

Markscheme

May 2018

Information technology
in a global society

Higher level and standard level

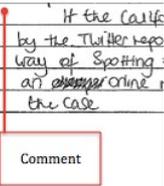
Paper 2

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The following are the annotations available to use when marking responses.

| Annotation | Explanation | Comment | Short cut |
|---|---|---|-----------|
|  | Correct point | Use for identify, state, outline, describe | |
|  | Incorrect point | Use for identify, state, outline, describe | |
| BOD | Benefit of the doubt | Answer is close enough to give some credit, indicates that you see some merit in it. | |
| NBOD | No benefit of doubt | Not quite enough to earn any credit. | |
| SEEN | Seen | Indicates that the text has been noted, but no credit has been given, or used on a blank page to ensure that RM Assessor and/or staff in Cardiff know that you have seen the page | |
| OC | Off course | | |
| TV | Too vague | Point is unclear, or not specific enough to answer the question. | |
| REP | Repetition | Repeats a point previously made, not necessarily worded in the same way. | |
| REF | Reference | This is used to indicate a reference to the stimulus material, article or the Case Study (Paper 2 or Paper 3) | |
| D | Description | Candidate has added descriptive information to an initial idea that has been named or identified. | |
| A+ | Analysis / Explanation | Candidate has explained why something occurs, or why it is important to the point s/he is making, or described the consequences of a policy/action/use of IT. | |
| B+ | Balanced argument involving detailed analysis | Use in the examiner’s comments at the end of extended response questions. Balanced arguments involving detailed analysis can occur within paragraphs as well as at the end of the response. Often, a transition word to link/compare ideas, such as “however” or “on the other hand” is used. Can also be structured analysis of ideas, <i>eg</i> good vs bad, for X and against X. | |
| EVAL | Evaluation – beyond the ideas presented to reach a conclusion or overall comment. | Use only if evaluation is supported , not just stated. Note that evaluation can occur in the body of an extended response as an evaluative comment about an idea as well as at the end in the conclusion. Fully evaluated requires a well-supported conclusion. Evaluation and detailed analysis can overlap when evaluation is within a paragraph. | |
| O | Opinion | Use only if opinion is supported, not just stated. Note that opinion can occur in the body of an extended response as well as at the end. | |

| | | | |
|---|---------------------------------------|---|--|
|  | Dynamic, Horizontal | Indicates a valid point that the student will need to support in an extended response. | |
|  | Dynamic, Horizontal Wavy | Used for incorrect statements/phrase | |
|  | Dynamic, Vertical Wavy | Indicates that the candidate has veered off course, ie either by not answering the question that is asked or has moved in a direction unrelated to the question. Can also use OC annotation | |
|  | Text box with extended vertical line. | Used to mark and comment on a block of writing that makes a valid point. Note that the text box and the vertical line are connected. | |
| Text box | Insert comments | Used for comments at the end of questions where the mark needs to be JUSTIFIED. Often with AO2 command terms – EXPLAIN. ALWAYS with AO3 command terms – EVALUATE, JUSTIFY, TO WHAT EXTENT, and DISCUSS. | |

You **must** make sure you have looked at all pages. Please put the **SEEN** annotation on any blank page, to indicate that you have seen it.

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*

Using assessment criteria for external assessment

For external assessment, a number of assessment criteria have been identified. Each assessment criterion has level descriptors describing specific levels of achievement, together with an appropriate range of marks. The level descriptors concentrate on positive achievement, although for the lower levels failure to achieve may be included in the description.

Examiners must judge the externally assessed work at SL and at HL against the four criteria (A–D) using the level descriptors.

- The same assessment criteria are provided for SL and HL.
- The aim is to find, for each criterion, the descriptor that conveys most accurately the level attained by the candidate, using the best-fit model. A best-fit approach means that compensation should be made when a piece of work matches different aspects of a criterion at different levels. The mark awarded should be one that most fairly reflects the balance of achievement against the criterion. It is not necessary for every single aspect of a level descriptor to be met for that mark to be awarded.
- When assessing a candidate's work, examiners should read the level descriptors for each criterion until they reach a descriptor that most appropriately describes the level of the work being assessed. If a piece of work seems to fall between two descriptors, both descriptors should be read again and the one that more appropriately describes the candidate's work should be chosen.
- Where there are two or more marks available within a level, examiners should award the upper marks if the candidate's work demonstrates the qualities described to a great extent. Examiners should award the lower marks if the candidate's work demonstrates the qualities described to a lesser extent.
- Only whole numbers should be recorded; partial marks, that is fractions and decimals, are not acceptable.
- Examiners should not think in terms of a pass or fail boundary, but should concentrate on identifying the appropriate descriptor for each assessment criterion.
- The highest level descriptors do not imply faultless performance but should be achievable by a candidate. Examiners should not hesitate to use the extremes if they are appropriate descriptions of the work being assessed.
- A candidate who attains a high level of achievement in relation to one criterion will not necessarily attain high levels of achievement in relation to the other criteria. Similarly, a candidate who attains a low level of achievement for one criterion will not necessarily attain low achievement levels for the other criteria. Examiners should not assume that the overall assessment of the candidates will produce any particular distribution of marks.
- The assessment criteria must be made available to candidates prior to sitting the examination.

