

# INFORMATION SYSTEMS

## FORMATION 2 EXAMINATION - APRIL 2017

### 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.

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

## SECTION A

Answer **BOTH** Question 1 and Question 2 in this Section.

(Both Compulsory)

1. Arramed is a pharmaceuticals company, focussing on the competitive, but lucrative, health supplements market. It operates three main divisions: Production; Distribution; and Research and Development. The Production division handles all aspects of production including the procurement of raw materials – all production takes place in one location, at Arramed's Head Office in Dublin. The Distribution division is responsible for sales, marketing and distribution activities. This division operates from Arramed's Dublin Head Office and has branch offices in 12 other countries across Europe and the Middle East. In each country, Arramed sells to third-party distributors including pharmacy and health food chains. The Research and Development division is responsible for developing innovative new products and refreshing existing product lines. This division is geographically dispersed across four 'Centres of Excellence', on the campuses of leading universities in France, Sweden, Malaysia and Canada.

Following a number of profitable years, Arramed has a limited quantity of surplus funds available to invest. Each division has been asked to prepare a costed proposal of how they would spend that money, and the Board of Directors is meeting to consider these proposals. In summary, the proposals are:

Proposal 1 (Production division): Invest €100,000 in a replacement machine for Production Line A, increasing output from 26,000 tablets per day to 42,000 tablets per day.

Proposal 2 (Distribution division): Invest €50,000 in a Customer Relationship Management (CRM) system (and required hardware/software) to improve customer service by all branch offices and Head Office.

Proposal 3 (Research and Development division): Invest €40,000 in collaborative tools and technologies (and required hardware/software) to facilitate collaboration between the Centres of Excellence and with Head Office.

The Board can choose which proposal or combination of proposals to fund. However, after a lengthy discussion, no decision has yet been made. Anna Walker, Head of Operations, felt there was not yet enough information on the proposals at hand:

*"I'm no expert in IT: I can see the benefit of investing in a machine to produce more tablets more quickly – but with these proposals about CRM and collaborative technologies, I find it hard to understand the benefits versus the costs we have in front of us. And surely we need to have some means of evaluating those benefits against costs?"*

Tom Baker, Deputy Chief Executive, shared a broader concern:

*"I think we need to seriously consider what our strategic objectives are as a company – just saying we want to continue to grow, but not how we're going to do that, isn't helping us generally, and certainly isn't helping us to make this decision. I feel like these proposals would take us off in different strategic directions, and we should have a conversation about what that direction should be".*

**REQUIREMENT:**

- (a) Discuss what is meant by the term 'Customer Relationship Management (CRM)' systems, and evaluate the possible advantages of the proposal to invest in a CRM system for Arramed. (6 marks)
- (b) Outline what is meant by the term 'collaborative technologies' (giving examples), and evaluate the possible advantages of the proposal to invest in collaborative technologies for Arramed. (6 marks)
- (c) In response to Tom Baker's comment, discuss four possible strategic objectives that Arramed might pursue, and how investment in information systems (including the suggestions above) could enable the achievement of these objectives. (8 marks)
- (d) In response to Anna Walker's comment, outline two methods of quantifying the potential value of Proposals 2 and 3 to Arramed. (5 marks)
- [Total: 25 Marks]**

2. Write briefing notes on any THREE of the following topics. Your notes should include a summary of the main points relating to the topic.
- (a) Decision support systems in international organisations.
- (b) Intellectual property rights and the Internet.
- (c) Data mining in the hospitality industry.
- (d) Enterprise-wide Knowledge Management Systems in large organisations.
- (e) Transaction processing systems in manufacturing organisations.
- (Each part carries 5 marks)
- [Total: 15 Marks]**

