TASK 1A

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Contents

Task 1

Activity A (i) – Research

How Hardware and Software are used within the context of the industry

What is the **industry**?

The charity is called **Health Advice Group** and they offer **information** and **support** for **environmental health issues**. They provided advice on how to deal with **extreme weather conditions**, information on **environmental health conditions** and **seasonal allergies**. They also provide **risk assessments for home environments**. This is a wide range of support and information being provided and does in fact cover different types of industries. The **main industries** covered within this charity **are the health sector** and **weather**. Per the brief provided, I will do research predominantly into the health sector. However, due to the nature of the charity and what they provide, I believe doing some research into the weather sector will help develop a solution to the best of Health Advice Group's desires.

Hardware and Software in Health Care

Hardware
- Heart-rate Monitoring
    - A heart-rate monitor is often used in hospitals to keep track of a patient's heart rate. This allows for the doctors to keep track of the patient's health efficiently.
- Wearables

- o There are so many smartwatch or fitness companies that have their own wearable sensor products that are used to track health and fitness. This could be in the form of a Fitbit or Apple Watch. These are used to measure things in your day-to-day life that you would often need to go to the doctors for.
- Sensors
  - o Typically found on diabetic patients, there is hardware such as sensors which are implanted or stuck to the patient, which they then use a device such as a phone or other handheld to check things like their glucose levels or blood sugars. This is more efficient than having to go to a doctor or checking bloods manually.

Software

- Patient Portals
  - o Some hospitals or clinics tend to have a patient portal where the patient will register and can have all their medical data stored for them and their doctors to see. This is efficient as it allows for the patients or doctors to see any previous medicines or treatments they have had for any potential recurring illnesses or issues.
- Sensor Software
  - o For sensors to work, there has to be software behind it. With diabetic patients, often to use their sensor they will need a handheld device or smartphone. This will also typically require an app for them to accurately calculate and check their sugar levels.

Hardware and Software in Weather

Hardware

- Thermometers
  - These read the temperature of the air. This allows for the analysis of whether the air is getting warmer or colder and a prediction of potential temperatures over the next coming periods.
- Barometers
  - This measures atmospheric pressure / the pressure of the air. Barometers allows for the analysis of weather quality. Typically, if the air pressure is low then the weather is bad, but if the air pressure is high then the weather is good. This allows for predictions to see whether good or bad weather is coming based on the pressure of air.
- Hygrometers
  - Hygrometers measure the humidity and water vapour in the air, typically in confined spaces. This allows for us to see the humidity levels within an area.
- Burkard Trap
  - These are used to measure the pollen and spores within the air. This allows for warnings to be put out for those with seasonal allergies such as hay-fever and asthma.

Software

- Weather Channels
  - These are used to display the weather to the public with further predictions as to the weather in the coming weeks. Weather channels are also used to issue warnings to take precautions for those with seasonal allergies such as asthma or hay-fever.

Newly Emerging Technology

Artificial Intelligence (AI)

AI has had a huge impact on the healthcare sector in recent years. For example, during the pandemic while we were all isolating away in our homes, AI was being used in order to analyse CT scans and treat the effects of the coronavirus. Even with this being a major impact, it's not the biggest that AI has had yet.

AI has been known to improve cancer diagnostics. For decades the only way to get a diagnosis for cancer was via biopsy. While it gave a diagnosis, it didn't provide a full image of the organ tissue. Now, with digital scans, Doctors can examine regions that may be impacted by cell mutations.

Integrating Data and Predictive Analysis

With more help from AI, the integration of data and predictive analysis allows for doctors to get more insights about a patient's conditions and how to treat them. Thanks to robots that allow for integrated data and predictive analysis, hospitals can gather more information about a patient's medical record which allows for a more accurate diagnosis and help with deciding what the best treatment is.

Remote Patient Monitoring & Virtual Care

Internet of Things (IoT) is the overall network of interconnected devices which also enables technology to communicate via the

internet. The health sector benefits greatly from this emerging technology as it allows for the care of patients from the comfort of their own home. This allows for hospitals to free up and waiting times to be reduced during emergencies as a patient's issues can be fixed from their own home.

