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**School of Computing**

**and**

**Digital Technologies**

**Software Projects**

**(55-407815-AF-20245)**

**Group Project**

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# 3. Group Project

## 3.1 Client Background

Our client is Mrs. Nurul Izrin Md Saleh, from Malaysia. She has commisioned us to construct a smart energy management dashboard that may be used by local government.

## 3.2 Software Project Planning Artefacts

### 3.2.1 Users

The users are as follows; an administrator, who has access to every feature and can manage the system, such as by adding and removing other users; network managers, who can access ordinary features and create reports for all geographical areas; and city councillors, who can access ordinary features only for the geographic area within which they operate.

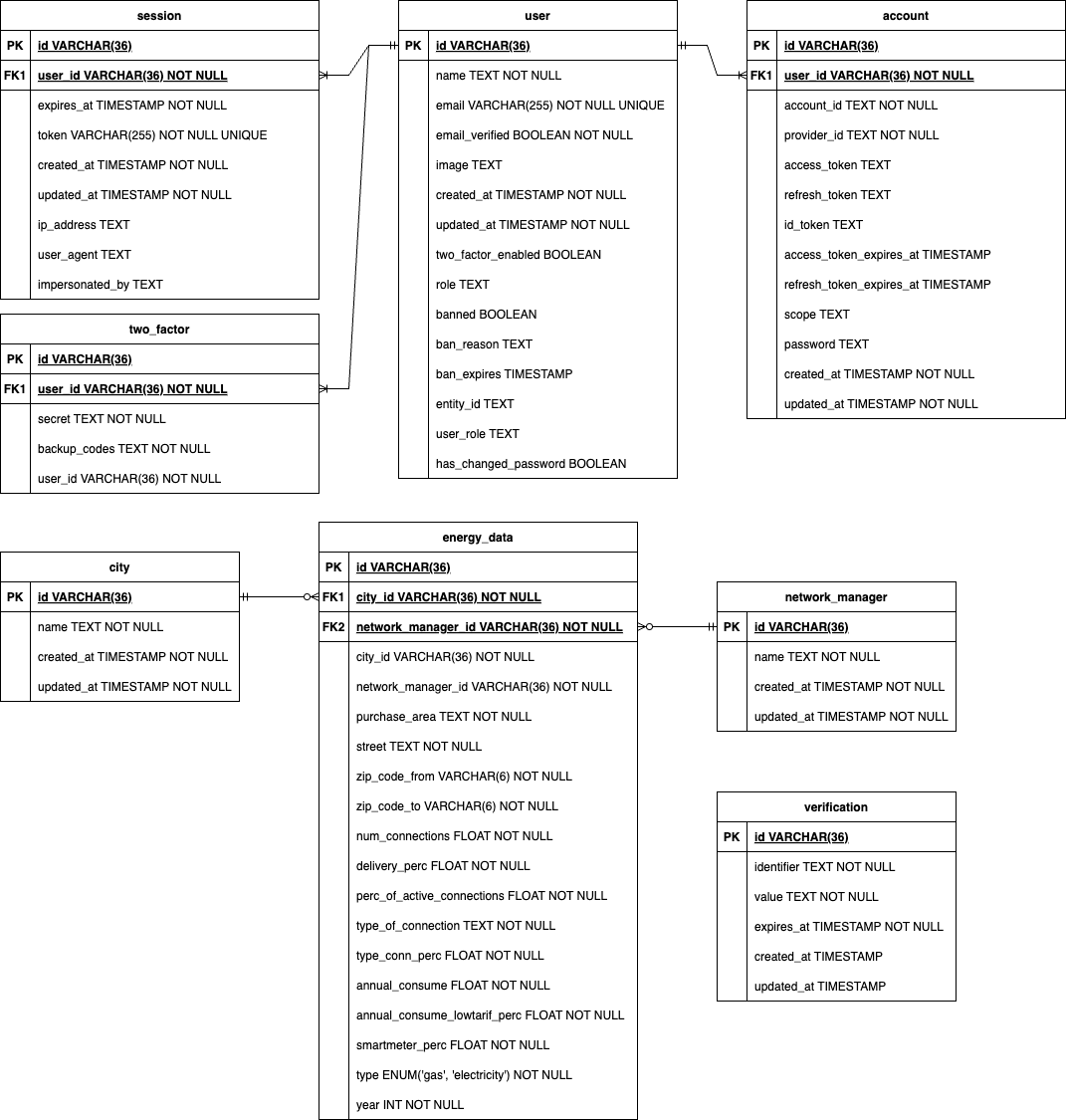
### 3.2.2 User Stories and Acceptance Tests

