CPA IRELAND | CERTIFIED PUBLIC ACCOUNTANTS

INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - AUGUST 2018

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

INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - AUGUST 2018

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. E-Vayper was set up by Jane and Jack Anderson in 2013 in response to the then new trend of 'vaping' – smoking electronic cigarettes (e-cigarettes) containing vapours of various flavours. E-Vayper manufactures and sells both the e-cigarettes and the e-liquid refills that are required for vaping, in addition to a wide range of related accessories. The company currently has three major operational functions:

- Manufacturing: It has a large facility manufacturing E-Vayper branded e-cigarettes and associated products in Dublin.
- Wholesale distribution: It has a team of staff focussed on sales and distribution of E-Vayper branded e-cigarettes and associated products to wholesalers and other retail chains.
- End-consumer retail: This consists of a chain of 45 shops across the island of Ireland selling both E-Vayper branded and other brands of e-cigarettes and associated products. Amongst the other brands sold are Ecovape, a low-price, entry-level e-cigarette that is cheaper than anything currently manufactured by E-Vayper and PlatinumVape, a premium brand of e-liquid refill with a retail price 20% higher than similar E-Vayper products.

Jane and Jack are joint CEOs and set up the company using funds from the sale of their previous business, a small chain of grocery shops, and they have extensive experience in the retail of fast-moving consumer products. They quickly identified that, when buying their product from wholesale distributors, both the manufacturer and wholesaler were achieving sizeable profit margins, particularly in sales of e-liquids and accessories. Accordingly, they decided to set up their own manufacturing facility in Dublin. However, as they had little manufacturing experience, they hired Gareth Williams as a production manager to set up and run their manufacturing facility in 2015. To some extent this facility has met its objectives (E-Vayper manufactures its e-cigarettes for 35% of the wholesale cost). However, Jane and Jack feel that they would like to have better information on the operation of this facility, including more regular information on production targets and volumes.

Jane and Jack sell their manufactured products through both their stores and wholesale distribution to other retailers. They employed Julie Rice to build and lead a sales team. Much of this team's compensation relates to the achievement of sales bonuses, and Julie provides a monthly analysis of team and individual sales against target.

Lastly, the number of retail stores has grown dramatically, including 12 new store openings in 2017 alone. Jane and Jack receive daily updates on till takings at each store, but would like more information on the product mix of stock sold (currently only available as a weekly report from the retail manager, three days after the week ends). Store managers are responsible for employing their own staff, staff rostering and the purchase of consumables. On a weekly basis, they communicate their stock requirement for the following week to the Inventory Manager of the manufacturing facility (for E-Vayper branded goods) and to a procurement clerk at Head Office (for other brands).

Three months ago, Jane and Jack employed Emma Tripp as Group Financial Controller. Emma impressed them at interview with her experience of the implementation of a new Management Information System (MIS) and development of expanded reporting (including both financial and non-financial indicators). Having assessed the information systems in place, Emma is proposing a significant investment in their information systems, including replacing the accounting software, upgrading hardware and network connectivity, and developing an Executive Support System (ESS). While there is broad agreement on the need for software and hardware upgrades, Julie Rice and Gareth Williams have expressed resistance to the proposed ESS.

REQUIREMENT:

(a) Outline, giving examples relevant to E-Vayper, the organisational, management and technological factors that will need to be considered by Emma, the Group Financial Controller, as she implements an improved information system.

(9 marks)

(b) Explain the term Executive Support System (ESS). (2 marks)

(c) Assess the potential of an ESS to improve decision making in E-Vayper. In your answer, you should suggest information that might be provided to Jane and Jack through such a system.

(8 marks)

(d) Discuss the reasons why Emma (Group Financial Controller) might face resistance to the planned changes, and suggest two possible strategies to overcome user resistance to systems change.

(6 marks)

[Total: 25 Marks]

2. Write briefing notes on any THREE of the following topics.

(a) Expert Systems in production scheduling.

