F2.3 Information Systems

Model Answers

January 2019

1)

(a)

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

Business analytics (BA) is also a vendor-defined term relating to the tools and techniques for analyzing and understanding data, including online analytical processing (olAP), statistics, models and data mining. At its core, business intelligence and analytics are about integrating all the information streams produced by a firm into a single, coherent, enterprise-wide set of data, and then, using modeling, statistical analysis tools and data mining tools to make sense out of all these data so managers can make better decisions and better plans, or at least know quickly when their firms are failing to meet planned targets. BI and BA can be beneficial to the firm in gathering, storing and analyzing the organization's own data (possibly in combination with externally-sourced data) to better understand factors that are important to their business, including customer behavior. It can provide a basis for more informed, and hopefully better business decision making on a range of issues.

By providing better information on customer and business line profitability, Booking-mart can target marketing to customers (to secure repeat custom or encourage customers to book more with them at each transaction) and develop their business line offerings based on customer preferences. Decisions on new business lines could be informed by analysis of data on existing lines, and evaluated on the basis of scenario modeling. However Booking-mart should also consider that business intelligence infrastructure and business analytics tools normally require a considerable investment and ongoing cost for the business. The infrastructure and systems bought will only lead to benefits being achieved if the data being fed into these systems is clean, reliable and relevant. Similarly, benefits will only be seen if the management team at Booking-

mart is involved, and capable of asking intelligent questions and analyzing the data they receive. Management and broader users need to receive information from these tools in an appropriate way, for example through an integrated delivery platform that integrates a range of information and brings it to the manager's desktop or mobile platform in a reliable, timely and easy to use way.

2 marks for defining bI/bA, 4 marks for evaluating the possible benefits, relevant to Booking-mart

(6 marks)

(b)

- ✓ Production reports: These are pre-defined reports which are specific to the industry and to a functional area of the business, for example, for Booking-mart, such reports might include: customer satisfaction reports; call centre resolution rate reports; marketing related reports on campaign effectiveness; loyalty and attrition; market basket analysis; direct and indirect spending.
- ✓ Parameterized reports: users enter several parameters as in a pivot table to filter data and isolate impacts of parameters. An example for Booking-mart might be identifying how sales vary by region and date/season, which might lead to different advertising campaigns in different regions.
- ✓ Dashboards/scorecards: visual tools for presenting performance data defined by users. Such dashboards/scorecards could be used by Booking-mart to give users, particularly senior managers, an overview of the most important metrics for the business.
- ✓ Ad hoc query/search/report creation: functions that allow users to create their own reports based on queries and searches, i.e. not just to run the reports predefined by the vendor or at the time of installation. These would normally be run by managers or business analysts in response to their specific queries such as, for example, investigating sales in a subsection of a region to inform future marketing strategy.
- ✓ Drill down: the ability to move from a high-level summary to a more detailed view. For example, to be able to see sales per region, then to drill down into sales for a particular region to see more detail such as bookings by day of the week, value of bookings, combination of services booked.
- ✓ Forecasts, scenarios, models: these include the ability to perform linear forecasting, what-if scenario analysis, and analyze data using standard statistical tools. Predictive analytics use statistical analysis, data mining techniques, historical data and assumptions about future conditions to predict future trends and behavior patterns. Variables that can be measured to predict future behavior are identified, and a collection of such predictors is combined into a

predictive model for forecasting future probabilities with an acceptable level of reliability. One possible use for Booking-mart might be to predict response to a direct marketing campaign. By identifying customers less likely to respond, Booking-mart can lower its marketing costs by ignoring these customers and focusing on those more likely to respond.