|  |  |  |
| --- | --- | --- |
| **ID** | **Story** | **Acceptance tests** |
| ADM-01 | As an administrator, I want a special controls dashboard so I can manage the system. | * Verify administrator account can access controls dashboard * Verify non-administrator cannot access controls dashboard * Verify administrator can add a user * Verify administrator can remove a user |
| ADM-02 | As an administrator, I want to be able to view all data within the system. | * Verify administrator can view energy usage for the entire system * Verify administrator can access analytics for the entire system * Verify administrator can generate reports for the entire system |
| NET-01 | As a network manager, I want to be able to view all data within my network. | * Verify network manager can view energy usage for own network * Verify network manager can access analytics for own network * Verify network manager can generate reports for own network * Verify network manager cannot view or process data outside of own network |
| NET-02 | As a network manager, I want to be able to compare and contrast energy consumption over different time periods. | * Verify network manager can layer multiple energy consumption graphs * Verify reports can include layered graphs * Verify network manager can specify time period for these overlays |
| NET-03 | As a network manager, I want all of the analysis tools available to city councillors to be available to me also. (Note: still only for own network) | * Verify network manager can use interactive dashboard as city councillor can (CIT-02) |
| CIT-01 | As a city councillor, I want to be able to view all data within my network. | * Verify councillor can view energy usage for own network * Verify concillor can access analytics for own network * Verify councillor can generate reports for own network * Verify councillor cannot view or process data outside of own network |
| CIT-02 | As a city councillor, I want an interactive dashboard to make it easy to interact with the system. | * Verify user is presented with interactive dashboard * Verify dashboard links to analytics * Verify dashboard links to reports |
| CIT-03 | As a city councillor, I want all of the analysis tools available to network managers to be available to me also. (Note: still only for own city). | * Verify network manager can compare and contrast energy consumption as city councillor can (NET-02) |

### 3.2.3 Use Case Diagram



### 3.2.4 Entity Relationship Diagram



### 3.2.5 Initial Prototypes

First prototype, created with Figma, primarily displaying the login flow:

<https://www.figma.com/design/0ycJPP3wQ09dzkAcm01Gil/Group-Project>

Second prototype, created with Mockplus, displaying the dashboard view with the sidebar and sample data:

<https://rp.mockplus.com/rps/QEVdt0Iu5C/VyGPuCjQvm>

## 3.3 Software and Presentation

### 3.3.1 Final Software Version

You are expected to submit the project, including all of its components (e.g., codebase), compressed in a zip file (or 7z). The file should be named “GroupProject\_(Your name)” (i.e., *GroupProject\_Group21*) and must be uploaded to Blackboard as directed in the relevant submission point.

### 3.3.2 Video Presentation

The project must be showcased in a video recording of up to 15 minutes. We will stop watching after the 15th minute.

<https://shu.cloud.panopto.eu/Panopto/Pages/Viewer.aspx?id=b35aedd7-0a14-401c-b664-b26b00ba566b>

## 3.4 Evidence of Collaborative Work

https://github.com/JedPattersonn/SHU-Project







## 3.5 Incorporation of Formative Feedback

Meeting notes & action plan (discussed on the Tuesday sessions following client meetings):

|  |  |
| --- | --- |
| **Note** | **Action plan** |
| **10.iii.25** |  |
| Use heat maps to display data | Add to todo list that a heat map needs implementing. Find a library to use. Implement the heatmap ASAP with placeholder data. |
| It’s fine to display historical data on the dashboard | No action needed, but question clarified. |
| Display at least 10 cities’ data for the prototype | Only process and validate 10 cities’ worth of data to save on processing time and file sizes (for the sake of testing). |
| For the OTP, use e-mail authentication | Add to todo list to implement e-mail authentication. Ensure 2FA is configured to allow a code to be sent through e-mail later on. |
| When the admin adds users, ensure the appropriate city / network for the new user can be selected | No immediate action needed, but plan to add this option when the admin dashboard is created. |
| **17.iii.25** |  |
| The client wants to see the registration screen (for new users) | Prioritise developing the system for adding new users before the next meeting (which won’t be until 7th April, so there is ample time to polish). |
| The client wants to see the dashboard from the perspective of the users | Prioritise developing the aspects of the dashboard which are changeable based on the user’s role before the next meeting (see above note). |
| For the heatmap, the client wants to see the consumption of an area when it is clicked on | Add to todo list to ensure the heatmap is clickable (lower priority than the above two points, since those were specifically requested to be displayed). |
| The next meeting will be on 7th April due to a Malaysian holiday | No action needed, except to mark the calendar. |