(b) Business-to-business e-commerce for a multinational business.

(c) Transaction Processing Systems (TPS) in retail organisations.

(d) Social Customer Relationship Management (CRM) tools for a high-street retailer.

(e) Tools and technologies to safeguard information resources.

[Total: 15 Marks]

SECTION B

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

3.

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

(8 marks)

(b) Outline the purpose of a data warehouse, including the type of data stored, and the potential business value of storing such data.

(6 marks)

(c) Explain the Total Cost of Ownership model and assess its usefulness in evaluating a proposed investment in data storage and analysis.

(6 marks)

[Total: 20 Marks]

4.

(a) Explain what is meant by the term Enterprise Resource Planning (ERP) systems, and outline options available to an organisation deciding to acquire ERP software.

(6 marks)

(b) Outline the potential benefits and challenges of implementing an ERP system for a geographically-dispersed organisation.

(8 marks)

(c) Discuss two appropriate options for converting from an existing system to a new ERP-based system, clearly identifying the advantages and disadvantages of each.

(6 marks)

[Total: 20 Marks]

5.

(a) Giving examples relevant to a large retailer, explain 'Infrastucture as a Service' (IaaS), 'Platform as a Service' (PaaS) and 'Software as a Service' (SaaS).

(9 marks)

(b) Outline the difference between a private and public cloud. With a focus on IaaS, recommend three factors that should be considered in deciding between private and public clouds.

(6 marks)

(c) Discuss the security implications of using SaaS for business-critical applications. (5 marks)

[Total: 20 Marks]

6.

(a) Outline how Information Systems can support Porter's four generic strategies used to address competitive forces in the marketplace.

(6 marks)

(b) Discuss the impact of the internet on the competitive forces facing small, niche retailers. (6 marks)

(c) Explore the possible business benefits of collaboration within firms, and the tools and technologies that might be used to facilitate this.

(8 marks)

[Total: 20 Marks]

END OF PAPER

SUGGESTED SOLUTIONS

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - AUGUST 2018

SOLUTION 1

Tutorial Notes: -
Purpose: To examine the candidates' understanding of: organisational, management and technological aspects of information systems; the value of Executive Support Systems; strategies to manage resistance to 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) Outline the organisational, management and technological factors that will need to be considered by Emma, the Group Financial Controller, as she implements an improved information system, giving examples relevant to E-Vayper.

(9 marks)

Organisation: The key elements of an organisation are its people; structure; business processes; culture and politics. Information Systems provide information to different staff levels to allow them to carry out their function and to monitor others as appropriate. Authority and responsibility is organised as a hierarchy. Each organisation has a unique culture, a fundamental set of assumptions, values and ways of doing things that has been accepted by most of its members. Organisational politics may be a part of this, and is often based in conflicts as to how the company should be run and resources and rewards distributed. Emma will need to consider how each of these factors could inhibit or support the success of the new information system: for example, does E-Vayper have a culture of positively embracing change, or is it slow to change? Are there clear reporting lines in each of the divisions, as well as from the divisions to Jane and Jack? In addition, new information systems can affect these organisational factors, for example, flattening hierarchies through greater information sharing: Emma should consider, with Jane and Jack, whether the new information system is to be used as a means of delivering such changes.

Management: management's job is to make sense out of the many situations faced by organisations, make decisions and formulate action plans to solve organisational problems. They assess business challenges in the environment, set the organisational strategy for responding to these challenges, and allocate human and financial resources to coordinate the work and achieve success. One of Emma's primary objectives will be to ensure that the new information system provides the information needed by management to complete these tasks, and that information ideally should be timely, reliable, accurate and objective. Examples include having more accurate, more regular (possibly real-time) information on the product mix being sold in each of the stores provided to management in the retail stores (for forecasting and placement), Head Office (for forecasting and procurement) and the manufacturing division (for production planning).

