Cardiff University

School of computer science and informatics

Initial plan: Designing an Interactive Application to Promote Healthy Eating Practices for Young Adults

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Context and Motivation:

Over recent years there has been a rise of unhealthy eating habits and practices among young adults. As highlighted by the World Health Organization (WHO) in their 2021 report on obesity and overweight, the prevalence of obesity has nearly tripled since 1975 with alarming statistics. As of 2016, over 1.9 billion adults aged 18 and older were overweight, with more than 650 million classified as obese. Additionally, 39% of adults were overweight, and 13% were obese. The majority of the global population resides in countries where overweight and obesity collectively contribute to more deaths than underweight conditions. Moreover, the statistics indicate a staggering concern for the younger demographic with over 340 million children and adolescents aged 5-19 falling into the same category in 2016 (WHO,2021). These statistics highlight the importance and cruciality of this topic which requires immediate attention as it affects both individuals and societal well-being.
This research project is motivated by the crucial necessity to solve this issue. It aims to delve into the concerning trend of young adults increasingly opting for readily available yet nutritionally inadequate options like fast food in contrast to the need for balanced and healthy meals. This shift towards convenience over nutritional value can pose a significant threat to an individual's physical and mental health. Which potentially could lead to the development of obesity, cardiovascular diseases, diabetes, and nutritional deficiencies (CDC.GOV,2022). To combat this issue researchers have been exploring innovative ways to promote healthy eating practices among young adults. One approach is using digital technology to promote healthy eating habits. This includes using technology to promote and encourage healthy eating habits. This research project aims to design an interactive application that can promote healthy eating practices among young adults.

Problem Overview:

Although it is undeniable that an interactive application to promote healthy eating in young adults is desirable, recent studies and articles have demonstrated that such innovative solutions aren't just a convenient option but an essential intervention (Coughlin et al., 2015). Recently WHO in 2021 reported that over 39% of those aged 18-44 years were obese or overweight (WHO,2021). Additionally, a report in the Lancet Global Health journal estimates that in 2017 unhealthy diets were responsible for over 11 million deaths worldwide, which is more than any other risk factor (Afshin et al. 2019). Highlighting the urgency for action, this trend goes beyond individual choices; broader factors like stress and societal influences play a significant role. This can be seen in research such as (Dutt et al. 2019) which demonstrates that stress and unhealthy eating among young adults are related. This suggests that broader societal factors also influence unhealthy eating behaviours. The report published by the Food Foundation in 2023 made a significant contribution to the discourse on the subject of bad food choices. The report suggests that the underlying reason for this issue is strongly ingrained in the system, including the restricted availability of healthier alternatives and widespread advertising of bad food products (The State of the Nation's Food Industry report 2023 , Food Foundation 2023)The finding highlighted the importance of an in-depth analysis of the existing food policies and regulations to address the issue at the systemic level. Furthermore, it emphasized the importance of promoting healthy food choices through targeted education and awareness.

Technological Landscape:

Research has demonstrated that mobile applications are emerging as an effective tool for encouraging healthy eating among young people. Recently the 2022 study in the Journal of Medical Internet Research (JMIR) found that apps specifically designed for this purpose led to significant improvements in dietary choices and nutritional awareness (McNamara et al. 2021). This aligns with the Food and Agriculture Organization's (FAO) 2021 report highlighting tech's potential to address global dietary challenges through education, behaviour change, and personalized guidance. The World Health Organization (WHO) recognizes the potential of mobile applications to address noncommunicable illnesses associated with a poor diet. This is highlighted in their 2021 report, "Global strategy on digital health 2020-2025, where they state the need for innovative solutions, including digital tools and applications. Recently there has also been an increase in AI and machine learning advancements, these are making personalised nutrition applications more accessible and viable for users. These applications, like the one studied by (Ding et al 2023) can analyse individual dietary patterns, preferences, and health conditions to provide tailored recommendations. This not only enhances effectiveness but also caters to the tech-savvy generation's demand for personalization.

Factors that Influence Food Choices:

Developing an effective solution to promote healthy eating habits among young adults requires a deep understanding of the specific challenges they face. This section investigates the key factors that influence their food choices. This will provide a crucial foundation for designing an impactful interactive application.