Theme: Home and leisure

Criterion A — The issue and stakeholder(s)

[4]

1. (a) Describe **one** social/ethical concern related to the IT system in the article.

Social/ethical concerns may include the following:

Privacy of the user – who has access to the data (time or sessions online and apps used) ...

- stored on the user's device
- sent to other members of the family group
- stored by the company
- supplied to third parties
- viewed by other members of the family without permission.

Note: the definition of privacy may be implicit, for example, invasion of privacy occurs if data accessed/used without consent.

Security of the data stored on the mobile device

- if the device is stolen or hacked the data might be accessed by unauthorized parties.

Security of the data sent to/stored by the company

- the transmission of data to the company may be insecure/intercepted by others
- data stored by the company may be insecure/at risk of unauthorized access.

Surveillance

- app can be used to monitor the actions of people, can be misused and cause embarrassment (psychological, social, work, family, physical health issues).

Policies

- employees of the company may misuse the data if there are no policies governing use by the employees about stored data.

People and machines (addiction)

- excessive time spent causing psychological and physical health consequences.

(b) Describe the relationship of **one** primary stakeholder to the IT system in the article.

Primary stakeholders may include the following:

- the user (teenager/person) using the app to record their device usage time and access to other apps
- the other members of the family group who have access to the user’s data
- the company (including employees of the company), that produces the app and stores the data
- third parties to whom the stored data may be sold/supplied
- family members who use the application to change/alter another members use/access of the phone
- user spending excessive or detrimental amount of time on social media.

| Marks | Level descriptor |
|-------|---|
| 0 | The response does not reach a standard described by the descriptors below. |
| 1 | Either an appropriate social/ethical concern or the relationship of one primary stakeholder to the IT system in the article is identified. |
| 2 | Either an appropriate social/ethical concern or the relationship of one primary stakeholder to the IT system in the article is described or both are identified. |
| 3 | Either an appropriate social/ethical concern or the relationship of one primary stakeholder to the IT system in the article is described; the other is identified. |
| 4 | Both an appropriate social/ethical concern and the relationship of one primary stakeholder to the IT system in the article are described. |

Criterion B — The IT concepts and processes**[6]**

2. (a) Describe, step-by-step, how the IT system works.
IT system: Collecting, transmitting and storing information from a mobile device.

Answers provided in the article include the following:

- the app collects information from the device's system and sensors in order to determine when and how it is being used
- the app collects information about what other apps a person uses
- the information collected by the app is stored on the device
- the information collected by the app is shared with all members of the family
- the information collected by the app is sent to *Moment* and stored by the company
- other information about the device and the user are also sent to the company. This includes information the user entered when they first installed the *Moment Family* app
- users/family members provide information when the app is installed - signing up is a development, and the details of the information provided as well
- references to the content of the screen shot:
 - displayed on the "lock" screen (sharing information with the user) the bar chart represented on diagram show number of interactions with the device in the day/24-hour period
 - the screen does displays start time for the lock, a timer until the unlock comes off and instructions for the user - these are not mentioned in the mark scheme
- mobile device: no details of the IT system provided in the article
- can be used on mobile devices - computer, tablets, phones or other electronic devices.

Answers with additional information to that in the article may include the following:

Collecting the data

- sensors used to gather information might include the accelerometers, microphone, camera, *etc*
- system might include information about which apps are running, battery level indication (faster drain on the battery indicating that the device might be in use), whether the screen is unlocked, *etc*
- the app calculates the time the user spends using the device. This is incremented each time the device is used in order to obtain a running total
- the user can enter a daily time limit. Each day the app continually subtracts the cumulative amount of daily screen time from this limit and once the difference is zero the user is alerted.

Sharing the data

Note: *how data is shared is not stated in the article so this opens up the question for many interpretations, eg. real-time, via a website, via a text message, alerts, etc - the list goes on. All realistic options should be accepted. Also, output to the user is not specified and is presumably on the screen so developments for output need to be accepted.*

- users must authenticate themselves to connect to WiFi/mobile (eg 3G, 4G, *etc*) network
- data is shared between family members and *Moment* via WiFi/mobile connection to the internet

- other device data might include the IP address of the device, location of the device, the unique device identification number (IMEI, *etc*), the device MAC address
- other user data entered when they first installed the app might include their name, email address and gender
- logon name and password for app sign in
- data may be encrypted while transmitting.