Technology: Technology includes computer hardware, software, data management technology and networking and communications technology (consisting of both physical devices and software, linking various pieces of hardware and transferring data from one physical location to the other). Networks including the internet, intranets (internal corporate networks) and extranets (private intranets extended to authorised users outside the organisation) may be used. These, together with the people required to run and manage them, make up the firm's information technology infrastructure. The success of information systems depends on their availability and ease of use, as facilitated by these technological components. Emma will need to consider what technology is optimal, taking into account the objectives of the new information system, integration between different parts of the system, performance, ease of use and cost. For example, with faster network connections more expensive, there may be aspects where the business is happy to have a daily update of some types of information rather than real time information (for example, information from the retail stores), and spend the money saved in other ways.

3x3 marks for organisational, management and technological, plus relevant examples

(b) Explain the term Executive Support System (ESS). (2 marks)

ESS - 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 (primarily Jane and Jack in this case) 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 systems are designed to be flexible, to cope with unstructured data from a range of sources, including internal and particularly external to the organisation. They may draw on information from MIS and DSS. They are designed to be easy to use or manipulate, so that executives can see the information provided to them in a range of ways that are useful in their decision making.

Up to 2 marks for clear explanation

(c) Assess the potential of an ESS to improve decision making in E-Vayper. In your answer, you should suggest information that might be provided to Jane and Jack through such a system. (8 marks)

An ESS may be beneficial in pulling together information from a range of sources, including (as above) internal sources (MIS, DSS, legacy systems, disparate systems including the HR and accounting systems) and external sources to the organisation. This indicates that an ESS will only be useful to Jane and Jack if the underlying systems and information generated are reliable, and if there are clear means to capture and use external information.

Usually the objective is to pull this information together in a user friendly way. If the ESS is not user-friendly, Jane and Jack may simply work around it. For example, it may be important to provide information 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 to allow the optimal decision to be made. This may be done through a portal, which uses a web interface to present integrated, personalised business content.

A dashboard type presentation is often used to provide, at a glance, a real-time view of key performance indicators for the business. For example, following the balanced scorecard approach, E-Vayper might monitor information relating to:

- financial position and performance (e.g. cash position, working capital position, budget v actual costs of each division, product profitability, store profitability)
- customers (e.g. repeat customers identified through loyalty programmes, average customer spend, product mix)
- internal business processes (e.g. production process information such as throughput, quality measures, idle time, defect rates; recruitment processes)
- learning and growth (e.g. new product development, patents applied, staff satisfaction/retention).

The case indicates that Jane and Jack currently lack certain types of information from all three of the divisions. Provided the information is accurate, reliable and provided in real-time (or in a timely fashion), Jane and Jack may be able to make more informed and better decisions on managing the business, including decisions about restructuring, investment, performance and the setting of strategy.

A valid counter argument to the suggestions of the usefulness of an ESS for this business is that this is still a relatively small business, over which other forms of oversight are possible. With Jane and Jack leading a small management team, it may be possible for them to generate similar information on demand, provided there is investment in information systems at the lower levels. Moreover, with Jane and Jack having founded the business themselves and hired all of the staff, they will have a good understanding of how the business works and the information they need to run it, possibly making a formal ESS superfluous. This is a growing business which may have alternative uses for the funds needed to develop an ESS, not least for better TPS and MIS at lower levels of the organisation.

4 marks for relevant points (positive and negative) on its usefulness, 4 marks for suggestions of information the ESS should provide (reference to balanced scorecard framework is not required)

(d) Discuss the reasons why Emma (Group Financial Controller) might face resistance to the planned changes, and suggest two possible strategies to overcome user resistance to systems change.

(6 marks)

Julie and Gareth might be resistant to having further information made available to Jane and Jack that might indicate less than optimal performance on their part or in their divisions. They might resent the loss of the autonomy to run their divisions that they appear to have had up to this point. They may be aggrieved that this is being suggested by a new employee who is not fully familiar with the company. They may lack confidence with new technologies. People are often resistant to change if they are uncertain as to the objective of the change, especially as many information systems changes are promoted as a means to increase efficiency (creating fears around budgets and job security for individuals/teams).

