Diploma Programme
Programme du diplôme
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Markscheme

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Information technology in a global society

Higher and standard level

Paper 2

16 pages

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.

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.

Themes: Business and employment; 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.

[1] : for identification of the concern (which does not have to be explicitly named).
[2] : there needs to be an explicit description of the impact/result/consequences/ effect/outcome on the taxi driver, passengers, and app developers/administrators.

Social/ethical concerns may include the following:

- Reliability – the app may not work (app server is down; app is being updated delaying the service); drivers' or passengers' phones may run out of battery or malfunction. Impact: driver cannot locate passenger who is then late for an appointment.
- Surveillance – data stored about the use of the app may be used to monitor activities of passengers. Impact: the privacy of the passengers could be invaded. Passengers could be blackmailed if they do not want their whereabouts known.
- Privacy – data collected and stored could be misused.
- Digital divide – Not all passengers may be able to use this technology (lack of appropriate phone/lack of skills). Impact: this service may not be available to everyone.
- Authenticity – the passenger riding the taxi may not be the person who booked the taxi. Impact: if an accident occurs the victim may be wrongly identified.
- Privacy – data collected and stored could be used by staff or hackers who profit from using the information. Impact passenger is harmed or threatened.
- Security – safety of information, hacking, inappropriate access, 3rd party access.

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

[1] : Who – identification of the stakeholder.
*[2] : **What** are they doing with the IT system and **Where** in the IT system (technical part).*

Primary stakeholders may include the following:
- Passenger using the app to book/share a trip/data stored in company database.
- Taxi driver using the app to pick up a passenger.
- Family / friends who are using the app to follow the passenger's trips.
- *Red Dragon Taxi Company* and administrators for the *Red Dragon Taxi Company*. Who have access to all of the data and potential use of the data .

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: GPS, smartphone apps, databases.

Note to examiners:

*Award **[1]*** if there is some understanding of the process but NOT in a step-by-step approach using the information **within** the article with possibly some steps missing.

*Award **[2]*** if there is a logical step-by-step account using the information **within** the article (but it may lack some detail).

*Award **[3]*** if there is a step-by-step account that *identifies information about how the IT system works that goes **beyond** the article.*

*Award **[4]*** if there is a step-by-step account that *describes information about how the IT system works that goes **beyond** the article.*

Answers provided in the article include the following:
- Passenger uses app to book a taxi.
- App works out the location of the customer.
- App selects a taxi to pick up the customer.
- The app displays the taxi number and current location on passenger and driver's phone.
- Invoice for the journey is automatically sent to the customer.
- Passengers and drivers can communicate to the Customer Service Department via the app.

*Basic element award up to **[2 max]***
- Passenger uses app to share the trip up to five people.
- Passenger uses app to rate the driver.
- Driver uses app to rate the passenger.

These could include:

Answers with additional information (2 additional identified for 3 marks and 2 or more 2 described for 4 marks) to that in the article may include the following:
(GPS could also be called **location services** – award marks correspondingly):
- *Red Dragon Taxi Company* app is installed on the (GPS-enabled) phone by passengers and drivers.
- Drives have a driver's app connected to Red *Dragon Taxi Company* that connects a passenger to the driver's (GPS-enabled) phone.
- Drivers can use the inbuilt navigation tool in their ride-sharing app (driver's app).
- Passengers' (GPS-enabled) smartphones connect to the Red *Dragon Taxi Company* app using WiFi, 4G, *etc*.
- The *Red Dragon Taxi Company* app uses the driver's phone GPS to track the location of the taxi.
- The location of the car is seen in real time.
- The app pinpoints the passenger and driver's location using GPS trilateration (accept triangulate) and cellphone networks.
- If the driver is using the driver's app navigation tool, there may be a delay if the app is not updated/is temporarily down.
- The app is linked to a database that stores information on customers, taxi drivers and routes. This includes Passengers' and drivers' personal information, including passenger payment preferences, is saved on the app to a database.

