



Mark Scheme (Results)

October 2021

Pearson Edexcel International Advanced
Subsidiary

In Information Technology (WIT13/ 01)

Unit 3

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October 2021

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Additional guidance	Mark
1 (a) (i)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> • Velocity / Speed of collection (1) • Variety / Range of data types collected / Mix of structured and unstructured data (1) • Veracity / Accuracy or quality (1) • Value / Actual or potential usefulness of analysing the data (1) 		2
1 (a) (ii)	<p>Award one mark for any of the following infrastructure requirements:</p> <ul style="list-style-type: none"> • Processing power/capacity (1) • Complexity of algorithms / Software for analysis (1) • Storing/Analysing related data over several sites (1) • Fast/high capacity WAN (1) 		1

Question number	Answer	Additional guidance	Mark
1 (b)	<p>Award one mark for a bottleneck and one mark for a matching solution.</p> <p>Answers may include:</p> <ul style="list-style-type: none"> • on-site space/scalability (bottleneck) (1) use of cloud storage for the data/having facility to send overflow data to cloud/other storage (1) • network speed/connectivity (bottleneck) (1) use of optical fibre/high speed switches/network devices (1) • internet speed/connectivity (bottleneck) (1) arrange for direct connection to internet backbone/switch to better performing ISP (1) • processing speed/power (bottleneck) (1) faster/more processors (1) 	Do not accept a software related problem or solution.	2

Question number	Answer	Additional guidance	Mark
1 c (i)	<p>Award up to two marks for a linked explanation:</p> <p>Answers may include:</p> <ul style="list-style-type: none"> • A DBMS deals with structured data/a schema (1) Big Data contains unstructured data / is non-schema (1) • A DBMS deals with a (one) database containing relational data (1) Big Data may not be held in a database/a single database/a relational database (1) 		2
1 (c) (ii)	<p>Award up to two marks for a linked description.</p> <p>Answers may include:</p> <ul style="list-style-type: none"> • A (secret) key is generated (by the company)/uses common key (1) • Key is distributed (to all airports) / different key sent to each airport/location (1) • Key is used for sending and receiving data/used to encrypt and decrypt (between company and airport) (1) 		2
1 (c) (iii)	<p>Award up to two marks for a linked explanation, such as:</p> <ul style="list-style-type: none"> • asymmetric is slower/symmetric is faster to encrypt/decrypt/process data (1) <p>And a suitable expansion, such as:</p> <ul style="list-style-type: none"> • Big Data/company needs timely/fast data processing/analysis (1) • slower encryption/decryption could produce a bottleneck/reduce the value of the data/prevent timely analysis (1) • less timely/current data at airports/company sites will be less useful (1) 		2

Question number	Answer	Additional guidance	Mark
1 d (i)	Award up to two marks for: <ul style="list-style-type: none"> • Components located on different machines/computers/sites that communicate/coordinate actions (1) • so that they appear as one system/machine to users (1) OR • A group of computers that have a shared state and operate concurrently/together (1) • if one fails it does not affect (the uptime of) the rest of the system / the rest of the system continues to work (1) 		2
1 d (ii)	Award one mark for any of: <ul style="list-style-type: none"> • updates may be lost/overwritten / data integrity may be lost (1) • queries from different locations may get different results (1) • (data locks) may slow down responses/prevent transactions (1) • data cannot be guaranteed to be consistent/reliable (across the whole system) (1) 		1

Question number	Answer	Additional guidance	Mark
1 e (i)	Award one mark for any of: <ul style="list-style-type: none"> • a passenger may not speak/know/understand/read the language of that country (1) • a passenger may be hearing/speech impaired and unable to communicate verbally (1) • practical example e.g. to read signs, tickets, documents (1) 		1
1 e (ii)	Award one mark for any of: <ul style="list-style-type: none"> • no need to employ staff who know (numerous) other languages (1) • better public relations/customer satisfaction (1) • can add new languages without adding staff (1) 		1
1 e (iii)	Award one mark for any of: <ul style="list-style-type: none"> • typos/keyboard errors may cause problems/mistranslation (1) • system may produce poor/unclear translation (1) • visually impaired/illiterate people may not be able to use it (1) 		1
Total for question 1			17

