BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 6 Professional Graduate Diploma in IT

MANAGEMENT INFORMATION SYSTEMS

Thursday 29th September - Afternoon
Answer **any** THREE questions out of FIVE. All questions carry equal marks.
Time: THREE hours

Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are **NOT** allowed in this examination.

SECTION A
Answer Section A questions in Answer Book A

General comments on candidates' performance:

The standard of answers was low for this session, possibly as a result of several factors, most notably:

1. *Many candidates did not attempt significant parts of an examination question, which meant that their maximum possible score on the question was immediately reduced.*
2. *Like last session, there were many candidates who used answers in response to what was essentially a different question, and therefore only attained one or two marks at best.*
3. *There were answers that demonstrated a lack of appreciation of the relevant MIS concept and of what an answer needs to cover (in both depth and breadth) to gain high marks.*

To ensure better performance in future sessions, candidates must ensure that they are fully versed with ALL the concepts as defined within the current MIS syllabus, that they draw upon relevant experiences/examples within answers (especially when the question explicitly requires these to be stated), that they possess an effective approach for tackling the examination and associated prior study, and that they take time to fully understand the requirements of an examination question before attempting to answer it.

There were a few excellent papers incorporating comprehensive, focussed, relevant and reasoned answers with effective supporting examples and academic references; these candidates should be congratulated on their achievements.

An indication is given below of the expected answer points. As is customary, marks were given for alternative yet appropriate answers.

SECTION A
Answer Section A questions in Answer Book A

A1.

a) Simon (1977) defined decision making to comprise three phases; Intelligence, Design and Choice. With the aid of examples, explain the meaning of **EACH** of these phases.

(9 marks)

b) Discuss the extent to which Office information Systems (OIS) can be used to support management decision making. Include in your answer an overview of the key capabilities you would expect to find within a comprehensive OIS.

(16 marks)

Answer pointers:

a) Simon's three stages within his decision making model can be described as follows (candidates should give at least one example and cover all of the three stages):

- Intelligence – searching the environment for decisions that need to be made, and defining what the decision really is
- Design – identify the alternatives, and the criteria upon which to evaluate them, and perform that evaluation
- Choice – the act of selecting the best of the alternatives evaluated

*(2 marks for overview of phase * 3 stages, plus up to 3 marks for example(s) = 9 marks)*

b) This question is about the Office Information System (OIS) concept, and how far it typically goes in supporting management decision making within the organisation. Candidates may first define what OISs are, namely:

Computer-based systems that support some of the functions that are typically carried out within an office environment.

Or more specifically:

A portfolio of software application systems that together support office-related work functions.

(For implicit or explicit definition/scoping of OIS - maximum 2 Marks)

Candidates should provide an overview of key functionalities they would expect to find within a comprehensive OIS, such as:

- Word-processing software, such as MS Office, which may include not only the typical creation and revision of documents but also joint document authoring capabilities.
- Spreadsheet software, such as MS Excel, including the provision of small Decision Support Systems (DSS) via cell-based data and modelling capabilities.
- Presentation software, such as MS PowerPoint.
- Database software, such as MS Access, including the ability to create and maintain small databases for (typically) personalised use.
- Content management systems, such as SharePoint.
- Groupware, including video/audio-conferencing/meeting software, such as Skype (enabling meetings involving more than two people at remote locations) and group authoring software.

- Chat systems, where a 'discussion' (albeit quite limited) via texting can take place.
- E-Mail systems, such as MS Outlook, including attaching documents to send to potentially many recipients.

(Answers to this part of the sub-question will vary in terms of structure and emphasis, and thus marking for this section needs to be correspondingly flexible. As a general rule, the following marking scheme will apply: 1 mark for each salient point, to a maximum of 3 marks per key OIS functionality (or subsystem), to a combined maximum total of 10 Marks)

The final aspect of the sub-question involves an assessment of the extent of OIS's capabilities to support management decision making. Candidates' answers will vary, and each will be marked on individual merit. Some points that candidates might make include:

- Decision support at all levels requires information. OIS offer capabilities for collecting information via communication systems like e-mail/Skype and storing/managing that information via databases/content management systems like MS Access and SharePoint.
- Actual decision support via modelling is only catered for by Spreadsheet modelling (in cells) in most OIS. So, in this context the support is limited in terms of modelling capability. There is little support provided in the form of data mining. Flexible viewing of information (such as provided within OLAP systems) is also not usually a feature of OIS.
- Decision making support via modelling in spreadsheets will be more appropriate to the requirements of lower/middle management levels: strategic management like other management levels will, however, utilise appropriate information sharing/communication tools such as email and Skype, where relevant.
- So, to summarise overall, the support available to management decision making via OIS is beneficial to information communication/sharing requirements across the enterprise, but only relevant to management decision situations where simple DSS modelling support is sufficient.

