M12/3/ITGSX/BP2/ENG/TZ0/XX/M

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# MARKSCHEME

## May 2012

## INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

## Higher Level and Standard Level

## Paper 2

12 pages

**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.

## Topic: Politics and government

### Criterion A — The issue and stakeholder(s) *[4 marks]*

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

*Social/ethical concerns may include the following*:

- reliability of data input – errors could occur when police enter a registration number resulting in retrieval of incorrect car owner details
- reliability if data is not updated at the server - a search retrieves out-dated information about the car owner eg an unpaid fine
- reliability of network/device – out of range/connection slow – police are unable to carry out their job/drivers are subjected to long waits
- integrity of results of searches – data could be lost/changed/corrupted when transmitted from the central computer to the hand-held device resulting in problems for police accessing car owner records
- Integrity of car owner information - if more than one person is able to access and change a record at the same time then car owner details may be incorrect
- privacy/security of car owner information stored in the central database – owner details/criminal records could be accessed by hackers
- privacy/security of data during transmission – hackers could access sensitive data (e.g. criminal records) as it is transmitted from the server to the hand-held computer
- privacy of sensitive data - if the device is found by an unauthorised person who can access the data
- privacy of sensitive data - if police perform unauthorised searches eg look up information about neighbours
- surveillance – car owners could be monitored and tracked by police as a driver's location will be recorded at a certain date and time
- surveillance – using the GPS functionality the police superintendent could track the police officers who are on duty.
- car owner cannot easily check when registration expires – this may have implications if it is not renewed on time and the owner is driving an unregistered car
- accessibility to the database for police officers outside the city - police officers who work both in the city and the country and may need to use both the old system and the new system
- authenticity of the person using the device - if police are not required to log on to the device with a user ID and password then there is no prevention of unauthorised access to car owners' data
- cost to the government to implement the system - money is needed for hardware, software, network coverage, police training

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

*Primary stakeholders may include the following*:

- police officers plus description eg who are using the hand-held devices to perform the driver searches/who are trained to use the hand held device
- car owners plus description eg whose details are being searched/who access the government website to check their registration details
- the police department/administrators who oversee the implementation of the system/supervise the police officers on duty.
- the Government - ie people ultimately responsible for police actions/citizens' rights
- citizens in Western Australia whose criminal records and photos can be accessed
- the software company responsible for designing a user-friendly and secure system

| 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 marks]***

**2. (a) Describe, step by step, how the IT system works.**
**IT system: using handheld computers, wireless network and central database**

*Answers provided in the article include the following*:

□ on payment of the car registration fee the owners' details are added to the car registration database

□ police input the car registration number into a hand-held computer

□ information about the owner is retrieved and displayed on the device screen

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

□ input is via a stylus or touch screen or keyboard

□ the police officer is authenticated with logon and password/built-in biometric finger print reader in order to access the database

□ the device uses installed software or firmware

□ the hand-held computer connects (via radio link) to a secure wireless police network/uses the mobile phone system/uses a VPN

□ any additional details relating to the hand-held computer and its connection to the main computer

□ a client server is used - police central computer is the server and handhelds are clients

□ data is encrypted during transmission/decrypted at the server

□ the registration number is uploaded to the central police server /a query is performed using the registration number

□ the registration number is used as a key field to search the database

□ a matching record is found for the car owner

□ a description of owner details (eg registration expiry date) which are sent back to the police officer's hand-held computer.

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

*Answers may include the following*:
*Privacy would be a concern if*:

- data is intercepted by hackers during transfer of sensitive driver details from the server to the hand-held device
- an unauthorized person is able to access data on the hand-held device eg a policeman has not logged out and the system is not password protected
- an unauthorized person is able to access the central database
- police officers abuse/misuse information - eg perform a query using the registration number of a neighbour to retrieve the neighbour's record and hence find out private information about him

*Reliability would be a concern if*:

- the police officer types in the wrong registration number and therefore retrieves an incorrect owner record from the central database
- reliability of the network /device - owner details are not available due to server crash/network unavailable/hardware problems with the handheld device
- data is not updated on the owner record if registration details have changed – a search retrieves out of date information

*Surveillance would be a concern if*:

- GPS functionality is used to track the location of a police officer without the police officer's knowledge/without a valid reason.

*Integrity would be a concern if:*

- The database is not able to accommodate multiple users - 2 users are trying to update the same record at the same time

*Accessibility would be a concern if:*

- the Wi-Fi coverage does not extend to the local area, there are problems with overloading/bandwidth

*Candidates are expected to make reference to 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 | 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.<br>The major components of the IT system are identified using minimal technical IT terminology. |
| 3–4 | There is a description of the step-by-step process of how the IT system works that goes beyond the information in the article.<br>Most of the major components of the IT system are identified using some technical IT terminology.<br>The relationship between the IT system referred to in the article and the concern presented in criterion A is identified, with the some use of ITGS terminology. |
| 5–6 | 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.<br>The major components of the IT system are identified using appropriate technical IT terminology.<br>The relationship between the IT system referred to in the article and the concern presented in criterion A is explained using appropriate ITGS terminology. |

**Criterion C — The impact of the social/ethical issue(s) on stakeholders** ***[8 marks]***

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

*Car owner advantages may include the following*:

- citizens all benefit from a more efficient police force – police officers have more time to be on patrol/car checks are faster
- stolen cars can be more quickly identified – returned to owners faster
- the cost savings to the government could be passed on to car owners – e.g. reduced registration fees.
- owners can check registration when away from their car eg overseas on holiday

*Car owner disadvantages may include the following*:

- car owners could be wrongly accused of lapsed registration/outstanding fines if the police officer mistypes the registration number/if data is not kept up to date
- personal details (e.g. home address) could become accessible to unauthorized persons if data is not secured at the server/during transmission – this information could be misused/changed
- data matching through linked databases allows access to more sensitive data, e.g. criminal records – poor security could compromise the owner's privacy/safety
- without a registration sticker as a reminder an owner may be late paying car registration – resulting in implications for fines, lack of insurance
- a car owner/driver's whereabouts can be tracked as police record date, time, location of the driver - drivers may feel that they are under surveillance
- Lost/stolen devices could be used by unauthorised people to access car owners' data
- reliability issues (device or network) could result in long waits for motorists
- lack of computer/Internet access/Government web site unavailable – could result in difficulty checking the registration expiry date
- privacy is at stake if police perform unauthorised searches on individuals

*Police department/police officer advantages may include the following*:

- increased efficiency – immediate responses to searches allows police officers to perform their job more effectively
- easier to identify crimes such as stolen cars
- less tedious paper work – there is more time to perform other duties
- greater accuracy – an automated system ensures less police errors
- it is easier to read a registration plate from a distance – going up to a car to read a sticker may have safety implications
- police officers can use a hand-held device outside the police car – there is no need to be in the car to access the radio
- safety during field work – if trouble arises the police officer's location can be immediately pinpointed and help sent
- cost saving – the police officer can perform the search without needing a second person at central office
- the information is more secure on a hand-held device than it is being transcribed to paper – less liability for police department/police officers.
- easy access to more information about drivers
- by accessing criminal records police are alerted to potential dangerous criminals before confronting them

*Police department/police officer disadvantages may include the following*:

- surveillance – police officers could be under constant surveillance as their superiors can potentially track their whereabouts
- due to GPS tracking hackers could gain information about location of police
- cost to implement the system – initial purchase, network infrastructure, upgrades, training
- responsibility/cost of maintaining security and reliability of the network
- reliability issues (device/network) will make the job difficult for police
- reliability of data - police may pursue/fine the wrong driver if data is not accurate
- system crash may result in loss of data – police are responsible for keeping data secure
- legal disputes may arise if owners are fined due to incorrect information in the database
- time factor – police officers need to spend time on training
- security of the police officer who may need to concentrate on the hand-held device – this could make the police officer more vulnerable if a driver becomes abusive
- lost/stolen devices could be used by unauthorised people to access data - police are responsible for maintaining security of the devices
- job loss – less police required - police are not needed to 'run a search'
- health issues from constant use of the device
- limited coverage of the device to city areas means country police have a more difficult job
- difficulties for police working between city and country as they may need to use both the old and new system
- repercussions on the police department if police abuse the device's capabilities and perform unauthorised searches
- safety concerns if police are using the device whilst driving
- lack of familiarity with the technology causing stress

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

| 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 marks]***

**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 security/privacy*:

- authentication to access the central database/handheld device – ID and password / inbuilt biometric fingerprint reader
- access to the database is time restricted - afterhours access is not available to police
- software is used to track and record access to the database - time, user, data viewed-monitoring software could be loaded onto the hand held device
- policies are in place to ensure police officers only access relevant information – e.g. access to criminal records may not be appropriate for an expired registration
- data is stored in a relational database and tables have access permissions - only certain tables can be viewed by traffic police
- use of a virtual private network (VPN)/secure police-owned private network
- a firewall is installed on the police server
- a decoy server is set up to protect the actual server
- car owner data is encrypted during transmission / on the central server
- the hand-held device screen locks after a certain time if no input is detected
- lost or stolen hand-held devices can be tracked via GPS and disabled
- data is wiped if the device is not turned on after a certain time
- police can turn off GPS tracking when off duty

*Solutions to the problem of reliability*:

- automated license plate recognition using a camera – overcomes issues with reliability of manual data entry/less distraction for police than typing in registration numbers
- data is validated on entry - eg registration number field is alphanumeric
- data is verified by typing in the registration number twice (at data entry/when checking a car)/staff are employed to check data input/owner is given the opportunity to check his/her record
- details returned to the hand-held computer include the car registration number, allowing a further check to ensure the police officer has entered the correct number
- the database is downloaded to the device and regularly updated – data is accessible even if the network is out of range
- a distributed database is used so the data is duplicated and distributed across many computers to improve the speed and reliability in case of a server crash
- a backup regime is in place if data is lost
- increased network coverage - to solve the problem of limited access of handheld devices
- testing of handheld device/debugging of software to minimise reliability problems

*Solutions to the problem of control*:

- the police officer can disable the GPS tracking, e.g. during coffee/lunch breaks
- implementation of policies on GPS tracking which are agreed to by all parties and made available to those affected.

*Solution to problem of missed expiry dates*

- implementation of an optional mail-out system

*Solution to problem of lack of familiarity with the device*

- the police administrators run courses for all police involved with the technology

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

| 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.<br>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. |