Strategies include:
Engage them on the project team – as active members, in leadership roles, or in installation and training.

Identify and address reasons for resistance, and demonstrate responsiveness to concerns – promptly answering questions, incorporating user feedback and ensuring that the end-user interface is user-friendly.

Identify required education, training and ongoing support - for example, user manuals/quick reference guides, support structures, repositories of information, support through regular communication.

Use clear management edicts and policies, with incentives for cooperation.

Address existing/developing organisational issues before implementation.

3 x 2 marks, other relevant suggestions and examples are acceptable

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 student 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.

Write briefing notes on any THREE of the following topics.

(a) Expert Systems in production scheduling

Expert systems are an intelligent technique for capturing tacit knowledge in a very specific and limited domain of human expertise. Expert systems model human knowledge as a set of rules that are collectively known as the knowledge base, potentially consisting of a few hundred to many thousands of these rules, depending on the complexity of the problem. These rules are interconnected and nested, and a strategy known as an inference engine is used to search through the knowledge base using either forward or backward chaining to move through the rules and frames.

Expert systems are used in discrete, highly-structured decision-making situations, decisions that could be taken by a professional in a few minutes or hours, such as deciding whether to grant credit for a loan. Similarly, such systems may be appropriate for production scheduling, where decision-making is based primarily on highly structured information (such as staff availability, availability of materials, time to carry out defined tasks, time to move items from stores and between production areas).

Benefits of expert systems include improved decisions, reduced errors, reduced costs, reduced training time and higher levels of quality and services. However if these benefits are to be achieved organisations need to be mindful of the limitations of such systems. These include that only certain classes of problems can be solved in this way. Developing and maintaining expert systems can be costly – such systems must work correctly and be based on regularly updated, relevant information, otherwise they could result in incorrect decisions based on outdated or incorrect information.

(b) Business-to-business e-commerce for a multinational business

Business-to-business (B2B) e-commerce is the term used to describe electronic sales of goods and services between businesses. It is a large and growing market, and suggested benefits of transacting in this way include reduced human intervention in procurement; reduced administrative overhead relating to procurement; optimised stock holding levels; and stronger supplier relationships. B2B e-commerce is increasingly being facilitated by internet-enabled mechanisms.

B2B e-commerce can be facilitated through electronic data interchange (EDI): the direct computer-to-computer exchange between two organisations of standard business transactions such as orders, shipment instructions or payments. In addition, EDI can be used as a system for continuous replenishment, giving suppliers online access to selected parts of the purchasing firm's production and delivery schedules to automatically ship materials and goods. EDI can be mediated through a private network, however web-enabled EDI is becoming much more common as an increasingly low-cost and flexible alternative.

Internet technology can be used to create extranets or electronic marketplaces for linking to other businesses for purchase transactions. These could include the use of private industrial networks or private exchanges, where a large firm uses a secure website to link to key suppliers and other partners. An example is VW group supply.

Alternatively, net marketplaces (or e-hubs) provide a single, digital marketplace based on net technology for many different buyers and sellers, either owned and operated as independent intermediaries or industry operated. Participants in net marketplaces can establish prices through online negotiations, auctions, requests for quotations or fixed prices. Some net marketplaces support contractual purchasing based on long term relationships with designated suppliers while others connect buyers and suppliers for spot purchasing based on immediate needs.

(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) Social CRM tools for a high-street retailer

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) Tools and technologies to safeguard information resources

Examples might include:

Firewalls – prevent unauthorised users from accessing a private network when it is linked to the internet.

Access authentication – use of passwords, tokens, smart cards and biometric authentication (and associated controls) to allow access to the system (and facilitate tracking of individuals' actions within the system).

Antivirus software – checks for viruses and worms, and eliminates malicious software

Antispyware software - checks for and eliminates malicious spyware

Encryption – the coding and scrambling of messages is a widely used technology for securing electronic transmissions over unprotected networks. Digital certificates can be combined with public key encryption.

