Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2016

Information technology in a global society

Higher level

Paper 3

12 pages

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.

If candidates answer more than the prescribed number of questions:

- In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers.

- In the case of a "describe" question, which 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.

- In the case of an "explain" question, which asks for a specified number of explanations *eg* "explain two reasons", mark the **first two** correct answers. This could include two full explanations, one explanation, one partial explanation *etc*.

1. Describe **two** features of a smart home that could be used to help the elderly or people with disabilities. **[4]**

Definition of smart home from case study: A home incorporating a **communications network** that **connects** to all the devices and allows them to be **remotely controlled, monitored or accessed**.

NB: the actual devices and sensors, such as thermometers and heaters, do not need to be described as the emphasis is on the communications and the control, monitoring and access.

Allow examples of sensors which are mentioned in the case study, as long as how it will help the disabled/elderly person is covered.

Answers may include:
Features that could be included

- using a handheld device to communicate with a central controlling hub or to the specific device controller directly
- setting up a controlling device or central hub that will monitor the house and/or adjust the device according to the settings
- controlling device can be device specific or a smart phone, tablet or computer
- the communications will be through Wi-Fi or another wireless protocol
- the monitoring would be through communications of data from a sensor device in the device, or separate from it, to the controller
- the controlling software can be accessed through a device specific controller, the device itself or an app or webpage on a smart phone, tablet or computer
- the centralized hub, or the device itself, can store records of its use that can be monitored and used for the benefit of the elderly or disabled person.

Help to elderly or disabled – most of the help will be for those who have a lack of mobility

- no need to be mobile to control the climate of the house, or other parts of the house
- increased security benefits and feelings of security: can monitor and control what is going on in the house and outside the house
- monitoring of activity of elderly or disabled that can trigger an alarm or alert message if eg there is lack of activity in the house since a fall may have happened
- saving of electricity, water and power to make cheaper to live at home
- set up automatic timer to control parts of the house, especially lighting and climate which will help an immobile person and also save money
- operating appliances and features of the house such as doors and windows using smart home wireless control from phone or tablet or using proximity sensors without needing to be mobile or access the devices directly
- setting up alerts for actions to be done such as taking medicines or other reminders
- control of entertainment in the house through voice or smart phone or tablet which is easier for an immobile or handicapped person
- voice control of the house as well as using a device such as a smart phone or tablet (which may be also activated by voice) which will help an immobile or handicapped person.

Accept any other relevant answer as long as it links with a concrete benefit to an elderly or disabled person.

*Award **[1]** for each feature identified up to a maximum of **[2]**.*
*Award **[1] additional mark** for a description of how each feature identified helps an elderly or disabled person up to a maximum of **[2]** per feature.*
*Mark as **[2 + 2 = 4]** marks maximum.*

2. (a) In addition to those provided in the case study, construct **one** If This Then That (IFTTT) recipe that would trigger an action by a device in a smart home. **[2]**

Answers may include:
Action and trigger event must be valid for a smart home.

*Structure of response must be of the format: **IF** event **THEN** action, but may insert words in between (ie some students may write a paragraph here instead of a sentence and still get full marks).*

***[1]** for inclusion of keywords **"IF"** and **"THEN"** in the correct order (do not award a mark if these are not present or in the wrong order).*

***[1]** for a valid event and a valid action in the correct places (ie the even after the **"IF"** and the action after the **"THEN"**).*

*Note: some students may extend the syntax to include **AND/OR/NOT**. This is not required but is accepted. For example: **IF** dark outside **AND** (time>18:00 **AND** time<7:00) **THEN** switch on lights.*

Examples:
IF **window is opened at unexpected time** THEN **send alert to owner's phone and alert the police or building security**.
IF **the front door is opened** THEN **turn on the light in the entrance way**.
IF **moisture is detected above a specified level** THEN **send a call to a specified cell phone**.

*Award **[1]** for an action that can be performed by a device in a smart home and act as a trigger for a further action to be performed by another device.*
*Award **[1]** for an event that can be in response to that trigger in a smart home.*
*If action and event are not connected, then mark as **[1]** mark maximum.*

(b) Explain **two** ways that an unreliable device or a network failure can cause problems in the smart home or for its occupants. **[4]**

Answers may include:
Candidates are allowed to provide examples where a weakness in a device or network component has been exploited by a third party, *eg* hacker exploiting a weakness in the Wi-Fi network to take control of a device resulting in possible damage to the house or security problems.

Examples:
- failure of heating control device and/or sensors could cause house to overheat with danger of fire
- failure of the network in the house (smart home hub, Wi-Fi access point, bug in main control software, power surge damaging equipment) could cause the occupants not being able to activate the door lock control through their smart phone app and be locked out of the house
- failure of a network can cause the door lock control not to be activated through their smart phone and the smart house can be open to theft
- security updates to devices on a network may not go as intended resulting in the updated devices being no longer able to be controlled remotely and inaccessible. Customers may experience difficulties in getting the network functioning again.