**SECTION B**

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

3. (a) Outline what is meant by the term 'Database Management Systems' and their usefulness in comparison to traditional file-based environments. In your answer, give examples related to the storage of employee data. (7 marks)
- (b) Outline what is meant by the term 'data warehouse' and the usefulness of such data warehouses in comparison to alternatives, such as Hadoop. In your answer, give examples related to storing the large amounts of data often generated by retailers. (7 marks)
- (c) Briefly discuss the principles of data protection to be adhered to by data controllers as outlined in the relevant Data Protection Acts. (6 marks)
- [Total: 20 Marks]**

4. (a) Evaluate the possible advantages and disadvantages for a small organisation of using cloud computing to store operational data (Infrastructure as a Service). (8 marks)
- (b) For a small organisation using cloud computing to store operational data (Infrastructure as a Service), discuss the importance of service level agreements and what these might include. (6 marks)
- (c) Outline three basic tools and technologies a small organisation can use to safeguard its information resources. (6 marks)

**[Total: 20 Marks]**

5. (a) The implementation of Enterprise Resource Planning (ERP) systems often lead to significant organisational change. Outline the four main types of organisational change enabled by information technology, giving examples relevant to the implementation of ERP systems. (8 marks)
- (b) Discuss the potential benefits and challenges of implementing an ERP system in a large, growing manufacturing organisation. (8 marks)
- (c) A large, growing manufacturing organisation has decided to implement an ERP system, based on purchased software. Briefly outline the systems analysis and design activities that the organisation should undertake before purchasing the software. (4 marks)

**[Total: 20 Marks]**

6. (a) Outline three ways in which social media can be useful to a government body. (6 marks)
- (b) Discuss the management, organisational and technological factors that may affect the success of internal corporate social networks. (8 marks)
- (c) Outline three possible ethical dilemmas arising from organisations' use of social media. (6 marks)

**[Total: 20 Marks]**

**END OF PAPER**

## SUGGESTED SOLUTIONS

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

# INFORMATION SYSTEMS

FORMATION 2 EXAMINATION - APRIL 2017

### SOLUTION 1

*Purpose:* To examine candidates' understanding of: CRM systems; collaborative tools; strategic objectives and the role of Information Systems in achieving such objectives; and methods of valuing Information Systems investments; and their ability to apply this knowledge to a given context.

*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) 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.

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.). Analytical CRM systems use operational data for data analysis, for example to identify buying patterns, create segments for targeted marketing and identify profitable and unprofitable customers.

Advantages of CRM systems include: improved customer service, lower direct marketing costs, increased marketing effectiveness, access to customer feedback for new product development, reduced sales costs, the ability to identify profitable and high lifetime value customers, reduced customer churn/improved customer loyalty. Advantages particularly relevant to Arramed – and to the critical importance of meeting customer needs given the risks to health if items are not delivered - include improved customer service. For innovation, the access to customer feedback may be important. From a financial perspective, identifying profitable customers, reducing customer churn and reducing marketing costs may be particularly useful.

3 marks each for explanation and relevant advantages

- (b) Possible tools and technologies include:  
Email, instant messaging, wikis

*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.

Possible advantages include:

*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’ – this may be the primary benefit if the organisation seeks to innovate new drugs.

*Increased productivity:* people interacting and working together can capture expert knowledge and solve problems more rapidly than the same number of people working in isolation, particularly if geographically distant. There may be fewer errors as problems and solutions are discussed, reducing possible time delays.

*Improved 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.

3 marks each for explanation and relevant advantages (note detailed discussion of these tools and technologies is not expected)

**(c) Operational Excellence**

Organisations continuously seek to improve the efficiency and productivity of their operations in order to achieve higher profitability. Information systems can assist in this by providing tools that allow organisations to operate more efficiently, examples might include the use of business to business e-commerce in procuring consumables; or real-time stock monitoring. Laudon & Laudon cite the example of Walmart and its RetailLink system, which digitally links suppliers to every store. As soon as a customer purchases an item, a replacement is shipped by the supplier. If Arramed were to focus on operational excellence, the CRM system may assist in making customer interactions more efficient – reducing the time taken in receiving orders, dealing with queries, complaints etc. and also potentially more effectively building relationships with customers – who seek to do business with Arramed in expectation of continuing high quality service. Alternatively, the collaborative tools may help to deliver operational excellence through the development of innovative, excellent products and in speeding these to market.