## 3.6 Peer Assessment Form

See Appendix

# 4. Evaluative Report on Legal, Social, Ethical and Professional Issues

## 4.1. Relevant Issues

One relevant issue is copyright and licensing (legal). This is because the product utilises a number of software libraries which may each have their own licenses restricting or dictating their usage, which must be adhered to in line with copyright law.

Another issue is data protection (legal & professional). This is because the project involves the handling and transmission of both sensitive information (such as passwords) and other confidential business information (such as the energy usage data).

A third issue is accessibility (ethical). This is because there is potential for the system to be used by a wide variety of users who may suffer from various disabilities making it harder for them to use the system than normal people, such as poor eyesight.

## 4.2. Discussion

Adhering to copyright law and following the restrictions imposed by software licenses is necessary for the software we produce to even be considered legal. These laws are in place to ensure that software authors are credited for their work, and that their work is not used in ways for which they do not give permission. The legal aspect is the most necessary part since failing to abide by copyright law can lead to unlimited fines or up to ten years of imprisonment (GOV.UK, 2017). However, the ethical aspect should not be neglected since some of the libraries used are either created or maintained by individuals or small organisations, and a study (Brehm, 2012) has shown that a considerable portion of people find copyright infringement to be immoral, particularly when it affects individuals or small companies. Public opinion and law are in general agreement that copyright must be abided by in a case such as this. In our project, we ensured that all the software dependencies of the final product were correctly licenses for our usage.

Data protection is another important legal issue, as well as professional. For example, similarly to copyright law, there are strict GDPR laws which bear high penalties; in this case, of up to £17.5 million fines or 4% of the total annual worldwide turnover in the preceding financial year of the company at fault (ICO, n.d.). And as for the professional aspect, since the data in question which ought to be protected is owned by the client, there is a professional expectation that every care is taken to protect it. In particular, a study found 60% of organisations to be less willing to work with clients who had suffered a data breach in the past (Ponemon Institute, 2020). In order to closely protect data, our software hashes passwords for login validation and logs users out after ten minutes of inactivity.

Finally, the ethical issue of accessibility was considered in the production of our software. Accessibility in software systems is a growing concern, with over 70% of people with visual impairments in the US (a figure likely to be similar in other Western countries) now using digital technologies such as computers and mobile phones (National Federation of the Blind, 2020). To this end, during the planning phase of our software we checked the prototypes for any identifiable issues, and found that the most major issue for people with visual impairments was low-contrast text being utilised in the colour scheme. To fix this, we ensured that the final product made use of strong contrast. In addition, our website uses text rather than images of text where possible, making it more compatible with screen readers, which are used by over 50% of blind people use daily (American Foundation for the Blind, 2020).

# 5. References

GOV.UK (2017). *Intellectual property offences*. Retrieved March 27, 2025, from https://www.gov.uk/government/publications/intellectual-property-offences/intellectual-property-offences

Brehm, E. K. (2012). *Moral Judgment of Internet Piracy: The Role of Individual Harm and Perceived Justice*.

ICO (n.d.). *Penalties*. Retrieved March 27, 2025, from https://ico.org.uk/for-organisations/law-enforcement/guide-to-le-processing/penalties/

Ponemon Institute (2020). Cost of a Data Breach Report 2020.

National Federation of the Blind (2020). Annual Report on the State of Blindness and Technology.

American Foundation for the Blind. (2020). 2020 Technology Usage Survey.