(for a good argument as to the extent of support with OIS – maximum 4 Marks)

(Total Q1(b): 2 + 10 + 4 = 16 Marks)
(Total Q1: 9 + 16 = 25 Marks)

Examiners' comments*:*

With 60% of candidates attempting it, this was the most popular question in Section A. However, the average mark attained was low at 7 out of 25. Part a) was left blank by several candidates, which meant that the maximum they could attain on the question was 16 marks. The evidence shows that most of the candidates who attempted Part a), however, gave incorrect descriptions of the Intelligence and Design phases, often likening Intelligence to 'being intelligent when decision making' or 'making intelligent decisions', and Design to systems design or some form of visual design/attractiveness.

There were some good answers to Part b), but there were a significant number that evidenced a lack of understanding of Office Information Systems (OIS). Many saw an OIS to be equivalent to a Management Reporting System (MRS), a Decision Support System (DSS), an Enterprise Resource Planning (ERP) system or even some form of integrated system embracing all types of MIS functionality. The evidence also shows that some candidates thought it to be a system for either human resource management or for office management. None of these answers are correct, and as such they only fetched a few marks.

A2. With the aid of suitable examples, define **EACH** of the following MIS-related concepts and discuss its use within Business Intelligence (BI) systems:

a) Middleware.

(6 marks)

b) Neural Networks.

(6 marks)

c) Meta-data.

(6 marks)

d) Key Performance Indicators (KPIs).

(7 marks)

Answer pointers:

This question takes four more generally applicable IS concepts and requires candidates to define each of them and consider the concept's use within a BI system. Candidates may make comments similar to following:

a) **Middleware**: This is software that enables a heterogeneous set of software systems to work together to provide an integrated, holistic service/product provision. Middleware is essentially the 'glue' that sticks a system together, providing functionality such as the following:
   - Ability to enable access to, and collation of information from, several database system platforms in the light of an SQL query and/or defined ETL script requirement.
   - Ability to map an OLAP data requirement query onto the set of calls/queries on data held in a particular DBMS.

   Functionality can be purchased within a middleware product, configured and adopted rapidly – eliminating the need for custom integration code. Typically, middleware operates by providing messaging services so that different applications can communicate using messaging frameworks like Simple Object Access Protocol (SOAP). The HTML/XML language can be considered to be middleware.

   BI systems need middleware to enable parts of the system to communicate and pass data. It is very frequently employed within BI systems to enable data from disparate source/database systems to be accessed and integrated into a uniform BI data repository. It also enables front end tools to have access to the required data in the BI data repository.

(3 Marks for overview description of concept, plus 3 Marks for discussion of use = 6 Marks)

b) **Neural Networks:** A type of AI-based approach to data mining, which relies on the development of a neural network model that relates input values to the set of plausible (and defined) outcomes. A neural network (which is likened to that found within the human brain), based on an interconnected mathematically weighted pattern of neurons, is trained using a large training set of past case data (including both inputs and outcomes). This results in the establishment of a predictive model with which to apply new input variables so as to be able to forecast the outcome. Neural networks have been used in many MIS/BI systems to detect fraudulent activity patterns in data, to classify customers into defined groups, to detect patterns signifying possible machine breakdown, etc. They are one of the mainstream data mining techniques to employ within BI systems, as part of the data analytics component.

(3 Marks for overview description of concept, plus 3 Marks for discussion of use = 6 Marks)

c) **Meta-data:** This is data about data and is critically important in the evolution and development of enterprise-wide BI systems. There are two types of meta-data; technical and business. Examples of technical meta-data include DBMS schema definitions, and the owners and derivation processes (ETL) of attributes/objects. Business meta-data incorporates the definitions of data items, their synonyms and links to associated technical meta-data. Use within BI Systems: as stated above, meta-data is crucial to enterprise-wide BI systems, as it provides the enterprise view of definitions and their derivations. This facilitates conformance across the BI support environment rather than the much less desirable silo approach and view of BI systems developments.

