



Unit ICT208 BUSINESS INTELLIGENCE TOOLS AND TECHNIQUES

Exam Type : Internal & External

Reading time : 10 minutes (Note taking allowed onto Exam Paper ONLY)

Exam Duration : 3 hours

INSTRUCTIONS

This paper consists of five (5) questions, each worth 20 marks.

Candidates should attempt ALL questions.

Please write your answers in the answer booklet provided.

EXAMINATION AIDS ALLOWED

CLOSED BOOK EXAM

Provided by the University

ANSWER BOOKLET

Provided by the Candidate

NIL

QUESTION 1 (20 Marks)

- a. Business Intelligence (BI) is said to be about getting, “...*the right information to the right people at the right time*”. Explain two reasons why an organisation would see a benefit to the implementation of BI.
(4 marks)
- b. You are about to buy a new motor car. Using Simon’s four-phase model, describe your activities at each phase.
(4 marks)
- c. List the three (3) major components of a DSS.
(3 marks)
- d. Define *efficiency* and *effectiveness*, and compare and contrast the two.
(4 marks)
- e. In the context of decision support, what is a **model** and why is it needed?
(2 marks)
- f. Define and give an example of each of the following:
 - i. Iconic model
 - ii. Analog model
 - iii. Mental model
(3 marks)

QUESTION 2 (20 Marks)

- a. This question is based on the following training data which lists the predictors as to whether or not a dog will bite:

Sample	Size	Colour	Hair Length	Age	Bites?
1	Big	Brown	Long	Old	No
2	Small	Beige	Short	Young	Yes
3	Small	Brown	Medium	Young	No
4	Big	Brown	Long	Young	Yes
5	Big	Beige	Short	Young	Yes
6	Small	Beige	Medium	Young	No
7	Big	Brown	Medium	Old	No
8	Big	Beige	Short	Old	Yes

- i. Calculate the *goodness score* (i.e., number of correct outcomes/total number of outcomes/number of additional branches required) for each of Size, Colour, Hair Length and Age.
 - ii. Which of Size, Colour, Hair Length and Age will be the root node of a decision tree created on the training data?
 - iii. If a big, brown, long-haired, young dog approached you in the street, do you think it would be likely to bite you?
(6 marks)
- b. The following questions are based on the narrative below which addresses the decision as to whether or not to play golf, which will be used to create a decision table.
- The decision as to whether or not to play golf is based on three conditions: the outlook (which can be sunny, overcast or rain), the humidity (which can be high or low), and whether the day is windy or not. If it is raining and windy, the players will tend not to play, but will play if it is just raining. If the outlook is overcast, the players will play. If it is sunny and the humidity is high, the players will not play, while they will play if it is sunny with low humidity.*
- i. Identify the attributes to be tested and their possible values.
 - ii. Calculate the maximum number of rules.
 - iii. Identify the possible actions.
 - iv. Create a table that lists all possible rules and the actions for each rule.
There is no need to simplify the table.
(8 marks)
- c. Explain the difference between what-if analysis and goal seeking, and give an example of each.
(2 marks)
- d. Linear programming is an optimization method used to solve problems in which the objective function and the constraints are all linear. A common use for linear programming is solving allocation problems. Give an example of an allocation problem and how it could be solved using Excel.
(4 marks)

QUESTION 3 (20 Marks)

- a. The textbook defines a data warehouse as “a pool of data produced to support decision making”.
 - i. What are the sources of data in a data warehouse?
 - ii. What is the role of metadata in the data warehousing process?
 - iii. Describe the three steps of the ETL process.
 - iv. Explain how the ETL process contributes to data quality?
(9 marks)
- b. How is a data warehouse different to an operational database?
(2 marks)
- c. How is Business Analytics related to data warehousing?
(2 marks)

- d. Describe three (3) major characteristics of OLAP.
(3 marks)
- e. Define GIS and describe two (2) of its benefits in a decision-making context.
(2 marks)
- f. Give an example of how GIS and GPS data could be integrated to provide benefit for an organisation.
(2 marks)

QUESTION 4 (20 Marks)

- a. With respect to data mining:
 - i. List and explain four (4) factors that have resulted in its increased popularity.
 - ii. Explain the difference between **classification** and **clustering**.
 - iii. Explain the general differences between OLAP and data mining.
 - iv. Define **text mining** and give an example of its application.(8 marks)
- b. List and explain the four (4) major BPM processes.
(4 marks)
- c. List the four (4) perspectives in the Balanced Scorecard.
(2 marks)
- d. Gartner Group lists 12 capabilities that are required for a BI Platform. In the context of Gartner's list, define and give an example using a BI platform you have reviewed of each of the following:
 - i. BI Infrastructure
 - ii. Workflow and collaboration
 - iii. Dashboards
 - iv. Ad hoc query(6 marks)

QUESTION 5 (20 Marks)

This question refers to the following case:

Vigilant Information Systems at Western Digital

Western Digital (WD) is a \$3 billion global designer and manufacturer of high-performance hard drives for desk top PC's, corporate networks, enterprise storage and home entertainment applications.