- **Lack of knowledge and awareness:** Young adults often lack comprehensive knowledge about nutrition, meal planning, and healthy cooking practices. This was highlighted in the article written by (Christiansen et al 2023)

- **Convenience and affordability:** Unhealthy options are often easier to access and cheaper, creating a significant barrier for budget-conscious young adults (Hebden et al, 2015)

- **Time constraints**: Busy schedules and demanding lifestyles leave little time for planning and preparing healthy meals (Escoto et al,2012)

- **Motivation and social influence:** Sustaining healthy habits requires ongoing motivation and navigating social environments that may not always support these choices (Higgs and Thomas 2016)

- **Stress and emotional eating:** Unhealthy coping mechanisms like stress-induced snacking can derail good dietary intentions (Harvard Health Publishing 2021)

Aims and Objectives

Overall Aim Summary:
The overall aim is to design and develop an interactive application that promotes healthy eating practices among young adults. This application will address the key challenges users face by empowering them with knowledge, tools and motivation to make informed and sustainable dietary choices.

Fundamental Aims/Objectives:

1. **Research and Analysis of Existing Technologies:**

   I. Conduct a thorough review of current technologies promoting healthy eating practices among young adults. This includes looking at existing applications as well as looking into articles and papers.
   II. Evaluate the accuracy of health and nutritional information in existing applications.
   III. Identify the benefits and weaknesses of features in current applications and assess potential market gaps for enhanced features.

2. **Taking a User-Centered Design Approach:**

   I. Conduct quantitative and qualitative research to understand the target attitudes towards healthy eating, their preferred features and functionalities for a health app, and any potential challenges they might encounter using such an app.

   II. Use the research findings to determine essential features and preferences of the target group and incorporate their feedback throughout the design and development process.

3. **Designing and Developing the Application:**

   I. Make informed decisions on the application platform and required tools.
   II. Develop a few prototypes based on gathered insights and iterate on design based on feedback.
   III. Implement the interactive application and refine features in the prototype stage based on feedback.
   IV. Repeat design and development iterations until a user-friendly and effective application is achieved.

4. **Testing and Evaluation:**

I. Conduct personal testing and facilitate user testing with potential app users.
II. Gather feedback on the application focusing mainly on usability, effectiveness, and user satisfaction.
III. Analyse feedback, make necessary adjustments and iterate on the application to enhance user experience.

5. **Final Report and Documentation:**

I. Write a comprehensive and detailed final report that clearly documents the research processes, design decisions, and development phases.
II. Evaluate the final product's effectiveness in promoting healthy eating practices.
III. Identify opportunities for further enhancements and improvements whilst considering feasibility.

Risks and Mitigations:

I have reviewed all aims and objectives and developed a risk and mitigation table to identify and address any potential issues that may arise during the completion of my project. Additionally, I've utilised a risk matrix to assess the severity and likelihood of each risk.

LIKELIHOOD ↓ / SEVERITY →	1	2	3
1	LOW –1–	LOW –2–	MEDIUM –3–
2	LOW –2–	MEDIUM –4–	HIGH –6–
3	MEDIUM –3–	HIGH –6–	HIGH –9–

Figure 1. Risk matrix

Objective	Risk	Risk Score	Mitigation
1.i	Limited data availability	Low - 2 -	Extend search scope beyond local sources to international publications, articles, and journals
1.ii	Incomplete/unreliable data sources	Medium - 3 -	Cross-verify all the information and prioritise validated and peer-reviewed studies which have a high precedence
1.iii	Insufficient data on features/effectiveness	Medium - 4 -	Utilise a combination of user reviews, look if there are any expert opinions published online of the application and conduct in-depth analysis to gather comprehensive insights
2.i	Low participant engagement in research	Low - 1 -	Encourage as many people as possible to participate in interviews and surveys by posting it on different platforms. This includes emails sent from the university to different year groups and courses
2.ii	Misinterpretation of research findings	Medium - 3 -	Use a variety of both qualitative and quantitative questions as well as open ended and closed question. Also do research into what questions are best used for surveys and interviews and see what are the most effective
3.i	Technical challenges in implementation	High - 3 -	Seek support from my supervisor and proactively learn all the required skills before I start developing the application
3.ii	Design iteration challenges due to diverse feedback	Low - 2 -	Establish clear design principles based on the feedback, rank the feedback into categories and see what is most voted/ common
3.iii	Delayed implementation due to technical challenges	High - 6 -	Have regular (weekly) meetings with my supervisor to get support as quickly as possible. Allocate additional time in the work plan so I have enough time to solve any technical challenges
3.iv	Extended project timeline	Medium - 3 -	Establish a realistic and flexible timeline for the workplan which prioritises the key milestones of the project
4.i	Limited user engagement in testing	Low - 2 -	Encourage as many users as possible to participate in the testing stage by posting it on different platforms. This includes emails sent from the university to different year groups and courses
4.ii	Insufficient data on usability/effectiveness	Low - 2 -	Utilise multiple feedback channels. This will include both surveys and interviews and conduct thorough testing with a few iterations
4.iii	Delayed implementation of necessary adjustments	Low - 2 -	Establish a clear timeline of when I want to gather all my feedback so that I will have enough time to make any adjustments. Make sure this is clearly included in the timeline of the workplan so I can keep myself accountable
5.i	Insufficient time allocated for the comprehensive write-up due to unexpected delays in project phases or underestimation of the required effort.	High - 6 -	Establish a detailed timeline for the report writing phase, considering each component's complexity. Regularly monitor progress and adjust the timeline if needed. Identify potential delays early on and address them promptly. Have weekly meetings with supervisor to keep myself accountable and see how I am progressing over the project
5.ii	Subjectivity in evaluation	Low - 2 -	Utilise both quantitative metrics (such surveys and user feedback) and qualitative insights (interviews) to ensure a balanced and objective evaluation. Involve multiple evaluators to reduce individual bias.