(3 Marks for overview description of concept, plus 3 Marks for discussion of use = 6 Marks)

d) **Key Performance Indicators (KPIs):** KPIs are those measurable aspects associated with one or more of a set of Critical Success Factors (CSFs) that have been identified by individuals, groups or organisations. CSFs are those aspects of some 'part' of an organisation that need to go right in order for that organisational 'part' to succeed. So, at the level of the whole organisation, a CSF might be 'customer loyalty' or 'product quality'. The set of associated KPIs provides the mechanism for calculating the achievement of a CSF. An example KPI for 'customer loyalty' might be 'the number of first-time customers that return for a second purchase from us'. Threshold values can be set against these KPIs: for instance, over 50% fist customer returns indicates 'satisfactory' KPI achievement, between 49% and 40% represents 'borderline' KPI achievement, and less than 40% represents 'unsatisfactory' KPI achievement. This, together with other such KPIs, can form the basis by which the 'customer loyalty' CSF is evaluated. Use within BI systems: enables the identification of measurables for CSFs at organisational, group or individual level, which can form the basis of an electronic dashboard capability development for a BI system. This capability will enable management to monitor KPI, and hence CSF, achievement via the dashboard.

(4 Marks for overview description of concept, plus 3 Marks for discussion of use = 7 Marks)

(Total Q2: 6 + 6 + 6 + 7 = 25 Marks)

Examiners' comments:

This question was attempted by around half the candidates, and the overall average mark for the question was low at just under 8 out of 25. The evidence shows that few candidates were able to provide a correct and sufficiently detailed description of middleware in their answer to Part a), with many believing it to be the same as OLAP or data mining. The same was true of metadata, the topic of Part c), where many candidates thought this to be equivalent to a data warehouse or some form of pre-processed large data set. Candidates generally fared better on their answers to Parts b) and d); most were able to provide one or two pertinent facts regarding neural networks (although some mistakenly equated this concept to a computer networking configuration) and key performance indicators, but only a few candidates that were able to present a clear and sufficiently detailed description of each concept to gain more than a couple of marks. And of these, only one or two candidates were able to effectively articulate each concept's use within BI systems.

A3:

a) With the aid of relevant illustrative examples, discuss the extent to which Management Reporting Systems (MRSs) and model-oriented Individual Decision Support Systems (DSSs) can support the Marketing & Sales function of a company.

(16 marks)

b) Describe the ROMC technique and assess its suitability to the development of a model-oriented individual DSS**.**

(9 marks)

Answer pointers:

Part a) focuses on specific subtypes of MIS, namely MRS and model-oriented DSS, and their applicability to the organisational Marketing & Sales functions.

All answers should be able to scope MRS and model-based DSS appropriately, either explicitly in the form of suitable definitions or implicitly within the text of the answers. Definitions that could be provided are as follows:

"An MRS provide managers with reports and, in some cases, with on-line access to the organisation's current performance and historical records (adapted from Laudon & Laudon, 2005)"

(Individual) DSS are "interactive computer-based systems which help decision makers utilize data and models to solve unstructured problems" (Gorry & Scott Morton, 1971). Model-oriented DSS typically have one very large model as its principal focus of support. The data is important (as without it the model can't function) but secondary to (and collected to 'serve') the model.

(2 marks for an implicit or explicit understanding of the two MIS subsystems as defined in the question)

Marketing & Sales is about the promotion of products/services to (potential and existing) customers and the sales that result. MIS have often been employed in the Marketing & Sales function of a business, to provide important management information and to interactively support management decision making. However, the extent to which the specific MIS subsystems are able to support Marketing & Sales varies.

MRS:

There is a lot of MRS use in both marketing and sales for customised and fixed reporting of typically internal data from key operational systems. Candidates may give examples of common uses of MRS within this business function, such as:

- The provision of sales reports, broken down for instance by product, by customer, by region, and by day/week/month/year. Comparisons to previous year's figures may be made.
- The provision of marketing information, such as current promotions and their planned and actual costs to-date, future promotions scheduled, who is responsible for each promotion, etc.
- Customer histories: what a customer bought and when, over the defined period of time.
- Sales rep performance reports: how much sold vs. targets, etc.
- A flexible interface to enable ad-hoc queries of sales and marketing data, for instance using SQL or some forms-based input or OLAP facility.