*Award **[1]** for stating an issue (eg malfunctioning smoke detector, or wireless router breaking) **[2 max]**.*
*Award **[1]** for linking that issue to a problem that it would cause the occupant **[2 max]**.*

Do not award marks for the same issue linked to both problems.

*Mark as **[2 + 2 = 4]** marks maximum.*

3. As increasing numbers of people will be living in smart homes, the nature of the Human–Computer Interface (HCI), the means by which the occupants interact with the device(s), will be critical to the success of the smart home.

To what extent is the success of the smart home dependant on the usability of the HCI of the device manager (lines 46–52)? **[8]**

Answers may include:
The success of the smart home may be determined by a number of factors which need to be balanced out. The smart home will fail at its weakest point, so it is necessary to consider a range of factors that could lead to system failure, or problems with the system, such as the human computer interface (the control of the device), device and system problems and the relationship between the supplier of the device and Brix Homes, among others candidates may think of.

Device failure
- can the connection between the device manager and the devices be maintained at all times?
- what back-up systems are in place if the main system fails?
- will the need to ensure a reliable connection have effects on the cost of the device manager and lead to compromises being made in other areas?
- compatibility of devices and the control systems.

Usability of the HCI
- can the HCI of the device manager be made intuitive and hide the complexity of the software operations? Is it a case of developing a “plug and play” system?
- what mechanisms are in place to assist users in the setting up and using of the device manager? How is this help provided?
- how extensive has the research been into the layout of the device manager, what potential users have been involved?
- how easy will it be to customize the HCI to suit the range of possible users?
- how willing will smart home owners be prepared to find workarounds if the HCI of the device manager is not intuitive?
- to what extent are aesthetics less important than functionality?

The supplier of the HCI device manager
- will Brix Homes choose a single supplier?
- if so, will the device manager be based on an existing system or an original bespoke one?
- What will be the relationship between Brix Homes and the Supplier(s)?
- What will be the level of support provided by the supplier for resolving incompatibility problems between the device manager and various smart home devices?

HL paper 3 question 3 markband

Marks	***Level descriptor***
No marks	• *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***	• *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 and/or conclusions.* • *No reference is made to the scenario in the stimulus material in the response.* • *The response may be no more than a list.*
Adequate ***3–4 marks***	• *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 and/or judgments that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.* • *Implicit references are made to the scenario in the stimulus material in the response.*
Competent ***5–6 marks***	• *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 scenario in the stimulus material are made at places in the response.*
Proficient ***7–8 marks***	• *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 and/or judgments that are well supported and underpinned by a balanced analysis.* • *Explicit references are made appropriately to the scenario in the stimulus material throughout the response.* • *There are explicit references to sites that the student has researched.*

4. Brix Homes is considering whether to use a third party provider, Intelligent Homes Services, to set up a proprietary cloud-based portal service for new houses that Brix Homes builds. This will allow the owners of these smart homes to control devices using the web portal from either inside or outside of the house (lines 65–73).

Discuss whether Brix Homes should use Intelligent Homes Services to set up a proprietary cloud-based portal service for new houses. **[12]**

Answers may include:

Advantages to Brix Homes

- an incentive for people to buy Brix homes that provides a service others may not offer
- data collected by the provider can be used to analyze and improve the smart home setup in the homes Brix builds
- the cost of setting up the smart homes will be cheaper as the many homes will be provided with the same products, gaining economies of scale
- a wide range of smart home devices can be offered to customer
- it prevents Brix homes from trying to spread their expertise too thinly.

Disadvantages to Brix Homes

- complaints from homeowners that the devices are not the type that they want
- complaints from homeowners that the access and control software is not exactly what is needed or cannot be modified
- privacy concerns from homeowners about the data collected and how it is used by Brix and the third party provider
- concerns of the homeowners about the security of their homes if the security of the third party provider is compromised.

Advantages to home owners

- do not need to contact a provider and set up a service themselves
- will be available immediately when they enter their home
- the smart home devices will be compatible with the service
- the interface to control and access all the devices will be specially designed for the Brix homes they buy
- data collected from all Brix homes can be analyzed and used to improve the service to them
- an external provider can be called upon if there is a problem with a device or part of the service, rather than contacting Brix Homes.

Disadvantages to home owners

- the smart home devices will be limited to the proprietary services and equipment supported by the provider and Brix
- the smart home devices supported may not have the capabilities and features the home owners want
- the data collected by the provider about the use of smart devices in their homes and their daily living habits could be use inappropriately
- homeowners will need to consider how secure their private data will be in the hands of the third party provider and Brix Homes
- an opt-out of the data collection may not be available.

Advantages to service providers

- a chance to get involved with a home developer and to set up special services that they can sell to other developers; and to established estates and apartment buildings
- a chance to collect data about a large number of homes that use their services in a controlled environment which can be used to improve their services.

Disadvantages to service providers

- possibly need to be involved with the maintenance and set up of the Brix Homes smart home networks and devices which is beyond providing a simple web service like IFTTT.

HL paper 3 question 4 markband

Marks	***Level descriptor***
No marks	• *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***	• *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***	• *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***	• *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***	• *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.*