**New Products, Services, and Business Models**

Information systems and technologies are a major enabling tool for firms to create new products and services, as well as entirely new business models. Examples include Apple’s creation of new (to Apple-arguably mainstreaming existing products) products such as the iPod and iPad, and a new business model through iTunes. If Arramed wishes to focus on new products and services, then arguably the greatest potential would arise from investing in the collaborative tools and technologies that could facilitate the development of new products (and potentially services or even business models). However, a case could also be made that a CRM system may help Arramed to better understand what its customers’ needs and wants are: potentially also assisting towards the objective of developing new products, services or business models.

**Customer and Supplier Intimacy**

When a business really knows its customers, and serves them well (the way they want to be served), the customers generally respond by returning and purchasing more. The result is increased revenues and profits. With suppliers, the more a business engages its suppliers, the better suppliers can provide vital inputs and this can lead to lower costs. For Arramed, investing in CRM would be an obvious means of creating better customer intimacy – ensuring that customers receive the best possible service.

**Competitive Advantage**

Doing things better than competitors, charging less for superior products, and responding to customers and suppliers in real time all add up to higher sales and higher profits that competitors cannot match. Apple, Wal-Mart and UPS are prime examples of how companies use information systems and technologies to separate themselves from their competition. Both the CRM system and collaborative tools offer opportunities for Arramed to set itself apart from its competitors, respectively by offering better service, or more innovative products.

**Survival**

Firms also invest in information systems and technologies because they are necessities of doing business. Information systems are not a luxury. In most businesses, information systems and technology are core to

survival. Laudon and Laudon cite the example of Citibank, the first banking firm to introduce ATMs. For Arramed, it may be particularly important to be innovative in their development of new, more effective drugs – in which scenario it would seem that the investment in collaborative technologies might be prioritised. On the other hand, they may perceive that their area within the drugs market is relatively stable, but that if they cannot deliver good customer service their competitors can replace them – in which case the CRM system might be prioritised.

4 x 2 marks

- (d) 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 total cost 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.

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

- a. Market demand for your firm's services
- b. Your firm's business strategy
- c. Your firm's IT strategy, infrastructure and cost
- d. Information technology assessment: where is the company's IT in relation to current trends?
- e. Competitor firm services offered
- f. 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, parts e and f (above). However when compared to total cost of ownership it acknowledges that the appropriate level of IT infrastructure investment is a function not only of internal matters but also environmental factors, and a source of potential competitive advantage.

2x2 marks for possible models, 1 mark for analysis of these. Candidates who discuss how to assess value without referring to these models will receive some credit.



## SOLUTION 2

*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. In each case your note should include a summary of the main points relating to the topic.

- (a) Decision support systems in large organisations
- (b) Intellectual property rights and the Internet
- (c) Data mining in the hospitality industry or another industry of your choice
- (d) Enterprise-wide Knowledge Management Systems in large organisations
- (e) Transaction processing systems in manufacturing organisations

- (a) Decision-support systems (DSS) are used at the tactical (middle) management level of a firm as a business intelligence delivery platform, with the ability to support semi-structured decision making. They support management decisions when these decisions are unique, rapidly changing, and not specified easily in advance. They have analytical modelling and data analysis capabilities and often draw on information from external as well as internal sources such as transaction processing systems & management information systems. A DSS may present information graphically and may include an expert system or artificial intelligence. It may be aimed at middle management or some other group of knowledge workers – particularly those who want to create their own reports, use more sophisticated analytics or models to find patterns in data, to model alternative scenarios or test specific hypotheses.