Model-oriented Individual DSS:

This is a different situation to MRS. Whilst 'traditional' model-oriented DSS (i.e., those incorporating mathematical models such as optimisation, simulation and forecasting) can be employed in 'pockets' of Marketing & Sales activities, there are a lot more potential opportunities for model-oriented decision support if you extend the range of models to include those built from AI techniques such as Neural Networks and Rule-based induction (after all, you could argue that they are all based on mathematics/logic!). Some comments candidates may make include the following:

- Traditional forecasting techniques are certainly used within Marketing & Sales functions (although you could question whether or not this would typically fall within the 'model-oriented' category of DSS as such systems tend to provide forecasting and other simple models across a large data set – is this 'data-oriented' DSS?) to forecast demand of products based on promotion work undertaken, or to extrapolate sales data into the future.
- There is a possible avenue for some form of traditional optimisation within Marketing & Sales, for instance to maximise use of marketing or sales 'channels', that might benefit from mathematical modelling within DSS.
- AI-based models can be applied to support the identification of fraudulent sales activities.
- Cluster algorithms can be used to aid identification of different customer groups. This can help to evaluate, and subsequently market to, new customers, based on the typical characteristics of the customer group that they appear to fall into.
- Sales patterns can be determined using AI-based models such as rule induction. These can then be exploited for maximum business effect.
- Modelling of sales and profits can be undertaken, so that impacts of changes to costs and/or income streams (e.g., sales) can be assessed and mitigated against where necessary.

(for a sound assessment of the extent of use of the two MIS subsystems – 10 marks, plus 4 marks for illustrative examples = 14 marks)

(Total Q3(a): 2 + 14 = 16 marks)

Part b) is about the use of ROMC within model-oriented DSS developments. Candidates need to provide an overview of the ROMC development technique first, and then assess its use within the stated MIS subsystem. Points that candidates may make include the following:

ROMC:

- A technique that enables the analysis and design of (typically individual) DSS by describing current decision making activities and subsequent DSS design in terms of R-Representations, O-Operations, M-Memory aids, and C – Control Mechanisms.
- At analysis level:
    - Representations refer to how the decision maker currently represents the decision situation, typically visually. For instance, to consider where to locate a particular new supermarket outlet, the decision maker may use a paper map representation.
    - Operations are those actions that are currently performed on the representations, such as putting an X on the map for each existing outlet, drawing and measuring a line between the X for a proposed outlet and the nearest of the existing Xs, etc.
    - Memory aids are any data storage (paper-based or otherwise) used to support the representations and associated operations.
    - Control mechanisms are those rules that govern/constrain decision making, e.g., no outlets allowed within 10 miles of one another.

- At design level, the ROMC takes on the role of specifying the design of the new DSS, such as the representations to be employed, the computer-based operations to be made available, the data storage required to support the representations and operations, and the mechanisms by which the user will 'control' the proposed DSS and its operations.
- ROMC was intended as a process-independent approach for identifying the necessary capabilities of a specific computerized decision support system. The result is a set of operations that can be employed in whatever order by the user (within the bounds of what is feasible to do).
- Translation from analysis to design is relatively straightforward, although there are not always one-to-one mappings between the details for a concept (i.e., R, O M or C) at analysis level and the details for the same concept at design level: Control mechanisms at analysis level, could, for instance, form part of the Operations concept at design level.

Applicability to model-oriented DSS:

- Limited applicability - ROMC was meant for data-oriented DSS, where the strength of the DSS lay in its strong visual interface, and where a suite of non-complex operations are performed on data within those representations with no ordering being prescribed on those operations. The usefulness of the technique is questionable where there is a DSS with a very complex model but with limited data and with no visual representations. Indeed, there appears to be very little benefit to employing ROMC when the DSS is to house one large and complex model with just parameter data being input and very limited representation of input/output.

(1 mark each salient point regarding the concept and/or on the applicability to model-oriented IDSS, to a maximum total of 9 marks)

(Total Q3: 16 + 9 = 25 Marks)

Examiners' comments:

This was attempted by a third of candidates. The average mark of the question was 7 out of 25.