Question number	Answer	Additional guidance	Mark												
2 (a)	<p>Award one mark for each correctly completed cell in the table up to a maximum of four marks.</p> <table border="1"> <thead> <tr> <th>Criteria</th> <th>How the objective meets the criteria</th> </tr> </thead> <tbody> <tr> <td>S</td> <td>Tania has set the specific objective of being promoted to assistant manager.</td> </tr> <tr> <td>M</td> <td> Success can be measured by: <ul style="list-style-type: none"> • completing the training (successfully) • making the application on time/before completing university • gaining the promotion. </td> </tr> <tr> <td>A</td> <td>The objective is achievable if Tania can complete the training.</td> </tr> <tr> <td>R</td> <td> The objective is relevant because Tania wants to become a senior manager and the assistant manager post would be the first step on the promotion ladder. OR realistic as a university student should be able to complete first stage management training. </td> </tr> <tr> <td>T</td> <td>The objective is time-bound because Tania has set limits of six months for the training/end of course for the application.</td> </tr> </tbody> </table>	Criteria	How the objective meets the criteria	S	Tania has set the specific objective of being promoted to assistant manager.	M	Success can be measured by: <ul style="list-style-type: none"> • completing the training (successfully) • making the application on time/before completing university • gaining the promotion. 	A	The objective is achievable if Tania can complete the training.	R	The objective is relevant because Tania wants to become a senior manager and the assistant manager post would be the first step on the promotion ladder. OR realistic as a university student should be able to complete first stage management training.	T	The objective is time-bound because Tania has set limits of six months for the training/end of course for the application.		4
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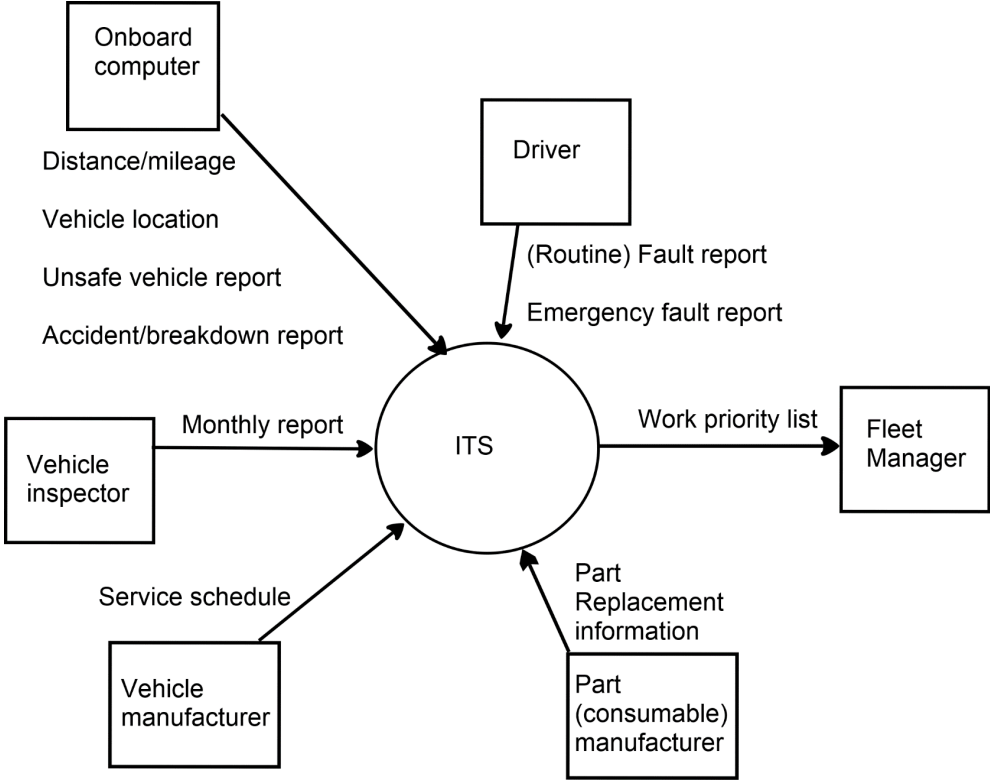
Question number	Indicative content		Mark
2 (b)	<p>Answers should be about characteristics of successful IT projects.</p> <p>Relationships with stakeholders:</p> <ul style="list-style-type: none"> • shared vision • accurate estimations • allowance for contingencies <p>Strong project management:</p> <ul style="list-style-type: none"> • ensuring sufficient resources • clear change management processing <p>Good documentation:</p> <ul style="list-style-type: none"> • of all processes • so that audits are possible • team changes are easier <p>Good communication:</p> <ul style="list-style-type: none"> • maintaining good relationships • looking at/fixing problems early • keeping everyone informed of progress/intentions/changes <p>On completion:</p> <ul style="list-style-type: none"> • fulfil requirements • meet the success criteria • are delivered within budget • complete on time • satisfy stakeholders 		6
Level	Mark	Descriptor	
	0	No rewardable material.	
Level 1	1-2	<ul style="list-style-type: none"> • Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a superficial and unbalanced discussion. 	
Level 2	3-4	<ul style="list-style-type: none"> • Demonstrates knowledge and understanding which is mostly relevant but may include some inaccuracies. • Applies understanding to make some coherent connections, leading to a discussion that shows some development, but may be unbalanced. 	
Level 3	5-6	<ul style="list-style-type: none"> • Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a balanced and fully developed discussion. 	
Total for question 2. 10			