SOLUTION 3

Tutorial Notes: -
Purpose: To examine the candidates' understanding of: hardware trends of mobile platforms and BYOD, data warehousing and the total cost of ownership model to evaluate 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) Assess the implications for a services organisation of the trend towards mobile digital platforms, including 'bring your own device'.

(8 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 definition, up to 3 marks each for positives and negatives

(b) Outline the purpose of a data warehouse, including the type of data stored, and the potential business value of storing such data.

(6 marks)

A data warehouse is a database that stores current and historical data of potential interest to decision makers throughout a company. The data originate in many core operational transaction systems inside the organisation such as systems for sales, customer accounts and manufacturing, and may include data from website transactions. The data warehouse then extracts current and historical information from these systems. This data is highly structured and capable of being organised and stored in a defined format. This is transformed by correcting inaccurate or incomplete data and restructuring the data for management reporting and analysis before being loaded into the data warehouse.

Once data has been captured and organised in a data warehouse they are available for further analysis using business intelligence tools and techniques for analysing and understanding data, including online analytical processing (OLAP), statistics, models and data mining. Business value is created when organisations analyse their own data (possibly in combination with externally-sourced data) to better understand factors that are important to their business, including customer behaviour. It can provide a basis for more informed, and hopefully better business decision making on a range of issues.

2 marks for definition, 2 marks for information stored, 2 marks for business value

(c) Explain the Total Cost of Ownership model and assess its usefulness in evaluating a proposed investment in data storage and analysis.

(6 marks)

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.

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. This is important given that, in the final analysis, many IS projects are over budget, partly due to unforeseen 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 gathering (a criticism of some alternative models, such as the competitive forces model). The business will have better information to do this if they have completed recent projects, and have completed end-of-project reviews of these (which would usually identify cost over-runs, unanticipated costs etc.).

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).

3 marks for definition, 3 marks for analysis (positive and negative)

SOLUTION 4

Tutorial Notes: -
Purpose: To examine the candidates' understanding of: Enterprise Resource Planning (ERP) systems; how software to enable such systems may be obtained; benefits/challenges of ERP systems and the possible conversion strategies.
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 outline options available to an organisation deciding to acquire ERP software. (6 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 of 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. The software is usually customised, often with support from external consultants, 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.

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.

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, 4 marks for options to acquire

(b) Outline the potential benefits and challenges of implementing an ERP system in a geographically-dispersed organisation. (8 marks)

Potential benefits:
- Increased operational efficiency by providing managers across locations with timely, accurate and relevant information to aid in their decision making
- Business can respond more quickly to customer requests for information or products, for example having better stock information available
- Better information is available to create more accurate sales forecasts and associated procurement, minimising costs and the risks of stock outs
- Better information on business processes such as procurement can be used to identify inefficiencies, control weaknesses or other areas for improvement
- Greater sharing of information, standardisation of information and reports can assist Head Office in reviewing performance and taking action as the business grows

Possible challenges:
- ERP implementation can have fundamental effects on how a business operates. Clear lines of communication are key and may be more difficult in a geographically dispersed business
- Difficulties in integrating the ERP with existing software – 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.
- Lack of in-house expertise to develop and maintain the system
- 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.

8x1 marks for suggesting and briefly outlining challenges/benefits

(c) Discuss two appropriate options for converting from an existing system to a new ERP-based system, clearly identifying the advantages and disadvantages of each. (6 marks)

Conversion is the process of changing from the old systems to the new ERP system. Possible conversion strategies include a parallel strategy – running the old and new systems in parallel for a period – a strategy which is very low risk, and allows for ongoing testing and amendments. However, this strategy is also relatively high cost and time-consuming (for example, transactions needing to be processed twice on the different systems – this also confusing and frustrating for staff).