- Rates might change based on the demand in real time, surge can change quickly.
- App informs passenger arrived safely.
- Even if passengers disable their phone GPS during a trip, the driver will still be linked to the passenger's account, which informs the location to the passenger's app.
- The app can determine the best drivers using the rating system and can assign them to the most frequent passengers.
- The app calculates the total fee according to the rate and the distance of the trip.

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

Note to examiners:
*Explaining the link between the concern and specific parts, or whole, of the IT system means the candidate must include **how or why** the concern has arisen from the use of the IT system. The concern identified in Criterion A may be implicit.*
*There **must** be a link to the concern identified/described in Q1(a).*

*Award **[1]** If the relationship between the concern and the IT system is identified. This may be a repeat, or rewording, of the response to Q1(a) or lack of detail for the how **or** why.*
*If there is more than one concern identified in Q1(a) accept **any** concern (i.e., preventing a follow through error).*

*Award **[2]** if how **or** why the concern that has arisen is described. Appropriate IT or ITGS terminology is used.*

For example, using a privacy concern, responses need to explain:

- *HOW the data can be accessed (e.g., interception of the WiFi signal is achieved)*

  OR

- *WHY it is possible to access the data (e.g., lack of encryption of the WiFi signal)*

Answers may include the following:

- Reliability – **(what)** passenger cannot share the trip **(why/how)** because the phone has no battery/no data plan / forgot to charge phone, forgot to buy credit.
- Reliability – **(what)** data may not arrive in real time, **(why/how)** which means the app may not be providing the service required to track the passenger.
- Reliability – **(what)** drivers turn off their phones **(why/how)** not to be tracked so the app server cannot locate driver because it uses a mobile-based GPS.
- Surveillance – **(what)** *Red Dragon Taxi Company* knows the exact movement of drivers **(why/how)** therefore the driver may feel his/her professional integrity is being compromised.
- Privacy – **(what)** data collected and stored about passengers **(why/how)** meaning they feel they are being surveilled/data accessed and used without permission/3rd parties view the data.
- Authenticity – **(what)** the passenger riding the taxi may not be the person who booked the taxi **(why/how)** and the app does not require a proof of identity to ride the taxi.
- Digital divide – **(what)** Older people may not be able to / be confident in having their location shared **(why/how)** so they are not gaining all the possible benefits of using the app.
- Security – **(what)** driver and passenger data may not be securely stored / is shared with third parties **(why/how)** therefore the privacy of passengers and drivers may be compromised.
- Policies – **(what)** drivers must keep their cell (mobile) phone on, **(why/how)** which means they feel they are being surveilled.
- Policies – **(what)** drivers turn off their phones to increase the demand for the service, **(why/how)** which may lead to unethical [surge] pricing strategies.

Candidates are expected to make reference of 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	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. 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. Most of the major components of the IT system are identified using some technical IT terminology. 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.
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. The major components of the IT system are identified using appropriate technical IT terminology. 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]

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

Note to examiners:
Mark holistically using a two-step process:

1. *Determine the markband the response falls into.*
2. *Determine the level within the markband using the guidelines below.*

Impact - result/consequence/effect/outcome on stakeholder which can be positive or negative.

The evaluation should focus on the overall impact on the stakeholders. Evaluative comments may be within the body of the analysis or as a final summary.