This is made possible via new technologies such as wearable sensors, 5G-enabled devices and remote patient monitoring. Patients can now wear sensors in the forms of smartwatches to keep track of their physical health. This allows for their independence and more time for doctors to focus on bigger medical concerns as the patient can check that their physical health is okay by themselves.

Wearables in the Health Sector

As previously mentioned, wearables are a new technology that have made a major impact on the health sector. Whilst they can often be seen as a gadget or accessory, they are an important innovation within the healthcare industry. For example, smartwatches allow for a doctor to remotely check up on a patient and their condition. This is done simply by analysing the watch-provided information about the patient's heart rate, blood oxygen, and blood vitals. These are all measured through the pedometers placed within the smartwatch.

However, smartwatches are not the only important innovation and there are other wearables that have just as big an impact. For example, Bio patches and Hearing Aids. Bio patches can give a great insight into a patient's vitals. Whilst hearing aid nose isolation can be further enhanced via the use of artificial intelligence.

How digital solutions could be used to meet different user needs.

It is crucial that a digital solution is created to be inclusive for anyone regardless of their needs. Every need should be catered for, and the digital solution must be accessible by all. Typically, different user needs are catered for via browser settings or settings on the website. Here is a list of the following needs that must be catered for.

- Impaired Vision
  - This will be catered for via zoom settings, allowing the user with impaired vision to enlarge the text, helping them to read it.
- Motor Difficulties
  - This will be catered for by not including any timeout sessions that requires the user to be quick in any way when using the solution.
  - There will also be large clickable actions so that the user does not need precision when manoeuvring the digital solution.
- Cognitive impairments or learning disabilities.
  - This will be catered for by making the solution learning disability friendly. The colours will be simple, with the text written in plain English.
  - Everything on the digital solution will be clear and not unpredictable to the user.
- Deafness or Impaired Hearing
  - This will be catered for by writing in clear plain English instead of using complicated words or figures of speech. The solution will also use a logical layout and not be complex to use.
- Dyslexia

- o Content on the solution will be kept short, clear and simple as often as possible.
- o There will be contrast settings between the background and text to allow for easier reading.

The industry-specific guidelines and regulations you will need to follow.

- General Data Protection Regulation (GDPR)
  - o This is a regulation that will have to be followed as the client is requesting features that will work with personal data such as a user's location and their personal health (via the personal health tracking tool)
- Data Protection Act
  - o This will have to be followed, again, because the client is requesting to use personal data.
- W3C (World Wide Web Consortium)
  - o This is the main international standards organization for the World Wide Web,

We would give our users the right to:

- Be informed of how their data is being used.
- Access the data collected.
- Have incorrect data updated.
- Have data deleted.
- Stop or restrict the processing or their data.

Activity A (ii) – Proposal

Health Advice Group are a charity that offer information and support for environmental health issues. Health Advice Group already provide advice on how to deal with extreme weather conditions, information on environmental health conditions and seasonal allergies (e.g., asthma, hay fever), and risk assessments for home environments.

They wish to have a digital solution that provides weather forecasting to inform health decisions, access to a dashboard for monitoring air quality data, and advice on how to deal with health matters affected by weather and environmental conditions.

Health Advice Group have also identified some features that could be included in the digital solution such as personalised health advice based on location, accessibility features to support a wide range of user needs, and a personal health tracking tool.

As Health Advice Group are a charity, when designing the digital solution, I will take this into consideration. This means the solution will be low cost to maintain while keeping it high quality and suited to all their needs. I will be using HTML, CSS, PHP and JavaScript when designing this digital solution. The HTML, CSS and JavaScript will be used to design the front-end and how the solution appears to the user, whereas the PHP will be used to handle the back-end database work.