Feasibility:

Ethical Approval and Justification:

I will complete the simplified ethics form provided by Cardiff University and I will submit it to my academic supervisor. This is crucial as I will be conducting research involving quantitative and qualitative methods like surveys, interviews, and observational studies. I will seek guidance from my supervisor and the university's relevant ethics resources to ensure that I conduct ethical research practices throughout the project.

Data Anonymity and Informed Consent:

Ethics approval is essential for collecting feedback during all the stages. To ensure informed consent and adhere to Cardiff University's ethical requirements I will create a consent form and information sheet. These will be given and displayed to each user at the beginning of each user study. They will only be able to take part if they consent to the requirements stated in the forms. Furthermore, the surveys will be conducted anonymously. This will safeguard participant privacy. I will also prioritise transparency and clarity in all communication with participants. This will ensure that they understand the research objectives, their role, and how their data will be used as a part of my research

Legal Issues:

One key legal issue that might be faced involves intellectual property rights and licensing. While open-source grants usage rights the tools' originators retain copyrights. To address this, I will credit and reference all utilised open-source components within my code and documentation so that I can respect and follow their intellectual property rights.

Work Plan

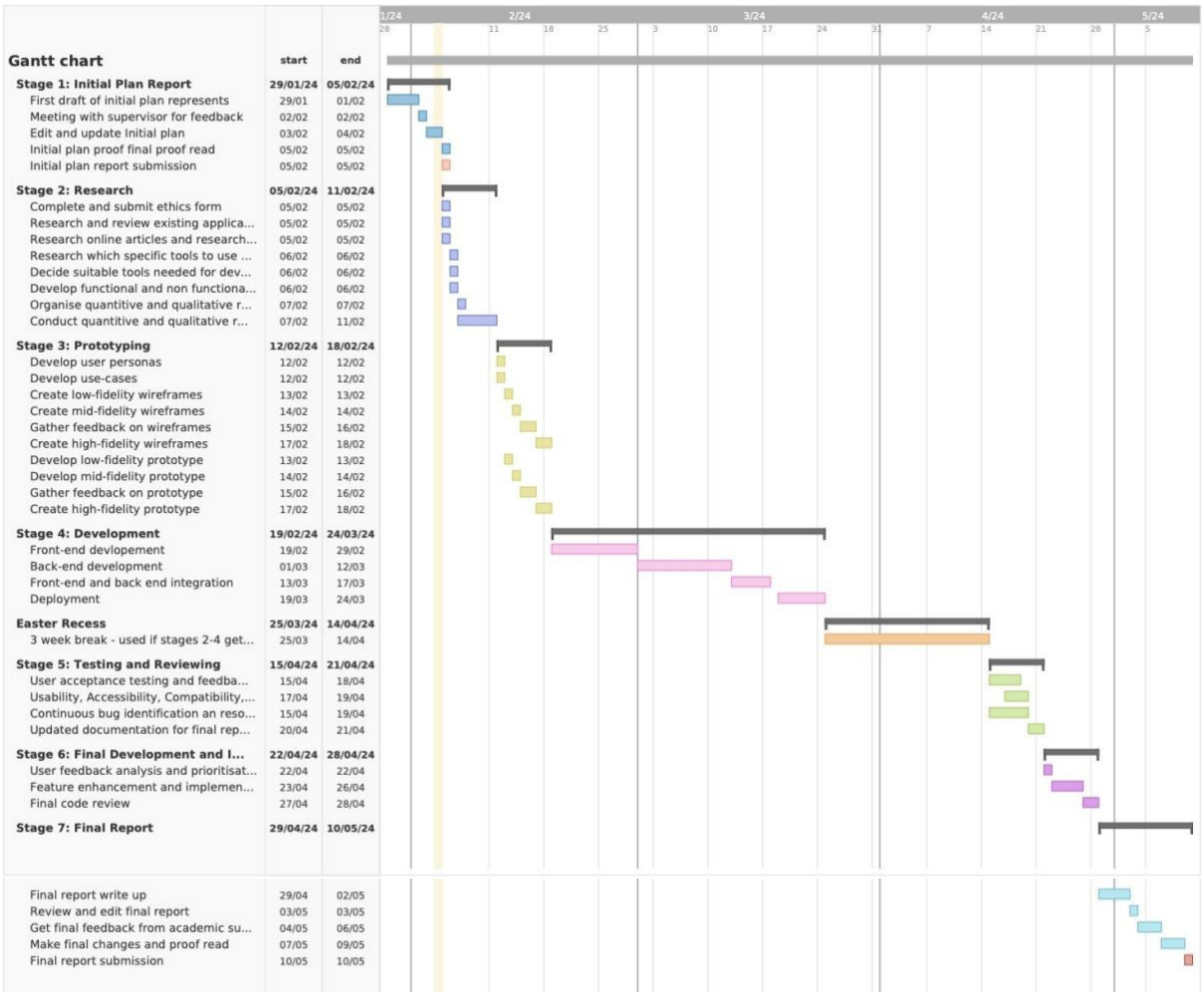
As of now, I have scheduled weekly meetings with my academic supervisor every Thursday at 4:30 pm. These sessions will be utilised for receiving feedback, addressing questions, seeking support, and fostering accountability for the progression of the weekly tasks I have set for myself.

Week	Dates	Tasks	Milestones/Deliverables
1	29/1-4/2 2024	- Schedule meeting with academic supervisor - Write first version of initial plan - Schedule meeting with academic supervisor to discuss project scope and get feedback - Make any changes on report based on feedback - Submit revised version of initial plan report to supervisor for a final review	-Submission of initial project plan by Monday 5th February