# Appendix

## Software Projects - Peer Marking Form

This form must be filled in as a group by honestly evaluating your contribution to the work. Each member’s contribution to the project must be clearly stated. Finally, each member must be rated out of 10 (10 being the highest contribution and 0 being no contribution at all). The highest mark must always be 10, e.g.

|  |  |  |
| --- | --- | --- |
|  | Team member + work done | Mark out of 10 |
| 1 | B D – Spent time learning Next JS, contributed to backend, good attendance, often participating in group work | 8 / 10 |
| 2 | B F – good attendance, provided first version of ERD (later improved), initialised database | 7 / 10 |
| 3 | T F – contributed throughout to development, great attendance and always early, kept people informed | 9 / 10 |
| 4 | A H – never spoke unless spoken to, stopped turning up a couple of weeks in | 1 / 10 |
| 5 | L L – good involvement with team, used initiative, sorted all paperwork, revised diagrams, great attendance | 10 / 10 |
| 6 | J P – team leader, backbone of development, very high-quality and high volume of work | 10 / 10 |



|  |
| --- |
| Add any comments you feel would be useful for the tutor to know about when assessing marks |
| LL took initiative in establishing communication before the group met, and wrote the group contract at the beginning.  AH contributed only a first version use case diagram which had to be reworked.  JP was team leader, however LL managed all paperwork, organisation and documentation so that Jed could lead development of the software.  BF created a version of the ERD which was later revised by him, then again by LL.  BF also worked on the database, agreeing on the schema and importing data.  BD, TF, and JP (with an emphasis on the latter) did the majority of the development, splitting work between front and back end.  TF also created the first prototype version for login flow, and JP expanded upon it with the dashboard design.  LL did user stories and acceptance tests.  LL did all of LSEPI, evidence gathering, and note-taking during meetings.  LL kept attendance and recorded what everyone had done.  LL drafted presentation, while technical details and recording was done by JP. |