When considering Health Advice Group's requests, I have dedicated 5 specific pages to place each part of information and features that

were requested. The 5 pages will be a home page, Frequently-Asked-Questions (FAQs), Forecast, MyHealth, and Settings.

On the Home Page, there will be a dashboard that is displayed to the user containing a graph with the data of the air quality. This fills the Health Advice Groups first request for a solution that provides access to a dashboard for monitoring air quality data. The home page also contains the current weather, including the temperature (Celsius) alongside an icon for the type of weather (sun, cloud, rain, etc) as well as a description of it (sunny, cloudy, rainy, etc). This gives the user the weather forecast which could help them decide how they need to approach the day when leaving their homes. This provides another one of their requests being weather forecasting to inform health decisions.

On the FAQs page, there will be a list of 'frequently asked questions' that will adhere to the requests of the client as well as informing and providing support for environmental health issues. On this page will be information such as how to deal with extreme weather temperatures, information on environmental health conditions and seasonal allergies, and risk assessments for home environments. This links back to Health Advice Group's requests for advice on how to deal with health matters affected by weather and environmental conditions, risk assessments for home environments, and advice on how to deal with extreme weather conditions. When displaying these questions and answers, I have decided I could potentially use just blocks of texts or dropdown boxes to display the text. I have not yet decided which one I will use and will decide when I come to developing the digital solution.

Next, on the Forecast page, there will be a block on the page which states the current date and day, as well as the weather with the temperature (Celsius) alongside an icon for the type of weather (sun, cloud, rain, etc) as well as a description of it (sunny, cloudy, rainy, etc). There will also be the forecast for the rest of the week on the

other side of the page from the block with the current date and weather. This fits into the request for weather forecasting informing health decisions.

Then we have the MyHealth page. However, this page can break off into an additional 3 sub-pages. The 3 sub-pages that will be used with the MyHealth page are the login page, the register page, and the 'Log Event' page. Now when you go onto this page, if you are not signed in, you will be greeted with a block on the page that says, "Please Login to View your Dashboard". The user can then simply click on the word that says "Login" and it will take them to a login page where they can either login with an existing account or can register to create an account. It is crucial to have this as a feature for the MyHealth page as each person is unique and has their own health issues. Therefore, we cannot take one user's data and display it to the rest of the users as this would be against the data protection act and GDPR and it wouldn't be personalised to the user as requested by Health Advice Group.

However, once you have signed in, you will be taken to your MyHealth dashboard where you will be welcomed by the page with your full name, as well as a section on the page called "About Me". This will display your age based on the date of birth you inputted at registering your account as well as your location and any allergies that you may have also specified at the creation of your account.

Below the "About Me" will be a section called "Todays Advice". This section will give the user advice based on the weather in their location as well as any seasonal allergies they may have specified. For example, if the weather in their location is hot and sunny, and the user has specified that they have hay fever, then the solution may present them with the advice to take a hay fever tablet as well as staying careful when outside due to a high pollen count. This fits into the request of features from Health Advice Group to have

personalised health advice based on location as well as advice on how to deal with health matters affected by weather conditions.

In the middle of the MyHealth page sits a big box that contains a title saying, "Recent Health Events". This will contain data that is inputted from the user on certain dates so the user can state any health events that has occurred from that date or around that period of time. This allows for the user to keep track of their health and analyse and events that may be recurring in order to go seek medical advice. The user can log events by pressing a button that says "Log Event" which will then take them to a sub-page where they will log the details of an event and press the submit button, so it displays on their MyHealth Dashboard. I have also not decided how I will display the information kept in the recent health events box, but it will most likely either be blocks of text or a dropdown to display the information.

On the sub-page where users will log health events, there will be a big box with the title "What happened?" where the user can explain what happened with the health event. There will then be two select buttons on the right of this box. One will be for the date of the event, the other will be for the time of the event. This is so on the "Recent Health Events" I can display to the user the health event that occurred on set dates at set times. This fits into the requested feature to have a personal health tracking tool for Health Advice Group. As this is all confidential / personal data being gathered and kept. It will be securely stored in a safe database. To safely store and retrieve this data I will use SQL queries in PHP.