Examples of their use in international organisations might include gathering and presenting: comparative sales figures between territories; projected revenue figures modelling assumptions about new product sales; implications of projected changes on production schedules; expected outcomes of different decision alternatives.

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

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

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

- (c) Data mining is the process of analysing data and summarising it into useful information. Data mining software allows users to analyse data from many different dimensions or angles, categorise it, and summarise the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases. There are the five types of information managers can obtain from data mining:



Associations: Determine occurrences linked to a single event

Sequences: Determine events that are linked over time

Classification: Discover characteristics of customers and make predictions about their behaviour

Clustering: Discover groups within data

Forecasting: Use existing values to forecast what other values will be

Data mining is primarily used by companies with a strong consumer focus - retail, financial, communication, marketing and hospitality organisations. It enables these companies to determine relationships among "internal" factors such as price, product positioning, or staff skills, and "external" factors such as economic indicators, competition, and customer demographics. And, it enables them to determine the impact on sales, customer satisfaction, and corporate profits. Finally, it enables them to "drill down" into summary information to view detail transactional data.

With data mining, a hotel could send targeted promotions based on an individual's purchase history. By mining demographic data from comment or loyalty cards, the hotel could develop products, services and promotions to appeal to specific customer segments. Data mining allows a business to get more information than ever before from its data. Businesses can use predictive analytics to create new opportunities for connecting with their customers by extracting information more easily and more precisely from their data warehouses.

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

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

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

- (e) 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 production-related processes and secondary 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 raw materials used in production, time taken to produce, number of quality control inspections, returns, production stoppages.

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

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.

Each part carries 5 marks  
**[Total: 15 marks]**

### SOLUTION 3

*Purpose:* To examine candidates' understanding of: DBMS and their usefulness relative to file-based environments; data warehouses and their usefulness relative to alternatives; and the principles of data protection and relevant ethical issues; and their ability to apply this knowledge to a given context.

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

Relational DBMS represent data as two-dimensional tables (called relations), with each table containing data on an entity and its attributes. Data is organised and accessed according to the relationships between data. Non-relational DBMS or NoSQL databases use a more flexible data model and can be useful in managing large data sets, including those which contain structured and unstructured data.

In terms of potential usefulness:

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

3 marks for a good definition of DBMS (distinction of types of DBMS is not required but credit will be given), 4 marks for relevant comments on their usefulness (as contrasted to file-based environments).

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

Data warehouses are useful for storing and facilitating analysis of organisational data – for example, enabling an organisation to understand information about sales, purchasing or other operational trends over a period of time. These can also form the basis of smaller, decentralised data warehouses called data marts – a summarised or highly focussed portion of the data in a separate database for a specific population of users. If the retailer is interested in structured data of the type generated by internal transaction processing systems, then depending on the amount of data a data warehouse may be sufficient to meet their needs.

However, data warehouses are not well suited for organising and analysing big data (datasets with huge volumes, often comprised of unstructured and semi-structured data). Hadoop, on the other hand, can handle structured, semi-structured and unstructured data in large quantities. It enables parallel processing of huge amounts of data across inexpensive computers. It does this by splitting a big data problem into sub-problems, distributes them around thousands of inexpensive computer processing nodes, and then

combines the result into a smaller data set that is easier to analyse. It can process a range of data including structured transactional data, loosely structured data such as Facebook and Twitter feeds, complex data such as web server log files and unstructured video and audio data. It runs on a cluster of inexpensive servers, with processors added or removed as needed.

The usefulness of each of these may depend therefore on the type of data which the retailer wants to store and analyse, and the quantity of data.

3 marks for a good definition of data warehouse (definition of Hadoop is not required but credit will be given), 4 marks for relevant comments on usefulness (as contrasted to Hadoop).

**(c)** Personal data protection applies to all interactions with public and private sector organisations.

A data controller is the individual or the legal person who controls and is responsible for the keeping and use of personal information on computer.