Band 1 - 2

*Award **[1]** for at least one impact identified.*

*Award **[2]** for at least one impact described or more than one impact identified.*

Band 3 - 5

*Award **[3]** for a limited analysis (such as the division into groups (privacy issues, security issues), or the impact on different stakeholders).*

*Award **[4]** for an incomplete analysis (such as mainly positives **or** mainly negatives).*

*Award **[5]** for a **balanced** analysis that includes connections (such as between positive and negatives or between impacts on different stakeholders). There may be limited evaluative statements.*

Band 6 - 8

*At least **two** stakeholders are required.*

*Award **[6]** for a balanced analysis of the impacts that includes **substantiated evaluative** comments.*

*Award **[7–8]** for an **overall evaluation** supported by **explicit references** to the analysis of the impacts (this is not a repetition or summary of the analysis). The evaluation shows evidence of insightful thinking.*

Answers may include the following:

Red Dragon Taxi Company

Positive impacts

- Security of passengers, as their location is monitored and they can communicate with driver prior to arrival.
- Security of drivers, as their location is monitored and they can communicate with passenger prior to arrival.
- Able to offer more perks/offers/discounts based on the passenger's use of the app.
- Able to predict the need for more cars in one area according to the data provided by passengers.
- More affordable, as *Red Dragon Taxi Company* can offer better prices by reducing the time drivers take to get to the passengers.
- More efficient and cost saving for the company, as fewer staff members are needed in the office once the system runs alone (predictions; locating drivers, GPS triangulation, etc).
- Pooled/shared may lead to more passengers on a single journey, cheaper fares than the competition.
- May be easier to manage the taxis if the location-finding software works as intended.
- Gathers passenger data to help optimize route selection in the future.

Negative impacts

- Lack of reliability of the app may be harmful for *Red Dragon Taxi Company's* reputation.
- May create a complaint culture that will work against the drivers.
- Passengers can give a low rate due to drivers racial, religious, gender bias.
- The overreliance on the phone may be an issue in case it malfunctions, the battery dies, etc.
- App development costs may be high and it may take a while to profit from it.
- Price may be set at the start of the journey, so a journey that takes longer than normal may be cost more than originally thought but *Red Dragon Taxi Company* cannot change the price of the trip.
- Responsible for the security of passenger data, which may be expensive. Hire staff to develop and secure the database, access to suitable expertise.

Passengers

Positive impacts

- Saves time, as no need to queue for a taxi.
- Might lead to cheaper fares, as no staff are required at *Red Dragon Taxi Company*
- to manage the bookings.
- More security for passengers, as they can share where they are going with family and friends.
- Reassurance for families of passengers of a personalized service based on the data provided by app database.
- More convenience to customers, as they can book anytime / anywhere.
- Pooled/shared may lead to more passengers on a single journey and more affordable fares.
- Increases efficiency, as more than one car may be directed to the passenger (rather than them having to wait for the one car that has been assigned to them).
- Possibility to accept, or not, a driver according to his/her reviews in the app.
- Cleaner cars, more polite drivers, better service due to the rating system.
- May rate a driver according to the service offered.
- Possibility to accept or reject the driver based in the app reviews.
- Could reject the ride based on the cost/surge pricing (can also be negative).

Negative impacts

- International tourists may not have internet access and may not be able to retrieve the SMS (for initial set up/authentication) or open the app. May not be able to fully utilize the functionality of the app or set up the account.
- Surveillance – passengers may feel surveilled knowing that *Red Dragon Taxi Company* know their location (can also be seen as a positive).
- Privacy/security – data collected and stored in the cloud could be used by staff or hackers if password access to data or reports is weak or online security is weak.
- Loss of personalized service – lack of interaction with the taxi driver, for example, making up a route on the spot rather than following a pre-determined one.
- Digital divide – may be problematic if passengers have problems using the app.
- Information provided by the app may not be reliable, so passengers may find this may lead to unintended problems (of this overreliance on the app).
- Drivers may not be available in certain areas of the city (poor and risky areas).
- Data sharing, who has access to the passenger's data, and does this infringe the privacy / anonymity of the passenger.
- May get a negative rating from a driver due to his/her racial, religious, gender bias.
- Exposure of data may allow a third party to build up detailed information about the passenger.

