

Markscheme

May 2023

**Information technology
in a global society**

Higher level

Paper 3

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Critical Thinking – explanation, analysis and evaluation

These trigger words often signal critical thinking. The bold words are the key terms in the various criteria.

Explanation – *Because, as a result of, due to, therefore, consequently, for example*

Analysis – *Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas*

Evaluation – *My opinion, overall, although, despite, on balance, weighing up*

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt, check with your team leader.

In the case of an “identify” question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In all other cases where a question asks for a certain number of facts eg “describe two kinds”, mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

It should be recognized that, given time constraints, answers for part (c) questions are likely to include a much narrower range of issues and concepts than identified in the markband. There is no “correct” answer. Examiners must be prepared to award full marks to answers which synthesize and evaluate even if they do not examine all the stimulus material.

1. (a) Identify **two** components in an RFID tag. [2]

Answers may include:

- microchip (or IC)
- an antenna
- a substrate or protective material layer that holds all the components together
- attachment system - adhesive to enable fixing to solid object or tamper proof case with magnetic pin release for garment RFID tags or stitched into fabric in garment
- if active, a power source e.g., battery otherwise an induction coil
- receiver / transmitter / a transceiver, a device that both transmits and receives communication
- memory (do not accept storage).

Award [1] for each component in a RFID tag up to [2].

Note: Accept shortened descriptions of the components e.g., chip, microprocessor, coil

- (b) Identify **two** characteristics of a smart shelf. [2]

Answers may include:

- Smart shelf displays can be wirelessly updated with current stock data including availability, prices etc.
- Smart shelves provide real-time updates of stock levels.
- Uses RFID antenna/readers on the shelves to read information about products from their RFID tags
- Thresholds for low stock levels can be set and notifications generated when thresholds are met/reached.
- Smart shelf display systems can recognise RFID and display item information.
- Smart shelf displays are a low power, high energy efficient LCD screen.
- Often battery powered reducing need for expensive infrastructure.
- Identify if stock positioning is incorrect/detect misplaced items i.e. items that have been wrongly put back on a shelf.
- uses weight sensors to calculate the quantity of inventory that exists on a shelf.

Award [1] for each characteristic of a smart shelf up to [2].

Notes:

*The characteristic should be in the form of a sentence and not the component listed, **nor** the uses listed.*

The characteristic must be that of the smart shelf not the stock inventory system.

2. The augmented reality (AR) solutions proposed by André include augmented reality mirrors and an in-store app (lines 37–42).

Explain **three** factors that André should consider when installing these augmented reality (AR) technologies.

[6]

Note: Interpretation of installing the mirror could be at the time of physical installation in the store, or the decision to have the AR mirrors in the store. Both are accepted.

Answers may include:

Factors to consider when physically installing the mirrors in the store:

- Location of Mirrors.
- The need for privacy which may be greater in some cultures than others (and positioning should allow for customers of all sizes to be able to see themselves fully in the mirror).
- Software updates for the Mirrors.
- How the mirrors will be updated with new product lines.
- Mirror Configuration.
- The mirror should be configured to show an accurate representation of the item and not be distorted, so it misleads customers.
- Security of data.
- How secure are the images that are captured when using the mirror.
- Testing.
- Testing the AR technologies to make sure that there are no bugs or issues so that the customers' experience is optimal.
- Training.
- Planning for training on how the mirrors will be maintained and/or configured by staff.
- Data Protection Policies.
- When introducing the new technologies, policies may should include - how data is to be collected, used, stored and/or shared.