2 marks per suggestion (to a maximum of 10 marks), well explained and with a clear example relevant to Booking-mart Ltd. (10 marks)

(c)

Social commerce includes a number of features which could be beneficial to Booking-mart as the organization seeks to grow. Social sign-on refers to websites allowing users to sign into their sites through social network sites, such as face book. This would allow Booking-mart to receive valuable social profile information from face book, which can then be data mined and used to target marketing, make product recommendations, or to build a relationship with the customer. While such information may be particularly useful to Booking-mart, an investment in infrastructure and tools would be necessary to gather, store, and analyze the information gathered. This could involve a significant cost which would need to be carefully weighed against possible benefits. Twitter can also be used as a rapid means of responding to customer questions, comments and even complaints. By encouraging customers to follow the brand, brand identity can be developed, relationships built and useful content generated (where text mining is used on feedback from followers on twitter, social networks and related sites). While this also means negative feedback is more visible, some research indicates that even this may be useful in offering the organization a chance to respond to such feedback, develop products and services and may lead to a perception of the organization as transparent and listening to their customers. Such information can be useful to Booking-mart not solely for marketing purposes but also in making decisions about their product offering, and continuing supplier relationships.

Collaborative shopping involves creating an environment where customers can share their shopping experiences with one another by viewing products, chatting, or texting. For Booking-mart it might be useful to link these conversations to social networking sites to allow friends to chat about Booking-mart brand and products, for example through talking about a particular destination. Similarly, social search (recommendations) enables an environment where consumers can ask their friends for advice on the purchase of products and services. Allows the users to identify products and evaluate these based on the evaluations of their friends (or friends of friends).

Social marketing can include activities designed to shape perceptions of the brand, solidify customer relationships, promote particular products or officers, and can be augmented by a range of tools to assess the usefulness of such marketing. For example, Booking-mart Ltd could promote its face book page through advertising, pay for promoted Tweets or promoted trends on Twitter, meaning that these are displayed more prominently, and designed to increase awareness of the brand and drive traffic to the website. Online advertisements on other sites could also be used to promote the brand's face book page or Twitter account – usually with users clicking on the advertisement and being taken to the relevant page.

3 marks per suggestion (to a maximum of 9 marks), well explained and with a clear example relevant to Booking-mart Ltd

(9 marks)

Total: 25 Marks

2)

(a) Examples might include:

- ✓ Firewalls – prevent unauthorized 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.

(5 marks)

(b)

- ✓ Ubiquity: internet/web technology is available everywhere via desktop and mobile devices – mobile devices extend services to local areas and merchants.

Significance: marketplace extended beyond traditional boundaries, including temporal and geographic boundaries. 'Market space' created, shopping can take place anytime, anywhere. Enhanced customer convenience and reduced shopping costs.

- ✓ Global reach: technology reaches across national boundaries.

Significance: commerce enabled across cultural and national boundaries seamlessly and without

Modifications – market space includes, potentially, billions of consumers and millions of businesses.

- ✓ Universal standards: one set of technology standards (Internet standards).

Significance: disparate computer systems can easily communicate with each other, extending reach of the market space.

- ✓ Richness: video, audio and text messages are possible.

Significance: video audio and text marketing are messages are integrated into a single market message and consumer experience – experience is more immersive and more emotive.

- ✓ Interactivity: technology works through interaction with the user.

Significance: consumers engage in a dialogue that adjusts the experience to the individual, makes the consumer a co-participant – again experience is potentially richer, more immersive.

- ✓ Information density: technology reduces information costs and raises quality.

Significance: information processing, storage and communication costs drop dramatically, whereas accuracy and timeliness improve. Information becomes more plentiful, and consumers can self-select their level of engagement with this.

- ✓ Personalization/customization: technology allows personalized messages to be delivered to individuals as well as groups.

Significance: marketing messages and products can be customized, potentially leading to greater consumer satisfaction, brand affinity and repeat custom.

(5 marks)

(c)

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 summarized form to higher level management, for example through Executive Support Systems.

(5 Marks)

(d)

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into three categories: Infrastructure-as-a-Service, Platform-as-a-Service and Software-as-a-Service.

<u>The main advantages for small and medium sized business are:</u>

- ✓ On-demand self-service: they can obtain computing capabilities such as server or network storage on their own
- ✓ Ubiquitous network access: They can use standard network and Internet devices, such as mobile platforms, to access cloud-based services
- ✓ Location independent resource pooling: Computing resources are pooled to serve multiple users, with different virtual resources dynamically assigned according to user demand. The user generally doesn't know where the resources are located.
- ✓ Rapid elasticity: computing resources can be rapidly provisioned, increased or decreased to meet changing user demand
- ✓ Measured service: charges for computing resources are based on the amount actually used.