Driver

Positive impacts

- Can choose their working hours.
- Safety, as their location is always known.
- May be able to increase their income as a result of receiving high customer ratings.
- Can pick up passengers from anywhere. No need to wait in a taxi stand. The driver may choose to accept or decline the trip.
- May be able to select where they are able to drive to improve their chances of being chosen.
- May accept, or not, a passenger based on personal preferences, passenger rating or passenger's location.
- May rate the passenger (as a + or – based on passenger's behaviour etc).

Negative impacts

- Intrusion of privacy for drivers, as the app knows their car movement 24/7 as long as their mobile phone is on (Could also be a positive).
- Loss of autonomy, as the app is providing constant information about their location.
- May over-rely on the app, and if it crashes may not know how to get to the destination.
- May find their ability to choose where they work is determined by an algorithm (which may not meet their preferred way of working).
- May be harder to get tips / gratuities due to online payments.
- May not be allowed to reject a fare as it may contradict company policies.
- Their ability to perform their job may be largely outside of their control / unsatisfying / based solely on customer ratings.
- May get a negative rating from a passenger due to racial, religious, gender bias.

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**.

Note to examiners:

The problem should be stated in the box above the response. However, if this is not done, a solution can be evaluated that addresses any problem identified in Criterion C.

*The solution must be **feasible**.*

If there is more than one solution, mark the first solution only.

Mark holistically using a two-step process:

1. *Determine the markband the response falls into.*
2. *Determine the level within the markband using the guidelines attached.*

*The solution may be a series of **related** measures that address the problem identified. For example, if the candidate identifies a problem such as security and then includes a range of security measures that are grouped together, this is acceptable.*

If there are more than one solution, and there is no explicit connection between them, only mark the first solution.

Band 1 - 2

The link to the problem may be implicit.

*Award **[1]** if a solution is identified.*

*Award **[2]** if a solution is described.*

Band 3 - 5

The solution is explicitly linked to the problem. (apply best fit if solution identified not described and reduce overall mark by 1)

*Award **[3]** if the solution described and there is at least one evaluative statement.*

*Award **[4]** if the solution described has limited evaluative comments about the strengths and weaknesses of the solution.*

*Award **[5]** if the solution described has evaluative comments that address a range of strengths **and** weaknesses.*

Band 6 - 8

There are explicit references to the article throughout the response.

*Award **[6]** for an overall judgement about the effectiveness of the solution.*

*Award **[7-8]** for an overall judgement about the effectiveness of the solution that is supported by the evaluation of its strengths and weaknesses. Future developments, clearly linked to the solution being proposed, may be proposed and/or insightful thinking demonstrated.*

Answers may include the following:

- Policy to ensure the passenger's or driver's data will not be shared with unauthorized third parties.
- Policy to ensure the rating system used by *Red Dragon Taxi Company* is fair.
- Provide smartphones in the taxi that enable international passengers to utilize the functionality of the app. *Red Dragon Taxi Company* provides facilities at airports to assist with bookings using the airport's WiFi.
- Policy to identify drivers who are using unethical practices to increase their income, such as the use of cameras recording the driver at all times they are working for *Red Dragon Taxi Company*.
- Robust and transparent feedback system to ensure ratings are as accurate as possible.
- Use open-source app development which can reduce the costs to *Red Dragon Taxi Company* and allow them to reduce their fares.
- Policy to allow the right of drivers and passengers to be forgotten / to turn off the GPS on their phones. To ensure their privacy when they are out of service.
- The app could include a safety mechanism to alert passengers if the taxi goes off a pre-determined route.
- The app could be developed to enable real-time changes to be made to the route (which may lead to a recalculation of the fares) / car breaks down / favorite driver can be selected by the passenger.
- Policy to enforce notification to the passengers in cases of delay in arrival due to traffic jams, vehicle break down, diverted route, *etc*.
- Encryption must be linked to the database and the information stored (could also add authentication of access using 2 factor authentication)
- Reliability – patches, updates, repairs to app
- Protection for the driver and passenger – having audio recordings of the drive/ride.
- Payment of the fare before entry into the taxi.

*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.