|  |  |  |
| --- | --- | --- |
|  | Team member + work done | Mark out of 10 |
| 1 | **B D**  **Week 1:**  Tuesday: discussed role distribution and agreed to focusing on helping with the backend, researched and did some learning of the basics of Next JS  Thursday: continued learning  **Week 2:**  Tuesday: continued learning  Thursday: continued learning, installed MySQL workbench ready to help with database  **Week 3:**  Tuesday: did programming jobs with Jed and Tyrese to learn on the go while contributing to the project, working on pulling in data from the database and bringing it into the frontend  Thursday: worked on populating more data on the homepage, bringing it in from the database  **Week 4:**  Tuesday: absent  Thursday: absent, joined very briefly then left  **Week 5:**  Tuesday: not recorded Thursday: not recorded  **Week 6:**  Tuesday: not recorded Thursday: not recorded | 8 / 10 |
| 2 | **B F**  **Week 1:**  Tuesday: discussed role distribution and agreed to focusing on the database  Thursday: begun analysing provided dataset and planning for conversion using a script (PHP?) into our database format, pending the ERD’s production  **Week 2:**  Tuesday: reviewed with Jed what needed doing with the database and started working on ERD  Thursday: finalised schema for the database with Jed  **Week 3:**  Tuesday: worked on the database tables. There was a minor misunderstanding concerning his work with Jed, but it has been fixed and a modified version has been submitted. Connected the database to PHP to make it easier to work on for him, but this will need to be re-done with the final version of the database. Will work on the ERD with the new version of the table.  Thursday: absent  **Week 4:**  Tuesday: not recorded  Thursday: working on the backend and discussing what to do next  **Week 5:**  Tuesday: not recorded Thursday: absent  **Week 6:**  Tuesday: not recorded Thursday: not recorded | 7 / 10 |
| 3 | **T F**  **Week 1:**  Tuesday: discussed role distribution and agreed to focusing on the frontend, created non-clickable first version of the wireframe  Thursday: worked on the frontend with Jed, planning what ought to go on the home page (dashboard) and the visibility of each element to different user types  **Week 2:**  Tuesday: absent  Thursday: Started on charts within webapp frontend, but still has to wait for database to be populated for testing in order to continue  **Week 3:**  Tuesday: worked with Bogdan and Jed on extracting data from the database and displaying it on the frontend  Thursday: worked on the charts and diagrams on the homepage, trying to get them to display data properly  **Week 4:**  Tuesday: not reported  Thursday: read Tailwind documentation, discussed what to do next  **Week 5:**  Tuesday: not recorded Thursday: not recorded  **Week 6:**  Tuesday: not recorded Thursday: not recorded | 9 / 10 |
| 4 | **A H**  **Week 1:**  Tuesday: discussed role distribution and agreed to focusing on helping with documentation (particularly the diagrams) while they need doing  Thursday: began constructing the use case diagram based on the completed set of user stories and acceptance tests  **Week 2:**  Tuesday: completed and presented to group a use case diagram  Thursday: focussing on learning how to use next JS  **Week 3:**  Tuesday: focussing on learning how to use next JS  Thursday: absent  **Week 4:**  Tuesday: absent  Thursday: absent, joined for only a few minutes then left  **Week 5:**  Tuesday: absent Thursday: absent  **Week 6:**  Tuesday: absent Thursday: absent | 1 / 10 |
| 5 | **L L**  **Week 1:**  In advance: cloned Git repository, accepted contributor invite, created Discord server for the group and configured with roles and channels  Monday: recorded client meeting, notified absent group members to join  Tuesday: added this document to the Git repository so changes can be tracked, added information such as names to this document, identified client background and users, identified nine use case stories – three per user – each with at least three acceptance tests, discussed group roles in this project and assigned roles in the Discord server  Thursday: begun logging information in this peer marking form, begun recording group member attendance, sent message to all group members and spoke in person with everyone when they were free to try and work out a list of what everyone had already done, sent reminder to everyone to share any resources referenced so they could be cited in this document, took screenshots of the discord server and git repository as evidence of collaborative working  **Week 2:**  Monday: recorded and shared notes from the client meeting  Tuesday: recorded work done in this document, added team contract to git repository, modified gitignore, did research to learn certain git commands required to carry out these changes  Thursday: refactored ERD produced by Abdulahi, presented it to the group for approval, recorded work done in this document, added use case diagrams to git repository, added use case diagram to this document, configured webhook on the Discord server so group members are notified whenever there is activity on the Github repository  **Week 3:**  Tuesday: made various modifications and additions to portfolio. Included and described briefly the two clickable wireframe prototypes we produced. Brought in and formatted the meeting notes which he has been recording for the group at the client meetings, including notes on the action plans we developed in-person. Recorded what everyone else is working on this week. Begun discussing and developing an action plan for the next three weeks, as has been requested of us in the weekly objectives.  Thursday: added to this document the LSEPI issues we identified when transitioning the prototype, recorded what everyone is doing this week, ~~drafted a framework to be filled in for the LSEPI section of this document~~  **Week 4:**  Tuesday: did more work on LSEPI, recorded attendance and work, revised and added ERD  Thursday: completed LSEPI, added references, recorded attendance and work, took over from Jed in presenting the update to the tutor since Jed was absent, discussed what to do next  **Week 5:**  Tuesday: begun work on presentation Thursday: continued fleshing out presentation, recorded in this document  **Week 6:**  Tuesday: continued on presentation, discussed technical content with Jed & the rest Thursday: not recorded | 10 / 10 |
| 6 | **J P**  **Week 1:**  In advance: created a whatsapp group chat for initial organisation (we soon moved to Discord, however), created Github repository, created Trello board for planning and time management  Tuesday: spearheaded organisation and role distribution, invited group members to Github and Trello resources, created first version of login page with 2FA for the website, hosted the site with Vercel  Thursday: continued working on frontend with Tyrese, planning what ought to go on the home page (dashboard) and the visibility of each element to different user types  **Week 2:**  Tuesday: implemented sidebar for the working version of the web app, with buttons, user information, and a content section taking most of the page with placeholder text, implemented basic heatmap ready to plot data to, some more UI development  Thursday: worked more on frontend, finalised database schema with Bolu  **Week 3:**  Tuesday: worked with Bogdan and Tyrese on extracting data from the database and displaying it on the frontend  Thursday: worked on user authentication, the user types for specific networks and cities, and other general backend work  **Week 4:**  Tuesday: not recorded  Thursday: absent  **Week 5:**  Tuesday: not recorded Thursday: absent  **Week 6:**  Tuesday: worked on the presentation, volunteered to present the presentation and record it Thursday: not recorded | 10 / 10 |



|  |
| --- |
| Add any comments you feel would be useful for the tutor to know about when assessing marks |
|  |