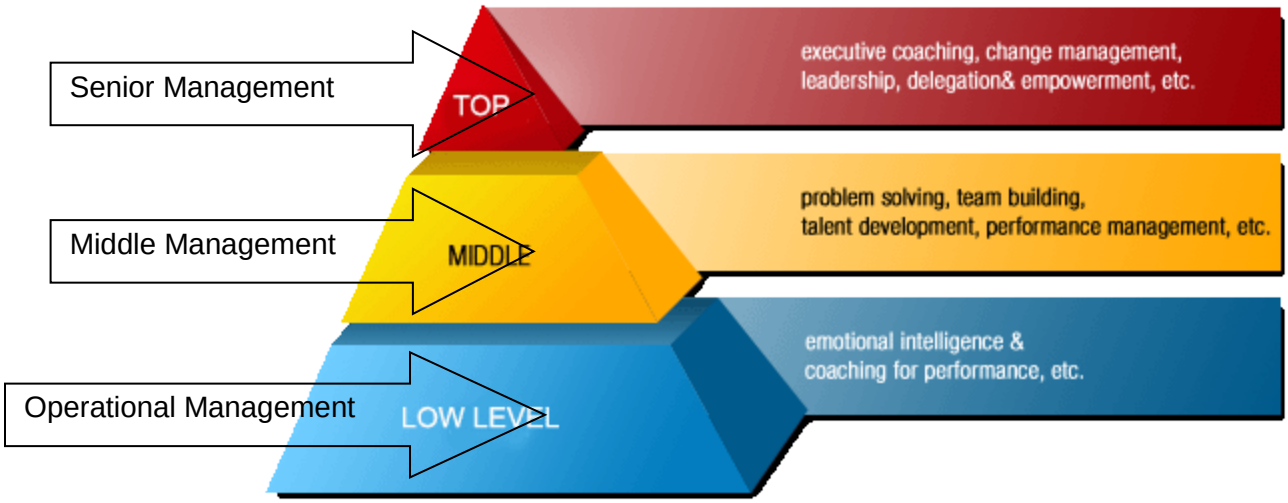
(5 marks)

5 x3 -Total: 15 marks

Section B

3)

(a)



(6 Marks)

(b)

Discussion of Value Chain Model

It allows organizations to highlight the specific activities where competitive strategies can be applied, and in the context of information systems, the specific, critical leverage points where a firm can use information technology most effectively to enhance its competitive position.

Example for an online retailer, it may be particularly important to evaluate business activities and how these may be impacted upon by internet technologies. The value chain highlights primary activities (those most directly related to the production and distribution of the firm's products and services, which create value for the customer) and support activities (those that make the delivery of the primary operations possible.

Primary activities include: Inbound logistics: receiving and storing materials for distribution to production. Possible Is (Information System) usage: automated warehousing systems are crucial for an online retailer for efficient stock management and good customer service through accurate inventory levels.

- ✓ Operations: transforming inputs into outputs. Possible Is usage: computer-controlled machining systems; manufacturing planning applications; each focused on producing products in the most time and resource efficient way due to competition on price from other online retailers.

- ✓ Sales and marketing: promoting and selling the firm's products. Possible IS usage: computerized ordering systems are essential for an online retailer and can be a source of competitive advantage (Amazon's patented 'one-click' technology). Customer relationship management applications; data mining on existing customer information for targeted marketing also extensively used.

- ✓ Service: maintenance and repair of goods and services. Is usage very dependent on the goods and services involved, may include equipment maintenance systems.

- ✓ Outbound logistics: storing and distributing finished products. Possible Is usage: automated shipment scheduling systems are essential in large online retailers and a possible source of competitive advantage (facilitating same day or one day delivery); parcel tracking increasingly an expectation of customers.