Factors to consider when deciding to include AR Mirrors in the store:

- Size of mirrors.
- For example, how can it be adjusted to deal with variations in height between different customers.
- Cost/Quantity of Mirrors.
- Consider how many to buy in order for their use to be effective.
- Phone compatibility.
- Whether or not customers phones have the appropriate features and specifications to run the AR technology in the app.
- Ease of Use/Digital Divide.
- how easy are the mirrors/AR App to use and what help is given to use them e.g. tutorials, help guides; are there groups of customers who would not have the skills to use AR?
- App/Mirror Recommendations of clothing choices may be unsuitable.
- For example, may overlay with inappropriate clothing selection such as sleeveless, skirt/dress length, perceived immodesty, insensitivity to gender/non-binary, insensitivity to age, insensitivity to body dimensions/shape.
- Recognition of skin colour/tone if using a virtual model.
- Computer enhancements/modification to body shape of the customer (snap chat lens style)/the skin tone could be related to cultural differences.
- Language options for companion app/mirror voice and/or labels.
- Allows users to interact with mirror/app in their own language or a range of languages.
- Options for customer to provide cultural preferences in app/on mirror.
- For example, may resolve suggestions of clothing choices.

*Award **[1]** for each factor that needs to be considered in the deployment of the virtual mirrors and **[1]** for each development up to **[2]**.*

Note: Accept other relevant factors which would be useful at the point of installation or when deciding to include an AR solution in the store.

*Mark as **[2]** + **[2]** + **[2]**.*

3. The customer service robots have been developed to recognize the human voice using natural language processing (lines 43–44).

To what extent will customer service robots using natural language processing improve the customer experience in *MCA Sports'* flagship store?

[8]

Answers may include:

Improves customer experience:

- Better data analysis: large amounts of text-based information can be processed and analyzed leading to improved interaction with customer.
- Streamlined processes by answering questions quickly for customers.
- Improved customer experience - do not have to wait to talk to staff member.
- No need for breaks/can communicate in a variety of languages.
- Consistency with responses.
- Language comprehension continually develops.

Does not improve customer experience:

- Muffled speech due to masks and visor wearing.
- Accessibility for the auditory or vocally challenged, non-verbal people.
- Unable to recognize rarely heard accents/non-standard dialects, e.g. customer service robots may be calibrated for one particular dialect such as English spoken in England.
- Interpreting colloquialisms, slang, sarcasm, irony, informal phrases, expressions, homonyms and synonyms.
- Languages where not much data has been collected, especially those spoken by people with less access to technology.
- Domain-specific language – may be a lack of understanding of contextual words or niche language/vocabulary used in retail industry.

Notes:

The question focuses on whether the customer experience is improved by the use of robots that use natural language processing.

[3 – 4]: response may include implicit references to the customer experience and be unbalanced.

[5 – 6]: response should include explicit reference to the customer experience with a balance of arguments, conclusion may not be well developed, some references to the MCA store are expected.

[7 - 8]: responses should include evaluative comments that make explicit references to the Case Study and demonstrates a knowledge of natural language processing.

Please see the markband on page 8.

SL and HL paper 1 part (c) and HL paper 3 question 3 markband

Marks	Level descriptor
No marks	<ul style="list-style-type: none"> • A response with no knowledge or understanding of the relevant ITGS issues and concepts. • A response that includes no appropriate ITGS terminology.
Basic 1–2 marks	<ul style="list-style-type: none"> • A response with minimal knowledge and understanding of the relevant ITGS issues and concepts. • A response that includes minimal use of appropriate ITGS terminology. • A response that has no evidence of judgments, conclusions or future strategies. • The response may be no more than a list.
Adequate 3–4 marks	<ul style="list-style-type: none"> • A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts. • A response that includes limited use of appropriate ITGS terminology. • A response that has evidence of conclusions, judgments or future strategies that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.
Competent 5–6 marks	<ul style="list-style-type: none"> • A response with knowledge and understanding of the relevant ITGS issues and/or concepts. • A response that uses ITGS terminology appropriately in places. • A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.
Proficient 7–8 marks	<ul style="list-style-type: none"> • A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts. • A response that uses ITGS terminology appropriately throughout. • A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis.

4. The Geneva store will become *MCA Sports*' flagship store and will incorporate four new technologies (lines 31–36):
- Augmented reality (AR) solutions
 - An in-store companion app
 - Customer service robots
 - Smart shelves.