The principles of data protection are:

1. Obtain and process the information fairly
2. Keep it only for one or more specified and lawful purposes
3. Process it only in ways compatible with the purposes for which it was given to you initially
4. Keep it safe and secure
5. Keep it accurate and up-to-date
6. Ensure that it is adequate, relevant and not excessive
7. Retain it no longer than is necessary for the specified purpose or purposes
8. Give a copy of his/her personal data to an individual, on request

However, the application of these principles – and the identification of whether such principles are followed or breached – requires an element of judgement. For example, judgment is needed as to whether data kept is adequate, relevant, or for how long it is necessary to hold that data. In these areas of judgment there is a need for those who have responsibilities relating to the data to consider the ethical appropriateness of the decisions they make, and not merely whether an argument of compliance can be made.

Up to 6 marks for discussion of the principles and relevant comments

## SOLUTION 4

*Purpose:* To examine candidates' understanding of: Infrastructure as a Service; service level agreements for cloud-based arrangements; tools and technologies for safeguarding information resources; and their ability to apply this knowledge to a small organisation.

*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)** Advantages:

- Cloud-based services can provide a low cost way to store data - lower upfront costs, e.g. in the purchase and installation of servers
- Works around IT resource and budget constraints – regular payment vs. upfront payment (particularly important in small organisation)
- If provider is well chosen, can rely on their specialist expertise (a small organisation may have little/no in-house expertise)
- Flexibility – paying for the storage space actually used – if purchasing own servers would need to have significant excess capacity
- Typically achieves faster time to deployment
- Avoids delays and costs associated with long IT projects
- Ongoing maintenance, security and updates are the responsibility of the cloud provider
- Taking data 'offsite' may form part of the organisation's disaster recovery plan.

Disadvantages:

- Loss of control of own data – reliance on third party's security
- Data security and/or confidentiality may be an issue – public vs. private clouds?
- Risks associated with the storage of data in other jurisdictions (especially outside the EU, where data protection regulations are different)
- Possible downtime if connection is lost (may be outside organisation's control)
- Performance – latency could be an issue with a service that is experiencing heavy usage from a lot of customers (servers may not be able to cope)
- May be difficult to get support or essential changes implemented quickly
- Potential difficulties integrating with organisation's applications (particularly proprietary or legacy applications)

4 marks for valid advantages; 4 marks for valid disadvantages

**(b)** Service level agreements (SLAs) help protect both the organisation (the customer) and the service provider. These might include:

- Responsibilities of the service provider and level of service expected by the customer, including the nature and level of services provided
- Provisions for security, confidentiality and disaster recovery – e.g. how is the organisation's data segregated from others?
- Stipulation of jurisdictions in which data will be stored, and that data is stored in accordance with the privacy rules of those jurisdictions
- Billing and conditions for termination
- Criteria for performance measurement – e.g. connection speeds, outages, responsiveness of support
- Customer support options

1 mark each for each valid point (up to a maximum of 6)

**(c)** 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.

3x2 marks for each relevant tool/technology with a brief outline- credit will be given for other tools/technologies as long as relevant to a small organisation

## SOLUTION 5

*Purpose:* To examine candidates' understanding of: types of organisational change enabled by IT; ERP systems; challenges and benefits of ERP systems; systems development processes; and their ability to apply this knowledge to a given context.

*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) Enterprise Resource Planning (ERP) systems 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.

Types of organisational change include:

**Automation:** Employees are assisted with performing tasks automatically, in order to have them completed more efficiently and effectively. For example, an ERP system can automate a range of transactions, such as ordering stock as items are sold, or making payment as stock is received.

**Rationalisation of procedures:** Standard operating procedures are streamlined – often as a result of automation revealing bottlenecks, potential efficiencies or control weaknesses, or in order to align procedures with the new system. This is a deeper organisational change, and may be part of a series of continuous quality improvements in products, services and operations – for example, Six Sigma. ERP-related examples include streamlining the procurement process to reduce the number of steps involved – with automation of ordering, a review of the process identifies that some of the controls that were previously required are no longer needed, or two controls can be replaced with one.