Support Activities include:

- ✓ Administration and Management: organizational infrastructure associated with managing the organization as a whole. Possible Is usage: electronic scheduling and messaging systems; range of decision-support systems providing timely and reliable information to management.
- ✓ Human resources: employee recruiting, training and hiring across all primary and support activities. Possible Is usage: workforce planning systems; hr-specific applications to facilitate confidential storage of employee data.
- ✓ Technology: improving products and the production process. Possible Is usage: computer-aided design systems; decision support systems to monitor the efficiency of various processes and activities.
- ✓ Procurement: purchasing inputs. Possible Is usage: computerized ordering systems; supply chain management applications; electronic data interchange. Particularly relevant to an online retailer as procurement over the internet tends to raise bargaining power over suppliers; substitute products may emerge from new suppliers; widening of geographic market may impact on price and supply availability.

(6 Marks)

(c)

DSS – A business intelligence system for non-routine decision making, which sets out to answer specified questions as part of semi-structured decision making by combining information from transaction processing systems, management information systems and some external sources. It is distinguished from TPS and MIS by the fact that such information is used as a basis for modeling, such as sensitivity analysis, multidimensional data analysis. These systems are used by 'super-user' managers or business analysts. For the manufacturer of retail products, the types of decision this system might support include decisions about how levels of production

would be affected if sales were to fall; how production/deliveries should be scheduled to meet estimated demand/reduce costs etc.

ESS - are information systems at the organization's strategic level, designed to address unstructured decision making through advanced graphics and communications. Their purpose is to provide executives with information to help them to make their decisions (not to provide executives with ready made decisions), because such decisions normally require judgement, evaluation and insight.

Such systems are designed to be flexible, to cope with unstructured data from a range of sources, including internal and particularly external to the organization. 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. 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, personalized business content. Another approach is providing a digital dashboard, which provides, at a glance, a real-time view of key performance indicators for the business. For example, following the balanced scorecard approach, the organization might monitor financial information alongside other indicators related to customers, internal business processes, and learning and growth. Executives using this type of information, provided the information provided is accurate, reliable and provided in real-time (or in a timely fashion), may be able to make more informed and better decisions on managing the business, including decisions about restructuring, investment, performance and the setting of strategy. These systems are distinguished by: their use in making specific decisions (DSS) versus providing oversight (ESS); use by analysts (DSS) versus by executives (ESS); their purpose as tools for modeling and analysis (DSS) versus tools for broader oversight (ESS); and the capability of ESS to deal with less structured information, including a (usually) greater amount of external information.

(8 Marks)
Total: 20 Marks

4.) (a)

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

Effective knowledge management can assist in: Reducing costs by leveraging what is known in the organization (not reinventing the wheel) – leads to increased profitability. Promoting organizational learning so that mistakes are not repeated – leads to improved products and/or services (competitive advantage). Improving speed of response (for example in a call centre) as a result of better knowledge access and application. Better relationship management through knowing customer/supplier/employee needs.

Driving innovation including through collaboration in physical and virtual teams, with knowledge workers driving the process of new knowledge creation.

(6 Marks)

(b)

The 4 strategies outlined are:

- Low-Cost Leadership:
By using information systems to lower your operational costs you can lower your prices. That will make it difficult for traditional competitors and new market entrants to match your prices. This strategy works best with commodities such as computers or with retailers.

- Product Differentiation:
A very effective use of strategic information systems is to create products or services that are so different that they create barriers for the competition. Product differentiation is at the heart of Apple Computer's success. Sure it makes computers. But the company gets away with charging a premium price because it differentiates its products from all others. Competitors, like Hewlett-Packard and IBM, have tried to duplicate Apple's strategic business model but have not been quite as successful.

- Focus on Market Niche:
If an organization is in a fiercely competitive market, it can choose to focus on a very narrow segment of the market rather than a broad general audience. A firm can gather very specific information about its customers using data mining techniques. Then it creates a focused differentiation business strategy to market directly to those consumers. Being able to address the needs and wants of a very small market segment is why companies are so intent on gathering consumer information from a variety of sources.

- Strengthen Customer and Supplier Intimacy:
Supply chain management (SCM) systems increase supplier intimacy while customer relationship management systems increase customer intimacy. SCM systems create immense

switching costs between a company and its suppliers because of the investment of hardware and software necessary to make the system successful. Customer relationship management systems allow companies to learn details about customers that give them the competitive advantage over traditional competitors and new market entrants.

(6 Marks)

(c)

ERP systems are suggested to increase operational efficiency by providing managers across business processes with timely, accurate and relevant information to aid in their decision making.