Onto our final page, the Settings page. This page contains accessibility settings that can be altered for those users with different needs. For example, we have zoom settings for those who are hard of sight and struggle to read smaller text. We also have contrast settings and text-to-speech for those who are dyslexic or any other learning difficulties that affects their ability to read.

As well as catering for users with those needs, we also cater for users with motor-difficulty issues. Our whole solution will use big clear buttons to navigate the solution. This ensures that users with these needs don't have to spend too much time or have difficulty trying to precisely click on smaller buttons that takes them a bit longer to reach.

Our solution will use clear English to also ensure that deaf or users hard of hearing can understand the information being displayed on our pages. There will be no major slang of figures of speech being used to ensure there is no confusion for those needs within users.

As I previously stated, for the MyHealth page, it needs to be accustomed to the user. This means we will need a Login page and a Sign-Up page. On our log in page, we will have two simple text boxes that request for a username and password, as well as a login button. These can only be used if a user has registered. Placing invalid login details to these input boxes will only result in the user receiving a message saying, "Invalid Username or Password, Please Try Again!". Below the login button will be a sentence that says "Don't have an account? Register here!". The word 'Register' will be made as a hyperlink so the user can simply click on the word and will be taken to the register page.

On our sign-up page, the user will be greeted with 7 input fields. One each for the user's full name, email, date of birth, username, password, location, and allergies. If the user goes forward and just tries to click the register button without inputting any fields or even missing one, this will be recognised and the website will present the user with a message saying "Please fill out all of the fields". The date of birth field also desires a specific input in the format of (DD/MM/YYYY). If the user does not meet this format, they will be greeted with a message saying "Invalid Input (Date of Birth)" and will be made to try again. Once the user has successfully filled out the fields correctly and pressed the register button, they will be greeted

with a message that says "Account Created!". They can then look to the sentence below the register button that says "Already have an account? Login here!" where the user can click the word "Login" as it will take them to the login page the same way the word "Register" does on the login page.

Once again, as the user is inputting personal / confidential data, it will be stored securely within a database. As this solution will also be handling passwords, there is the potential to program my solution with a hash and salt to ensure that even if anyone gained unauthorised access to the database containing the passwords, they wouldn't gain instant access to the passwords for each account. This ensures extra security for the data being kept. This solution will be developed to ensure it follows any regulation or legislation within the health sector and keeping the data safe. We will be sure to follow the Data Protection Act and GDPR when storing and securing our data.

One feature that could be further developed and added to the solution is the resetting of passwords when forgotten. However, this would require email confirmation which this digital solution will not have developed meaning this feature will have to be dismissed for now.

Another feature that could be implemented when designing this digital solution is the use of APIs. As this is solution is based on weather and health, there is opportunities to use weather or health APIs to make the solution better and more appealing to the user. For example, a weather API could be used to display real-time weather forecast and future forecasting predictions based on the information being provided by other online weather forecasting services.

The integration of social media would also be a good feature as this allows for more accessibility by users. This could be through an

embedded social media platform page where the user can interact with weather or health based social media pages.

As I previously stated, I will be using HTML, JavaScript, CSS, and PHP to develop this digital solution. This means that if this solution were to be hosted, it would be made accessible to users across a wide range of devices, such as Windows Devices, MacOS, iOS, Android, etc… This means no users will be left out due to unequal access to technology as this can be accessed on any device.

However, when designing the layout for this solution I have taken into consideration that a mobile user won't be able to access the solution in the same way a desktop user can. This is due to the fact that a desktop user will have a much larger screen for all of the text and navigation buttons to fit on. To counteract this issue, for the mobile design there will be a 'hamburger' icon that can be used to display all the navigation buttons rather than making it mandatory for them to be on screen the whole time obstructing other text or information.