Question number	Answer	Additional guidance	Mark																																																																																																																																																																																																																																																																																																								
3a	<p>Gantt chart.</p> <p>Award one mark for:</p> <ul style="list-style-type: none"> the task starts on 5 July plausible time scales for all 7 tasks. Task 2 & 3 may start on 5 July at least two dependencies at least three constraints two types of dependency shown (S to S and F to S) possibility of early start shown in Task 7. <table border="1"> <thead> <tr> <th colspan="2">Task details</th> <th colspan="30">July</th> </tr> <tr> <th>Task num.</th> <th>Constraints</th> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>24</th><th>25</th><th>26</th><th>27</th><th>28</th><th>29</th><th>30</th><th>31</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td><td></td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>2</td> <td>Needs plan</td> <td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>3</td> <td>Needs plan</td> <td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>4</td> <td>Needs parts list</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>5</td> <td>3 to 14 days from order Or delivery time</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>6</td> <td>Needs parts</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td> </tr> <tr> <td>7</td> <td>Needs parts fitted</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>	Task details		July																														Task num.	Constraints	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1						X																											2	Needs plan						X	X	X																								3	Needs plan						X	X	X	X																							4	Needs parts list								X	X	X																						5	3 to 14 days from order Or delivery time										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						6	Needs parts											X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				7	Needs parts fitted																																Allow dependency 6 - 7 to vary with task 7 start date.	6
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Question number	Indicative content		Mark
3 (b)	<p>Answers should be about the impact of IoT (entertainment system and management chip) on the owner of the car.</p> <p>Positive aspects:</p> <ul style="list-style-type: none"> • Entertainment system <ul style="list-style-type: none"> ◦ very large number of playlists/media files available ◦ no need to sort/process media on other devices ◦ can stream material so reducing storage requirements. • Engine management chip <ul style="list-style-type: none"> ◦ performance data can be analysed 'live' to detect problems ◦ cloud/external analysis can be better/more comprehensive than onboard processing could manage ◦ updates/patches do not/may not require a visit to a garage/dealer. <p>Negative aspects:</p> <ul style="list-style-type: none"> • Entertainment system <ul style="list-style-type: none"> ◦ security of media files/personal accounts may be an issue ◦ external connection means the system could be hacked/compromised ◦ compromise of one system in the car could allow a hacker to get at more sensitive systems. • Engine management chip <ul style="list-style-type: none"> ◦ updates/patches may cause downgrade in performance/'brick' the chip ◦ security of the chip may be an issue ◦ unauthorised access to the chip could allow an external agent to take control of the car 		6

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a superficial and unbalanced discussion.
Level 2	3-4	<ul style="list-style-type: none"> • Demonstrates knowledge and understanding which is mostly relevant but may include some inaccuracies. • Applies understanding to make some coherent connections, leading to a discussion that shows some development, but may be unbalanced.
Level 3	5-6	<ul style="list-style-type: none"> • Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a balanced and fully developed discussion.