Using ERP systems, firms can respond more quickly to customer requests for information or products. With one system integrating ordering, manufacturing and delivery data, better information is available to create more accurate sales and production forecasts, minimizing costs and the risks of stock outs – both more efficient for the business and leading to higher customer satisfaction. With better information gathered on processes such as the manufacturing process this can be used as a basis to analyses the performance of these processes, and ultimately identify bottlenecks, delays or other areas for improvement. With linkages between ordering, manufacturing and delivery information, better decisions can be made about the levels of production, timing of production and stockholding leading to cost savings and greater efficiency.

Greater sharing of information, standardization of information and reports can assist senior manager's in comparing performance across the firm, possibly identifying areas where improvement is required.

(8 Marks)

Total: 20 Marks

5)

(a)

Information systems are vulnerable to technical, organizational, and environmental threats from internal and external sources.

Key areas where systems are most vulnerable include: hardware or software failure and errors; personnel actions;

- ✓ Terminal access penetration; fire or electrical hazards; user errors; theft of services, data, and equipment; program changes; and telecommunications problems. Examples of specific vulnerabilities include: internet vulnerabilities (every point of entry into the Internet network is a point of vulnerability); vulnerabilities related to the use of wireless networks (radio frequency bands are easy to scan); Malicious Software: Viruses, Worms, Trojan Horses, and Spyware; Hackers and Computer Crime; Spoofing and Sniffing; and Denial of Service Attacks.

Additionally, purposeful and accidental problems, such as programming and data errors, can occur. Hardware and software can fail. The effects of an event such as a hardware malfunction, power outage, or fire can be extensive. Underinvestment, poor system design, failure to plan for disasters/contingencies are potentially significant risks.

(6 Marks)

(b)

• Data is collection of symbols or facts. It can be a flow of events or transactions which, by itself is only useful for transacting. Example: list of sales orders in transaction processing system.

• Information is data that has been given meaning by way of relational connection. This is done by processing, organizing, structuring and presenting the data in a given context so as to make them useful. Example: monthly sales reports / regional sales reports

• Knowledge is the appropriate collection of information such that its intent can be useful. To create knowledge resources must be expended to discover patterns, rules and contexts where the knowledge works. When someone ‘memorizes’ information they have a massed knowledge.

(6 Marks)

(c)

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 modeling 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 geographically dispersed smes might include gathering and presenting: comparative sales figures between territories; projected revenue figures modeling assumptions about new product sales; implications of projected changes on production schedules; expected outcomes of different decision alternatives, given past experience

(8 Marks)
Total: 20 Marks

6) (a)

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 organization. It may be managed by the organization 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 organization 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. (6 m**arks)**

(b)

- ✓ Collaboration internally within the organization, for example using enterprise social networking tools – specialized 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 face book.

- ✓ 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, face book) to feed into future service decisions e.g. decisions about new/closing services.

- ✓ Service advertising on face book 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. **(6 Marks)**

(c)

Inter-organizational systems are information systems that automate the flow of information across organizational boundaries and link organizations to their customers, distributors or suppliers. examples include the use of supply chain management systems: systems that help suppliers, purchasing firms, distributors and logistics companies share information about orders, production, inventory levels and delivery of products so that they can source, produce and deliver goods and services efficiently. Another example is customer relationship management

systems: providing information to coordinate all of the business processes that deal with customers in sales, marketing and service, and which may (in some cases) facilitate automated sharing of information with customers. Inter-organizational systems can be facilitated through Electronic Data Interchange (EDI): the direct computer-to computer exchange between two organizations of standard business transactions such as orders, shipment instructions or payments.

Transactions are automatically transmitted from one information system to another through a network, eliminating the printing and handling of paper copies at one end and the inputting of data at the other. Major industries usually have EDI standards that define the structure and information fields of electronic documents for that industry. 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.

Internet technology can be used to create extranets (private intranets extended to authorized users outside the organization) 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. The site is controlled by the purchasing firm and allows for the secure sharing of detailed information on product design and development, marketing, production scheduling, inventory management and unstructured communication. An example is VW group supply.

(8 Marks)
Total: 20 Marks