As for input handling / validation, this will be developed to safely handle or refuse any cyber security threats such as SQL injections, man in the middle attacks, etc… To prevent SQL injections, I will avoid writing code that uses dynamic queries with string concatenation. As well as reducing user supplied input as much as I can. Where it is possible to use things such as dropdown boxes or lists for the user to pick from, I will use them as it will help reduce the overall risk of a cyberattack.

When developing this solution, I will be closely following the W3C standards to ensure it's suitable for all types of users regardless of their needs. Any images displayed on the page will have an ALT tag to ensure that those users with needs can still know the content that is being displayed.

This software development cycle will be done following the waterfall methodology. The requirements will be outlined, then following will be the designs, as well as the implementation of these two. Once the requirements and designs have been implemented into HTML, CSS, JavaScript, and PHP code, it will be verified that it's up to user's standard and maintenance will follow.

All visual / interface designs for these pages can be found in my Task 1B where I have placed the design documents for everything. This includes both desktop and mobile visual / interface designs.

I will now list some of the functional and non-functional requirements as well as a RAG Rating (Red / Amber / Green) based on their importance.

Functional Requirements

- Display advice on how to deal with extreme weather conditions.
- Display information on environmental health conditions and seasonal allergies (e.g., asthma, hay-fever)
- Have a My Health Page for the user (Allows for the personalised health advise based on location and the personal health tracking tool)
- Provide Risk Assessments for home environments.
- Display weather forecasting and inform health decisions.
- Have a dashboard for monitoring air quality data.
- Display advice on how to deal with health matters affected by weather and environmental conditions.
- Have accessibility settings to ensure the digital solution caters for users with different needs. (The different needs are labelled in Activity A (i) – Research)
- Have different webpages for different desires (home page, FAQs page, advice page, etc…)
- Have full functionality (no broken or useless buttons or links)
- Login / Sign-up page for the user's own My Health page.

Non-Functional Requirements

- Page must load before 3 seconds has passed (users will have gone to look for another website if it takes longer than this)

- Store any data securely.

- Database with stored data about various locations (personalised health advice based on location)

- Database for the user's personal health (personal health tracking tool)

- Store the user's health events securely within the designated database.

- Terminate the session when a user signs out so their data can no longer be accessed.

- Store the user's login credentials safely and securely within a database.

- Potentially hash and salt the password.

Functional Requirements	Importance (RAG)
- Display advice on how to deal with extreme weather conditions.	Red (Important)
- Display information on environmental health conditions and seasonal allergies (e.g., asthma, hay-fever)	Red (Important)
- Have a My Health Page for the user (Allows for the personalised health advise based on location and the personal health tracking tool)	Red (Important)
- Provide Risk Assessments for home environments.	Red (Important)
- Display weather forecasting and inform health decisions.	Red (Important)
- Have a dashboard for monitoring air quality data.	Red (Important)
- Display advice on how to deal with health matters affected by weather and environmental conditions.	Red (Important)
- Have accessibility settings to ensure the digital solution caters for users with diverse needs.	Red (Important)
- Have different webpages for different desires (home page, FAQs page, advice page, etc…)	Amber (Semi-Important)
- Have full functionality (no broken or useless buttons or links)	Red (Important)

- Login / Sign-up page for the user's own My Health page.	Red (Important)

Non-functional Requirements	Importance (RAG)
- Page must load before 3 seconds has passed (users will have gone to look for another website if it takes longer than this)	Red (Important)
- Store any data securely.	Red (Important)
- Database with stored data about different locations (personalised health advice based on location)	Red (Important)
- Database for the user's personal health (personal health tracking tool)	Red (Important)
- Store the user's login credentials safely and securely within a database.	Red (Important)
- Potentially hash and salt the password.	Red (Important)
- Store the user's health events securely within the designated database.	Red (Important)
- Terminate the session when a user signs out so their data can no longer be accessed.	Red (Important)