Question number	Answer	Additional guidance	Mark
3(c)	<p>Award up to three marks for a linked description that includes:</p> <ul style="list-style-type: none"> • Information source(s) (1) • Relevant display (1) • Added information (1) <p>Answers may include:</p> <ul style="list-style-type: none"> • camera(s) on exterior of car (1) • proximity/distance sensors on outside of car/beside cameras (1) • camera(s)/sensors feed to a display inside the car (1) • display is placed so that driver's view aligns eye-display-camera viewpoint (1) • display shows exterior of car that is behind the display (1) • system provides guides/distance indicator on display (1) 	Allow 1 mark for a description of augmented reality that is not in context	3
Total for question 3. 15			

Question number	Answer	Additional guidance	Mark
4 (a)	<p>The diagram is an example of what the candidates might produce. Other layouts and content are acceptable. There are no specified symbols for an information flow diagram, allow anything consistent.</p> <p>Award one mark for each point to a maximum of nine marks.</p> <ul style="list-style-type: none"> • All components present (1) (Vehicle and part manufacturers may be combined) • All lines have correct directional arrows (1) • ITS sends work priority list to Fleet Manager (1) • Computer sends mileage and location details to ITS (1) • Computer sends accident/breakdown details to ITS (1) • Computer sends unsafe vehicle report to ITS (1) • Driver sends unsafe vehicle report/emergency fault report to ITS (1) • Vehicle inspector sends fault report to ITS (1) • Vehicle manufacturer sends service schedule to ITS. (May be via Fleet manager) (1) • Parts/vehicle manufacturer sends replacement schedule to ITS. (May be via Fleet manager) (1)  <pre> graph TD Onboard[Onboard computer] -- "Distance/mileage Vehicle location Unsafe vehicle report Accident/breakdown report" --> ITS((ITS)) Driver[Driver] -- "(Routine) Fault report Emergency fault report" --> ITS Inspector[Vehicle inspector] -- "Monthly report" --> ITS Manufacturer[Vehicle manufacturer] -- "Service schedule" --> ITS PartMfg[Part (consumable) manufacturer] -- "Part Replacement information" --> ITS ITS -- "Work priority list" --> Fleet[Fleet Manager] </pre>	Accept sensible alternative labels and information items	9

Question number	Indicative content		Mark
4 (b)	<p>Answers should be about information needed for organising deliveries.</p> <p>Size of each delivery to determine:</p> <ul style="list-style-type: none">• optimum use of vehicle(s)• how packages/deliveries will fit in the vehicle• which vehicle(s) to use <p>Delivery locations:</p> <ul style="list-style-type: none">• so that times/distances can be calculated• so that order of delivery can be decided/optimised• to arrange similar hours of driving/use for each driver/vehicle <p>Driver hours/rest periods so that:</p> <ul style="list-style-type: none">• legal limits are not exceeded• available working hours are not exceeded• drivers have a full day scheduled but won't go into overtime <p>Opening hours at destination:</p> <ul style="list-style-type: none">• so that deliveries are not made to closed locations• to allow delivery time slots to be booked• to ensure that unloading can be completed in time. <p>Specialist vehicle requirements:</p> <ul style="list-style-type: none">• refrigeration needed• constraints on size of vehicle that can access a delivery site• constraints on size of vehicle on route, low bridge, weight limits, etc. <p>External factors:</p> <ul style="list-style-type: none">• roadworks• peak traffic conditions.		6

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a superficial and unbalanced discussion.
Level 2	3-4	<ul style="list-style-type: none"> • Demonstrates knowledge and understanding which is mostly relevant but may include some inaccuracies. • Applies understanding to make some coherent connections, leading to a discussion that shows some development, but may be unbalanced.
Level 3	5-6	<ul style="list-style-type: none"> • Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a balanced and fully developed discussion.
Total for question 4. 15		

