data represents a large chunk of the data being created on a continual basis. For example, YouTube, Facebook, Instagram are responsible for vast quantities of media files. Additionally, PDFs, emails and tweets make up a considerable portion of data that may be used for analysis and insights.

A range of possible implications might be discussed.

Massive increases in storage potential and processing power: significant increases in both over time, and continuing to evolve rapidly, facilitating the use of 'big data' by increasing numbers of firms, particularly in customer-facing industries.

Changes to how data is stored and analysed: if 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 suited but Hadoop can handle structured, semi-structured and unstructured data in large quantities. It enables parallel processing of huge amounts of data across a cluster of inexpensive servers, with processors added or removed as needed.

A possible further development of this is quantum computing: emerging technology with the potential to dramatically boost processing power – developments in analytics software then allow for analysis of these large quantities of structured and unstructured data.

Cloud computing: a model of computing in which computer processing, storage, software and other services are provided as a pool of virtualised resources over a network, primarily the internet. 'Clouds' of computing can then be accessed on an as-needed basis from any connected device and location. There are three main categories of cloud computing: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). From a big data perspective, IaaS is most relevant and can lead to cost savings, reduced investment in hardware (paying for usage rather than owning servers), and keeping data offsite is a disaster contingency measure however concerns over access and security of data remain.

Competitive advantage: Whether an organisation successfully engages with this trend may have a significant impact on competitive advantage. For example, analysis of big data may yield powerful insights, that help the organisation to focus on market niche, build intimacy with customers/suppliers, differentiate their products or find new means of lowering costs. If an organisation does not successfully engage, its competitors may gain competitive advantage over them.

Significant cost implications include costs of storage, hard ware and software costs to facilitate analysis, HR costs of recruiting and retaining staff with analysis capabilities, and training others in the organisation in the use of this data. Additional security threats are faced when more data is stored and analysed. Ethical considerations of how data is stored and used should be considered.

<div align="center">2 marks for explanation of the trend, up to 3 marks each for positives and negatives</div>

(c) Discuss three possible strategies that managers can employ to increase user involvement and overcome user resistance to systems change. (6 marks)

- Engage users on the project team – as active members, in leadership roles, or in installation and training.
- Demonstrate responsiveness to user concerns – promptly answering questions, incorporating user feedback and ensuring that the end-user interface is user-friendly.
- Identify and address reasons for user resistance - for example, dispute of system benefits, demotivation through exclusion, feelings of imposition.
- Identify required education, training and ongoing support - for example, user manuals/quick reference guides, software embedded help feature, support structures, repositories of information, dedicated telephone support, support through regular communication.
- Use clear management edicts and policies, with incentives for cooperation.
- Address existing/developing organisational issues before implementation.

<div align="center">3 x 2 marks, other relevant suggestions and examples are acceptable</div>