**Business process reengineering or redesign (BPR):** This is a more significant form of organisational change in which business processes are analysed, simplified and redesigned. BPR reorganises workflows, combining steps to cut out waste and to eliminate repetitive tasks. It requires a new vision of how the process is to be organised, and often results in the elimination of jobs. An ERP-related example might include changing the procurement system from a 'pull' system to a 'push' system, facilitated by SCM software and supplier access to the company's stock levels.

**Paradigm shift:** In paradigm shift, the very nature of the business is rethought, new business models are defined, and the structure of the organisation may be completely reorganised. Whole new products or services that didn't exist before are created. This can cause major disruption and extreme change. An ERP-related example is that the organisation identifies an area of its business that was not previously core, but which they have a unique competency/advantage – for example, the business begins to act as a distributor for raw materials which were formerly purchased for use in production.

4x2 marks for identifying and describing the change with valid examples

- (b) 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
- Business can respond more quickly to customer requests for information or products, for example having better stock information available or easier/faster production scheduling
- Better information is available to create more accurate sales and production forecasts, minimising costs and the risks of stock outs – important for a growing business (avoiding overtrading)
- 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
- With linkages between ordering, manufacturing and delivery information, better decisions can be made about the whether to make or buy products, levels of production, timing of production and stockholding leading to cost savings and greater efficiency.
- Greater sharing of information, standardisation of information and reports can assist senior managers in reviewing performance and taking action as the business grows



Possible challenges:

- As noted in part a), 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
- 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. 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?
- Lack of in-house expertise – as a growing company, we do not know the size/expertise of the IT function, and 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) Systems analysis:**

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

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

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

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

**System design:**

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

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

2x2 marks, for identifying systems analysis and design with relevant explanations

## SOLUTION 6

*Purpose:* To examine candidates' understanding of: social media; management organisational and technological factors; ethics; and their ability to apply this knowledge to a given context.

*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)** Any three of the following, explained:

Collaboration internally within the organisation, for example using 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.

Recruitment and locating required expertise – using twitter, LinkedIn etc. to locate, seek recommendations and make contact with potential expertise.

Collaboration externally with citizens/service users, informing customers about new services, changes in arrangements, and providing a forum for citizen/service user feedback e.g. a Twitter account.

Using information from this engagement and feedback (and possibly data retrieved from social network followers (for example, Facebook) to feed into future service decisions e.g. decisions about new/closing services.

Service advertising on Facebook etc., for example targeting promotion of a new service (such as a training scheme) at specific demographics (such as people between the ages of 16 and 18).

Viral Marketing - sharing and spread of viral content through social media can be very effective, for example for a government body charged with providing public health information such as encouragement around healthy eating or exercise.

3x2 marks for relevant points

**(b)** 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. Each of these factors may inhibit or support the success of internal corporate social networks, and, in addition, an internal corporate social network may affect these factors, for example, promoting a more open, inclusive culture, or flattening hierarchies.

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. Internal corporate social networks can be a tool for sharing information on these strategies, and to engage with staff towards achievement of these strategies – for example, encouraging greater collaboration, which may have been identified as important in working towards an overall strategy of increasing innovation in the organisation.

Technology: Technology includes computer hardware, computer 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 internal corporate social networks depends on their availability and ease of use, as facilitated by these technological components.

2 marks for explaining internal corporate social networks and 3x2 marks for relevant factors across management/organisational and technological



**(c)** Possible answers include:

- Right to privacy of those engaging with the organisation
- Targeting of specific demographics
- Reputational risks (organisation and those engaging with it)
- Exclusion of those not engaging with social media
- Use of data from social media (e.g. Facebook profiles)
- Need for social media use policy, and for this to be fairly applied

3x2 marks for relevant points, explained