Question number	Answer	Additional guidance	Mark												
5(a)	<p>Award one mark for:</p> <ul style="list-style-type: none"> • Model table • Model_colour table • Company table • Colour table • Indication of primary keys (Model, Company) • Indication of primary key (Colour) • Indication of foreign key (Company_ID in Model) • Indication of composite key in Model_colour • Fully normalised. <p>Model</p> <table border="1"> <tr> <td><u>Model_ID</u></td> <td>Model_name</td> <td>Company_ID *</td> <td>Order_time</td> </tr> </table> <p>Model_colour</p> <table border="1"> <tr> <td><u>Model_ID*</u></td> <td><u>Colour_ID*</u></td> </tr> </table> <p>Company</p> <table border="1"> <tr> <td><u>Company_ID</u></td> <td>Company_name</td> <td>Telephone</td> <td>Email</td> </tr> </table> <p>Colour</p> <table border="1"> <tr> <td><u>Colour_ID</u></td> <td>Colour_name</td> </tr> </table> <p>Alternative answer using parenthical format Model(<u>Model_ID</u>, Model_Name, Company_ID*, Order_time) Model_colour(<u>Model_ID</u>, Colour_ID) Company(<u>Company_ID</u>, Company_name, Telephone, Email) Colour(<u>Colour_ID</u>, Colour_name)</p>	<u>Model_ID</u>	Model_name	Company_ID *	Order_time	<u>Model_ID*</u>	<u>Colour_ID*</u>	<u>Company_ID</u>	Company_name	Telephone	Email	<u>Colour_ID</u>	Colour_name		9
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<u>Company_ID</u>	Company_name	Telephone	Email												
<u>Colour_ID</u>	Colour_name														

Question number	Answer		Mark
5 (b)	<p>Award up to two marks for a linked description.</p> <p>Answers may include:</p> <ul style="list-style-type: none"> • password/account limitations/permissions/rules/encryption (1) to allow access to (specified) data items (1) • password/account limitations/permissions/rules/encryption (1) to control which operations are allowed for a (specified) person/account (1) • usage monitoring/auditing (1) to track who is using the database/what people are doing with the database (1) 		2
Total for question 5.			11
Question number	Indicative content	Mark	
6	<p>Responses must be in the context of using an expert system with a chatbot to diagnose hardware problems</p> <p>How the expert system might work</p> <p>One possible method, other ways could be used, accept anything sensible that would allow:</p> <ul style="list-style-type: none"> • customer/chatbot interaction • a way of moving through a script/algorithm/flowchart • advice to be given to the customer • allow a live agent to intervene. • Chatbot follows a script. • collects common/starting data for all cases e.g. customer name, hardware item model, ID code, date of purchase/warranty. • based on starting data, script branches to e.g. specific hardware model questions. • the expert system may use a database of problems and solutions, which can be added to by the system. • Chatbot asks questions to identify problem. • Chatbot/expert system tries to pick relevant words/phrases out of customer answer to branch to the next question. • expert system may give Chatbot/customer steps to fix the problem. 	12	

- Chatbot/expert system must recognise when chat reaches a dead end/no answer available, to switch in a live agent.

Advantages and disadvantages

Advantages for customer.

- Less likely to have to wait for a service agent.
- System is more likely to have the latest/best information.
- System is less likely to give incorrect/mistaken information.

Advantages for company.

- May be cheaper over time, cost to create system less than running cost/wages for current system.
- Need less staff/staff training.
- Can serve more customers at once, customer satisfaction
- Can gather structured information about hardware problems more easily/automatically.

Disadvantages for customer.

- May be difficult to contact a real person
- System may go round in circles/keep restarting question sequence
- Frustration with dealing with a chatbot.

Disadvantages for company.

- May annoy customers, cause complaints, cause poor reviews, give wrong information
- May not deliver cost savings if too many cases have to go to a live agent
- Each new product would need extra development of the expert system, which could become unwieldy/too complex over time

Conclusion

There is no preferred option. Conclusions should be supported by arguments made in the answer.

The fact that a number of hardware manufacturers/vendors use a chatbot would indicate that a good business case for the new system exists in some situations.

The fact that not all manufactures/vendors use such a system would indicate that it is not always appropriate/successful.

Where a chatbot is used there is often an alternative help method such as email or a web form.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–4	<ul style="list-style-type: none"> • Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a response that lacks development. • Demonstrates limited awareness of competing arguments. • Conclusion, if present, is generic or unsupported.
Level 2	5–8	<ul style="list-style-type: none"> • Demonstrates knowledge and understanding, which is mostly relevant and may include some inaccuracies. • Applies understanding to make some coherent connections and a partially developed response. • Demonstrates some awareness of competing arguments, but this may be unbalanced, and partially supports conclusion with evidence.
Level 3	9–12	<ul style="list-style-type: none"> • Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a fully developed response. • Demonstrates an awareness of competing arguments and supports conclusion with evidence.
Total for question 6		12