Part a) was attempted by most that answered this question. The evidence shows that while most candidates were able to articulate a suitable view of MRS, there were very few candidates that provided a sufficiently clear description of an Individual DSS (IDSS) with most failing to pick up on the reference in the question to model-oriented IDSS only. As such, answers often focused on data-oriented aspects of DSS (e.g., covering OLAP) and were therefore largely irrelevant to the question set. Whilst some candidates were able to show, using detailed and relevant examples, how MRS and model-oriented IDSS support organisational marketing and sales functions, many answers had limited or no examples and/or made very vague statements about how MIS support these functions.

Very few candidates attempted Part b) thereby limiting the maximum that they could achieve for the whole question to 16 marks. When attempted, the answers were generally incorrect; only a handful of candidates knew enough about ROMC to pass this part.

SECTION B
Answer Section B questions in Answer Book B

B4.

"In a corporate environment, a well integrated Management Information System is a hacker's dream".

a) With reference to FOUR examples, discuss the extent to which you agree or disagree with this statement.

(12 marks)

b) Write an article for a corporate in-house magazine which discusses how a large organisation can both determine and manage the security risks associated with its Management Information System.

(13 marks)

Answer pointers:

a)
The more you integrate information in a well-structured manner, the easier it potentially is to harvest critical data unless robust steps are put in place regarding both the design and operation of the information system.

The four examples could be any reasonable aspects from either the candidates own experience or elements taken from media or technical reports regarding security breaches.

b)
The requirement is for a popular article, which can be understood by the great majority of the staff of the organisation – who will therefore be better informed, and have a better understanding, about the restrictions placed on them by security processes within the organisation.

The two key words are "determine" and "manage", so the answer should address these areas specifically.

Examiners' comments:

This is the type of statement that is commonly asserted in a Boardroom or senior management meeting – perhaps based on a random conversation, a blog post that has been read or an article in the press. It is important that professionals working in the MIS arena are able to present a set of reasoned arguments which will inform less technical managers in the organisation.

In this case, only a few candidates managed to achieve a good outcome. Around 36% of the candidates attempted the question and the pass rate was low – at only around 39%.

The evidence shows that many candidates who scored poorly failed to give the correct number of examples, which meant that they immediately lost marks.

B5.

"In the near future, the availability of facial recognition software will be an access key to the databases of many organisations worldwide."

In the context of MIS, discuss the above statement and assess its implications for business, governments and society in general.

Answer pointers:

The 25 marks available for this question were not assigned to particular elements of the answer. This allowed the candidate to build a response which reflected their background, experience and knowledge without constraint. Marks were allocated against the overall quality of the answer given, allowing full credit for relevant organisational argument and technical discussion.

There is no set answer to this question, but the examiners were seeking some understanding of the issues involved with arguments justified by examples where appropriate.

In summary, the current situation is that many organisations have facial photographs linked to personal details, for example driving licences and passports. Social media also have personal details linked to facial images.

Once there is a link between a facial image and personal data, other links can be made. These links could be exploited by businesses (to identify shoppers' lifestyles, financial standing, health, criminal convictions etc) and governments (to track individuals, catch criminals, identify terrorists etc.) When coupled with other new technology such as Google Glass, helmet camera and body cameras, facial recognition systems pose a serious threat to liberty.

Marks
Fail mark range (0-9)

Candidate either **identifies** just one or two discussion points or uses weak or incomplete arguments. Content of the answer is limited.

Pass mark range (10-15)

Candidate **describes** two or three possible discussion points but there are gaps in understanding.

Medium mark range (16-20)

Candidate **considers** three or four discussion points and provides rational explanations for each.

High mark range (21-25)

Candidate **discusses and analyses** many different points that are justified by rational explanation and relevant examples.

(Total = 25 marks)

Examiners' comments:

This type of essay-style questions requires more discipline on the part of the candidate in ensuring that the structure of the answer given is appropriate and fully covers all aspects of the question. In many cases, this discipline was not demonstrated, and the responses given lacked coherence and an appropriate format.

Around 75% of candidates attempted this question and the overall quality of answers was low for a question which gave the degree of freedom to the candidate that this one did. There was a general lack of structure present in many answers as well as a lack of depth in the material presented by many candidates. Some of the answers received were of very low quality.

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