For the past decade, competition in the hard drive industry has been fierce. Like many other industries, this industry faces constantly changing customer requirements, price pressures due to global competition, short product life cycles and high demand for product quality and reliability. As a result, the industry has shrunk from 11

manufacturers to 5. During this period, WD has excelled, and it is now the 3rd largest producer by volume.

Need for New Information Delivery

As part of their survival strategy, WD management expressed a need for a new mode of information delivery. They wanted the ability to react more quickly and to have integrated information so they could manage enterprise-wide in a “follow-the-sun” manner, passing information across the time zones as the workday closes in one and opens in another. Their solution is WDs Vigilant Information System (VIS).

The word *vigilant* means being ever watchful. VIS “*integrates data and distils information and business intelligence from various sources to detect changes, initiate alerts, assist with diagnosing and analysing problems and support communication for quick action.*” Unlike traditional information systems, VIS is proactive rather than passive. As changes are made in the data, the data are re-analysed. If the data meet certain pre-specified conditions, the system alerts the user.

VIS Architecture

WDs VIS has a multi-tiered architecture. At the bottom of the system are raw data from various transaction sources. These data flow into a number of functional applications (e.g., ERP, point-of-sale, manufacturing). On top of this tier is the BI tier, which analyses the data to determine whether they meet certain pre-specified conditions. The data that satisfy these conditions initiate alerts that are sent to the dashboard tier at the top.

Three capabilities form the foundation of WDs VIS: the ERP system, which was implemented in 1997 and provides up-to-date data on enterprise operations; the data warehouse, which was implemented in 1999 and provides integrated data from 12 disparate legacy systems; and Quality Information System (QIS), which was initiated in 1999 and provides insight into overall manufacturing quality.

Even though these systems form the foundation of VIS and have been in effect for some time, they failed to provide managers with the view of operations that they needed. In particular, a number of legacy systems still remain non-integrated, the data refresh rate of the systems was inadequate, and the system lacked adequate analytical capabilities.

Management felt that VIS, in combination with real-time management dashboards, could provide the visibility they wanted, as long as certain policy changes were instituted. First, they had to translate strategic enterprise goals into a set of aligned, measurable, time-based operational objectives for each department. Next, they had to monitor KPIs in real-time, both horizontally across the organisation and vertically within the business units. Finally, they had to foster cross-team collaborative decision-making across teams, departments, enterprises and geographies.

Dashboards

Two types of real-time dashboards were developed; one for factory data and one for corporate information, including demand planning, distribution and sales. The factory dashboards – aimed at yield, material, production output, station monitoring and quality – were built from scratch. Each of the five factory dashboards displayed

various KPIs and metrics, allowed drill-down to underlying detail and issued alerts. In contrast, the corporate dashboards – aimed at billings and returns, backlogs, outlook, finished goods inventory and the like – were built using Cognos’s BI suite. The suite provided the same capabilities as the factory dashboards, as well as a number of other specialized analytical features.

In addition to providing needed visibility to WDs operational systems, the combination of VIS and dashboards also supported WD’s OODA decision methodology. OODA stands for the integrated processes of *observing* (i.e., seeing change signals), *orienting* (i.e., interpreting the signals), *deciding* (i.e., formulating an appropriate response), and *acting* (i.e., executing the appropriate response). From WD’s perspective, companies that can execute OODA loops faster have a competitive advantage.

Business Impact

By 2004, more than 200 managers and professionals at all levels of WD were using the dashboards. The payoffs from the system and dashboards have come in two forms:

- *Cost Savings.* The system and dashboards provided a better view of inventory and other carrying costs. The result was a net saving of \$3 million. The system also reduced the costs of producing customized management reports. The cost saving here was estimated at \$900,000 per year. Finally, the system has reduced information overload and in turn, time spent in meetings. In this case, the savings are estimated at \$350,000 per year.
- *Strategic advantages.* The system and dashboards speed the delivery of data and information to executives and managers at all levels. This means that problems and opportunities can be addressed more rapidly, that strategic decisions can be made more quickly, and that the processes in the OODA loop can be executed more swiftly.

QUESTIONS FOR THE CASE

- a. What are the basic benefits provided by WDs VIS and dashboards?
(5 marks)
- b. The system described in the case operates in a “proactive” rather than a “passive” mode. Discuss the advantages and challenges associated with this type of approach to BI.
(5 marks)
- c. The case suggests that large cost savings were made as a result of the implementation of WDs VIS and dashboards. Discuss how these cost savings could have been achieved, for example, how could the implementation of these systems reduce inventory costs?
(5 marks)
- d. Explain the roles played by the Data Warehouse in the implementation of these systems.
(5 marks)

**** END OF PAPER ****