A phased approach strategy involves introducing the system in stages – for example department by department, or introducing specific modules first before integrating these with others. Again this allows for ongoing testing and amendments, identifying issues before the system is fully integrated, then implementing and testing the integration separately. This is low risk when compared to a direct cutover strategy but may not be possible in all ERP implementations, and has a high cost associated.

A pilot study strategy involves testing the system in a single department before rolling it out to other departments. Advantages and disadvantages would be similar to a phased approach: however it may not be fully appropriate for an enterprise wide application such as ERP – where the success or failure of the system is closely linked to its ability to be used across departments.

2x3 marks for each strategy (note direct cutover is not appropriate)

SOLUTION 5

Tutorial Notes: -
Purpose: To examine the candidates' understanding of: key types of cloud computing; the use of private and public clouds; security implications of cloud computing.
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) Giving examples relevant to a large retailer, explain 'Infrastucture as a Service' (IaaS), 'Platform as a Service' (PaaS) and 'Software as a Service' (SaaS). (9 marks)

Infrastructure as a Service (IaaS): customers use processing, storage, networking and other computing resources from cloud service providers to run their information systems. Examples include computing resource management, network management and storage management: Amazon Web Services (AWS) offers a range of storage services, including the Simple Storage Service (S3) for storing customer data. Retailers generate huge quantities of data on sales, purchasing, stock movements and customer behaviour, requiring significant infrastructure to store this and facilitate its analysis.

Platform as a Service (PaaS): customers use infrastructure and programming tools supported by the cloud service provider to develop their own applications. Examples include Salesforce.com's Force.com which allows developers to build applications that are then hosted on Salesforce.com's servers as a service. This might be appropriate for a retailer to customise an application specific to their business, either for the use of their employees or their end customer.

Software as a Service (SaaS): customers use software hosted by the vendor on the vendor's cloud infrastructure and delivered over a network. Customers access the applications via a web browser with the data and software maintained on the providers' remote servers. Examples include Google Apps for business applications and Salesforce.com for customer relationship management software. For a retailer this will usually be used for internal processes – an example might be cloud based HR systems, given that retailers often employ many staff, often paid on an hourly rate.

3 marks for each type, well explained with relevant examples

(b) Outline the difference between a private and public cloud. With a focus on IaaS, recommend three factors that should be considered in deciding between private and public clouds. (6 marks)

A public cloud is owned and maintained by a cloud service provider, such as Amazon Web Services and is made available to the general public or industry group. 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:
- Business strategy – is the business stable or facing major change, e.g. expansion, closing stores/territories/moving online
- 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
- Availability of money to invest in building a private cloud
- Nature of data, in particular its sensitivity and whether it is subject to regulatory requirements – numerous scandals around customer payment details
- Organisational importance of 'guaranteed' access/risks of downtime
- Existence of organisation-specific IT infrastructure, e.g. stock management systems, which can be difficult to integrate with existing public clouds.

Up to 3 marks for clear distinction between public and private cloud, 3 marks for relevant factors

(c) Discuss the security implications of using SaaS for business-critical applications. (5 marks)

- Security of connection – uninterrupted connection is vital, need for back-up connections plus built in checks on processing to ensure all data input and processing has completed.
- Security of data transfer – encryption is a widely used technology for securing electronic transmissions over unprotected networks. Digital certificates can be combined with public key encryption.
- Security of access – use of passwords, tokens, smart cards and biometric authentication (and associated controls) to allow access to the system (and facilitate tracking of individuals' actions within the system).
- Security of data used by the SAAS – procedures to protect data by the provider should be clearly stipulated in a Service Level Agreement or contract.
- Usual protections against viruses, malware, spyware etc. (focus on protecting relevant software and connections).

Up to 5 marks: points must be relevant to SAAS

SOLUTION 6

Tutorial Notes: -
Purpose: To examine the candidates' understanding of: information systems in implementing Porter's four generic strategies, competitive forces and the internet, collaboration tools.
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) Outline how Information Systems can support Porter's four generic strategies used to address competitive forces in the marketplace.