Storing the data

- data is stored on the device in files/a database created by the app when it is installed
- shared data is stored on *Moment's* servers and/or in the cloud
- data is stored in a database
- the devices of other members of the family group can query the database to retrieve data relating to the activities of all members of the group
- data may be encrypted while storage on device/ moment's servers.

App setup

- download, a step before the installation mentioned in the article
- sign-up self and family
- enter personal and family data - must include data that links the family members - could be phone numbers, email addresses, social media account membership, moment membership user ID, *etc*
- configure app, give permissions/consent to app to use location/microphone, camera, contacts and other apps and run in the background.

Data Processing

- possibly beyond scope of collect, transmit and store - but candidates who describe processing of user operation against pre-set rules = ITTT rules.

Mobile Device

- as no details are provided in the article all technical descriptions are developments.

- (b) Explain the relationship between the IT system and the social/ethical concern described in **Criterion A**.

Relationship of the IT system to privacy issues:

Sharing data with family members

- HOW - other family members can see when and for how long the user is accessing their device and which apps they are opening via the user interface of the Moment Family app. WHY - family member may not have given permission for sharing and/or altering the access to the apps.

Sharing the data with *Moment*

- HOW - the data sent to *Moment*. This data would potentially allow the approximate location of the user to be determined at any time if the data was intercepted during transmission to the company. WHY - no restrictions on the use by Moment, no encryption on the data transmitted.

Relationship of the IT system to security issues:

Storing the data on the mobile device

- HOW - data stored on the device may be vulnerable to unauthorized access if the device is stolen or from malicious apps that the user might install. WHY - the application has access to the whole system, phone may not have a security setup or prevent use if stolen or lost.

Storing the data on *Moment's* servers/cloud

- HOW - unauthorized access to the database may compromise the security of the stored data. WHY - lack of policies at Moment, lack of supervision at Moment, lack of security at Moment e.g. firewall, patches, virus checkers, levels of access, lack of encryption.

Relationship of the IT system to surveillance issues

- HOW - App monitors the use of IT system, creating a surveillance scenario which can be used/misused by people who can track. WHY - lack of security built into the app, no hierarchy/levels of access to data, all members of the family allowed to access the data,

People and machines (addiction)

- HOW - Addiction/overuse to the device or applications/systems on the device such as social media. HOW - App allows the user/family to limit access to media. WHY - addiction has psychological, relationship and potential physical effects.

Candidates are expected to make reference to the relevant stakeholders, information technologies, data and processes. Candidates will be expected to refer to "how the IT system works" using appropriate IT terminology.

| Marks | Level descriptor |
|-------|--|
| 0 | The response does not reach a standard described by the descriptors below. |
| 1–2 | <p>There is little or no understanding of the step-by-step process of how the IT system works and does not go beyond the information in the article.</p> <p>The major components of the IT system are identified using minimal technical IT terminology.</p> |
| 3–4 | <p>There is a description of the step-by-step process of how the IT system works that goes beyond the information in the article.</p> <p>Most of the major components of the IT system are identified using some technical IT terminology.</p> <p>The relationship between the IT system referred to in the article and the concern presented in criterion A is identified, with some use of ITGS terminology.</p> |
| 5–6 | <p>There is a detailed description of the step-by-step process that shows a clear understanding of how the IT system works that goes beyond the information in the article.</p> <p>The major components of the IT system are identified using appropriate technical IT terminology.</p> <p>The relationship between the IT system referred to in the article and the concern presented in criterion A is explained using appropriate ITGS terminology.</p> |

Criterion C — The impact of the social/ethical issue(s) on stakeholders

[8]

3. Evaluate the impact of the social/ethical issues on the relevant stakeholders.

Positive impacts may include:

For the user(s)

- use of the app may encourage users to be more aware of or reduce the time spent using their own devices
- making other family members aware of the time spent/apps used may result in users making more conscious choices about how they use their devices through peer pressure.

For other family members

- family members may be able to monitor the use of devices at inappropriate times (eg when children are supposed to be asleep/at meal times/doing homework, etc)
- enforcing limits may encourage greater social interaction between family members.

For the company and/or third parties

- data gathered would be a source of commercially valuable information
- data could be used to improve the app, and develop more features or other apps
- profit from selling the app.

Use of mobile device

- there are many benefits from using mobile devices and all are acceptable, but the benefits need to be described with some details.