Discuss whether the introduction of these new technologies will be beneficial to *MCA Sports*.

[12]

Answers may include:

Beneficial to the MCA Sports

- Establish position as market leader in the development and implementation of new technologies.
- Bring in additional customers who are tech savvy/pioneers.
- Increase in customers due to the increased language options and consideration of cultures
- Gain more accurate information about preferences of customers / create consumer profiles and be able to use this to make more informed choices regarding items to stock.
- Real-time data collection regarding inquiries and searches.
- Real-time stock management enabling more efficient use of the supply chain, restocking shelves etc which could lead to a JIT system being implemented / less storage required / reduces overheads.
- Reduced time/cost returning garments to shelves - AR-mirrors.
- Reduction in stock loss through theft, stock damage and soiling.
- Increased efficiency in the use of customer service robots who can handle simple inquiries on stocking level, locations, garment availability etc.
- Staff are involved in each stage of the upgrade leading to loyalty, increased motivation and retention rates
- Staff are upskilled in the use of new technologies/staff from other stores can be trained in advance of upgrades

Concerns for MCA Sports

- Upfront costs to introduce the new technologies
- There may not be interoperability between the different technologies
- Need for staff training
- Technical support for customers and staff
- Requirements to secure customer data may require additional costs as the increase in data collected and possibility of it being aggregated may lead to more rigorous data security measures being needed.
- Customers and staff may not embrace the new technologies so there may be additional costs. There may be concerns about customers' perceptions that sensitive personal data may be shared.
- Costs associated with the maintenance of new technologies
- Consideration for non-technical customers and staff
- Downtime/reliability issues – staff may not retain existing skills prior to upgrade as these have been replaced by new technologies
- Short term - disruption to store while IT systems are installed/integrated with existing technologies potentially leading to loss of sales/customers
- Consideration of legal implications/requirements associated with these new technologies
- Workplace health and safety considerations
- Potential objections from workplace unions that may need to be negotiated

Concluding comments

- MCA may consider that although the technocentric strategy leads to short term costs, over the longer term it could position them as a market leader / gain first mover advantage.
- This could lead to other retailers adopting this strategy further strengthening MCA's position.
- It could lead to these technologies being implemented in other MCA stores.

Notes:

This question focuses on the impact on the store, which is different from Question 3 which focuses on the impact on customers.

The technologies will impact the customers, but to be in the competent markband and above, candidates should then make explicit links to the store e.g., increase in sales, returning customers due to in-store experience

Please see the markband on page 11.

HL paper 3 question 4 markband

Marks	Level descriptor
No marks	<ul style="list-style-type: none"> • A response with no knowledge or understanding of the relevant ITGS issues and concepts. • A response that includes no appropriate ITGS terminology.
Basic 1–3 marks	<ul style="list-style-type: none"> • A response with minimal knowledge and understanding of the relevant ITGS issues and concepts. • A response that includes minimal use of appropriate ITGS terminology. • A response that has no evidence of judgments, conclusions or future strategies. • No reference is made to the information in the case study or independent research in the response. • The response may be no more than a list.
Adequate 4–6 marks	<ul style="list-style-type: none"> • A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts. • A response that includes limited use of appropriate ITGS terminology. • A response that has evidence of conclusions, judgments or future strategies that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced. • Implicit references are made to the information in the case study or independent research in the response.
Competent 7–9 marks	<ul style="list-style-type: none"> • A response with knowledge and understanding of the relevant ITGS issues and/or concepts. • A response that uses ITGS terminology appropriately in places. • A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis. • Explicit references to the information in the case study or independent research are made at places in the response.
Proficient 10–12 marks	<ul style="list-style-type: none"> • A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts. • A response that uses ITGS terminology appropriately throughout. • A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis. • Explicit references are made appropriately to the information in the case study and independent research throughout the response.