(6 marks)

The four generic strategies and the potential for information systems to assist in implementing such strategies include:

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

Product differentiation: securing competitive advantage by differentiating products from the offerings of competitors. IS can assist by, for example: using stored information to develop a more personalised, or faster, shopping experience for customers; using proprietary technology to enhance the product/buying experience.

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.

Strengthening customer and supplier intimacy: securing competitive advantage by developing loyalty with customers and suppliers. 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).

2 marks for detailing the four strategies, 4 marks for a clear explanation of how IS can be used in implementing the strategy. Other relevant suggestions and examples are acceptable.

(b) Discuss the impact of the internet on the competitive forces facing small, niche retailers. (6 marks)

The following table from Laudon & Laudon summarises the impact the Internet is having on many industries.

TABLE 3-5 IMPACT OF THE INTERNET ON COMPETITIVE FORCES AND INDUSTRY STRUCTURE

COMPETITIVE FORCE	IMPACT OF THE INTERNET
Substitute products or services	Enables new substitutes to emerge with new approaches to meeting needs and performing functions
Customers' bargaining power	Availability of global price and product information shifts bargaining power to customers
Suppliers' bargaining power	Procurement over the Internet tends to raise bargaining power over suppliers; suppliers can also benefit from reduced barriers to entry and from the elimination of distributors and other intermediaries standing between them and their users
Threat of new entrants	The Internet reduces barriers to entry, such as the need for a sales force, access to channels, and physical assets; it provides a technology for driving business processes that makes other things easier to do
Positioning and rivalry among existing competitors	Widens the geographic market, increasing the number of competitors, and reducing differences among competitors; makes it more difficult to sustain operational advantages; puts pressure to compete on price

The Internet allows traditional/new competitors to introduce new products and services and lure customers away. Consumers can easily and quickly find substitute products and services through the Internet.

Customers can easily use the information available online to switch to lower-cost providers. They can compare product prices across hundreds of providers via large trusted marketplaces (eBay, Amazon) or larger specialised providers.

The corollary of this is that small niche retailers can also switch to lower cost suppliers, potentially widening their product offerings, improving the quality of product and driving cost down.

The internet and the potential for new sellers without high street premises provides a low cost avenue for new market entrants. New business models for retail goods are being developed by these types of providers, e.g. subscription models for monthly deliveries of items such as snacks, tea/coffee and wine. This may create competition and fundamentally change the market.

The geographic market is widened as global competitors become a threat – small niche retailers can find themselves facing competition from household name providers who have the ability to expand their ranges online.

Up to six marks for discussion of impact relating to the 5 forces, or equivalent.

(c) Explore the possible business benefits of collaboration within firms, and the tools and technologies that might be used to facilitate this.

(8 marks)

Possible business benefits include:

Productivity: people interacting and working together can capture expert knowledge and solve problems more rapidly than the same number of people working in isolation. There may be fewer errors. This can lead to a reduction in buffers and time delays among production units.

Quality: People working collaboratively can communicate errors and corrective actions faster than people working in isolation. There are likely to be fewer errors as a result, and reduced time delays.

Innovation: people working collaboratively in groups can come up with more innovative ideas for products, services and administration than the same number of people working in isolation. There are advantages of diversity and the 'wisdom of crowds'.

Customer service: People working together in collaboration can solve customer issues and complaints faster and more effectively than if they are working in isolation from each other.

Financial performance: As a result of improvements in productivity, quality etc., organisations that support collaboration can achieve higher sales and better overall financial performance.

Possible tools and technologies include:

Email and instant messaging
Wikis
Virtual worlds – online 3D environments where employees have graphical representations of themselves (avatars) which meet, interact and exchange ideas at these virtual locations.

Collaboration and social business platforms including:

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 business e.g., Yammer, Jive and IBM Connections – employees are connected to each other through profiles, updates and notifications similar to Facebook features.

4 marks for business benefits, 4 marks for possible tools and technologies