Negative impacts may include:

For the user(s)

- sharing time and app usage data with other family members might result in those members making assumptions about what the user is doing with their device or asking awkward/prying questions about the user's activities
- the setting of limits by the user or other members of the family might be inconvenient. There may be times when the user needs to use the phone for longer than the limits allow, or at times "prohibited" by family settings
- the interception of user data while in transmission over the internet to the company might expose the user to threats by malicious parties (eg determining location via IP address, collecting email addresses, building a profile of the user for subsequent criminal activities)
- sharing data with the company potentially exposes the user to negative impacts (eg targeted ads based on app use and/or location sent by email, the potential for the company to construct a detailed profile of the user, etc)
- if the device or the company database is hacked/accessed by unauthorized people, the detail contained in the data could lead to the user becoming a target for criminal behavior (eg constructing a pattern of movements of the user, using age and gender information to select victims for attack or "grooming", sending phishing emails or threats, etc)
- the sharing of users' data with third parties exposes the user to greater potential risks. The user has no control over whom the data is shared with and what subsequent use is made of that data
- the data sent to *Moment* includes information about the user and the apps. This could include sensitive information eg from apps related to health, diet, finances, etc.

- there are also trust issues. How would you feel if you felt that your every move was being monitored by your parents? This is a very tricky issue and a potential hornets nest for parents. How much can you trust what your children are doing?
- Psychological, health, relationship, business, work and social problems arising from the overuse of mobile devices.

For the company

- misuse or unauthorized exposure of user’s data might make the company legally liable/open to prosecution.

| Marks | Level descriptor |
|-------|--|
| 0 | The response does not reach a standard described by the descriptors below. |
| 1–2 | The impact of the social/ethical issues on stakeholders is described but not evaluated. Material is either copied directly from the article or implicit references are made to it. |
| 3–5 | The impact of the social/ethical issues on stakeholders is partially analysed, with some evaluative comment. Explicit references to the information in the article are partially developed in the response. There is some use of appropriate ITGS terminology. |
| 6–8 | The impact of the social/ethical issues on stakeholders is fully analysed and evaluated. Explicit, well developed references to information in the article are made appropriately throughout the response. There is use of appropriate ITGS terminology. |

Criterion D — A solution to a problem arising from the article

[8]

4. Evaluate **one** possible solution that addresses at least **one** problem identified in **Criterion C**.

Answers may include the following:

Solutions to the problem of sharing time and app usage data with other family members

- give the user the option to exclude specific apps from the data gathering. This would not impact the data gathered about the overall time spent using the device but if certain apps were sensitive in nature or considered private by the user they could be excluded from the list of accessed apps shared with family members/the company

Solutions to the problem of the setting of limits by the user or other members of the family

- allow the user the option to over-ride limits in case of particular need or emergency
- adding extra technical features to the app to solve the problems, e.g. hierarchy of levels of access to data and the app features e.g. controlling what can be shared and who.

Solutions to the problem of the interception of user data while in transmission

- transmit all data using a secure protocol (eg encrypted using https, secure sockets layer (SSL) or transport layer security (TLS)).

Solutions to the problem of sharing data with the company

- company policies must detail and limit exactly what the data can be used for. User should have the option to opt-out of specific uses of the data.

Solutions to the problem of the device or the company database being hacked/accessed by unauthorized people

- store the data in encrypted form using an encryption or hashing algorithm such as Secure Hash Algorithm (SHA), Advanced Encryption Standard (AES), Blowfish, Twofish, *etc*.

Solutions to the problem of the sharing of users' data with third parties

- policy solution: allow users to opt-out of data sharing with third parties and/or control what data is shared
- anonymize the data by removing names, email addresses, IP addresses, *etc* before the data is shared.

Solutions to the problem of the company being legally liable/open to prosecution

- add a clear legal disclaimer to the user agreement policy that the user must accept before installing/running the app.

Solutions to addiction/overuse

- the purchase of the Moment Family app is a valid response
- medical treatment for the addiction/overuse
- family policies to curb use
- using features of routers to control internet usage (time, sites, duration), using parent settings, using content filters, connecting to filtered internet service providers,
- removal of phone from the member of the family
- negotiation with parents
- schools have policies and discussions with students and community
- Internet addiction boot camps.

If the evaluation does not provide any additional information to that in the article, the candidate will be awarded a maximum of [2].

| Marks | Level descriptor |
|-------|---|
| 0 | The response does not reach a standard described by the descriptors below. |
| 1–2 | One feasible solution to at least one problem is proposed and described. No evaluative comment is offered. Material is either copied directly from the article or implicit references are made to it. |
| 3–5 | One appropriate solution to at least one problem is proposed and partially evaluated. The response contains explicit references to information in the article that are partially developed. There is some use of appropriate ITGS terminology. |
| 6–8 | One appropriate solution to at least one problem is proposed and fully evaluated, addressing both its strengths and potential weaknesses. Areas for future development may also be identified. Explicit, fully developed references to the information in the article are made appropriately throughout the response. There is use of appropriate ITGS terminology. |