Potential Problems When Implementing Functional & Non-Functional Requirements

Functional Requirement	Problem	Mitigation
Have different webpages for different desires (home page, FAQs page, advice page, etc…)	How will users access these webpages?	There will be a bar at the top of every page containing buttons that will redirect the user to each page
Have accessibility settings to ensure the	How will these settings work with changing the	When the apply button is pressed, whatever changes

| digital solution caters for users with diverse needs. | already made style settings? | the user has made will then be made to the CSS file containing the webpage's styles |

Non-Functional Requirement	Problem	Mitigation
Store any data securely.	How will it be stored securely?	The data will be stored using queries in PHP files which will be inaccessible to public users
Store the user's login credentials safely and securely within a database.	How can you guarantee a user's login credentials are stored securely?	The password can be hashed and salted to ensure that no one with unauthorised access to gain instant access to them.
Terminate the session when a user signs out so their data can no longer be accessed.	How will this be achieved?	When the user clicks the sign out button, the session the user has created from when they login, will be terminated, meaning they will have to login again to get back to their dashboard.

Key Performance Indicators (KPIs)

- Traffic to the website
    - This helps indicate a solutions performance as if the traffic to the website decreases, it tells us that the digital solution has not been successful, whereas if the traffic increases, it has.
- Website Load Speed
    - This is a crucial KPI as if a website can not load in less than 2 / 3 seconds, a user will typically go and look for another website.
- Time spent on each page.
    - This allows for us to see what page engages users more so we can establish where our successes are.
- Unique Website Visitors (engage with one or more sub-pages)
    - This lets us see that our solution is engaging and makes the user want to see more.

User Acceptance Criteria

<u>Front-end Needs</u>

- Large and clear navigation buttons
- Appealing design to attract the user's attention.
- The pages must be organised in order to look professional and not scrappy.
- The information displayed must follow the desires of what has been requested by Health Advice Group

<u>Back-end Needs</u>

- User details must be stored securely into the user database.
- Only the necessary data must be retrieved and displayed when showing any recent health events for the user.

For our user acceptance criteria, we believe we will achieve all of the things that a user would want in our solution. We will ensure that the solution loads in less than 2 / 3 seconds. This is a crucial criterion to achieve as if the website does not load in this time, there is a high chance the user will move on to find another website to use, therefore website load time is crucial.

Another criterion we will achieve is that our digital solution is fully functional. When developing the solution, there will be extra efforts made to ensure that there is no pointless or broken functionality on the website that may come across as displeasing to the user. We realise that clicking on a button or link that looks like it does something when really it doesn't, can be quite unappealing Therefore, we will work harder to ensure this does not happen.

Another criterion the user will expect is that once a health event has been logged, it comes up straight away upon return of the MyHealth page. Again, this will be ensured as the main function of the health

event log will be to display any health event within the database for the set user.

Potential Risks and Mitigations

Risk	Threat / Importance	Mitigation
User tries to access the MyHealth page without logging in	Low	The dashboard will be unavailable, and the user will be given the option to be redirected to the login page
User tries to login with invalid login credentials	Low	The page will display a message saying "Invalid username or password please try again"
User tries to register with invalid fields or fields left empty	Low	The page will display a message saying "invalid inputs please try again"
The user tries to use somebody else's username to steal their personal data	High	Accounts are password protected, so unless the user has their username and password, then the data is safe.
User with needs cannot read the content on the website	High	The user can go the settings page and change their settings to ensure a better experience for themselves and so that the website is accessible for them
Too many people load onto the website at once (Stress testing)	High	Upgrade the systems infrastructure to allow for more users at once.
The user wishes to view their MyHealth dashboard but doesn't have login credentials	Medium	The user can go to the register page to sign up and have their own MyHealth dashboard.
A cyber-criminal hacks into the system and is	High	Hashing and salting the password prevents those

able to view the database potentially stealing passwords		with unauthorised access from having instant access to a password.
The user clicks the sign out button on MyHealth but is still able to press the back button on the browser to view their dashboard	Medium	This will be prevented by tracking sessions. My PHP code will check for a started session before allowing the user to view their dashboard. A session will only be started when the user logs in and will be ended when the user signs out.