2	5/2-11/2 2024	- Submit initial report on 05/02/2024 by 11pm - Conduct research into technologies promoting healthy eating and specifically focuses on applications which have features relevant to young adults. - Analyse opinions (reviews), benefits, and feasibility for each of the identified feature. - Research online articles and research papers - Research which specific tools to use for development - Decide on most suitable tools needed for development - Prepare ethical documents for approval from my academic supervisor - Discuss potential features and project direction with the academic supervisor. - Identify key features and prepare for user studies. - Develop functional and non-functional requirements for application -Once ethics approval has been grated organise quantitative and qualitative research -Conduct quantitative and qualitative research	-Submit ethics approval -Conduct quantitative and qualitative research
3	12/2-18/2 2024	- Conduct user studies to evaluate preferences and habits related to healthy eating - Analyse results and adjust the project scope accordingly. -Develop user personas -Develop use-cases -Create low-fidelity wireframes -Create mid-fidelity wireframes - Gather feedback on wireframes -Create high-fidelity wireframes -Develop low-fidelity prototype -Develop mid-fidelity prototype -Gather feedback on prototype -Create high-fidelity prototype (using Figma)	- Complete high-fidelity wireframes and protypes
4	19/2-25/2 2024	-Set up version control (Git) -Install all necessary tools to code -Create basic structure of the application using HTML and CSS -Continue refining HTML and CSS for better structure and styling -Integrate JavaScript into my project and work on interactions and functions	Start developing front-end

5	26/2-3/3 2024	-Implement basic interactivity for user engagement using JS -Use React.js for front-end framework and set it up -Implement, build, and refine components needed within the framework -For back-end create the basic project structure, including folders for routes, -controllers, models, and any other necessary components. -Set up configuration files and ensure the project is well-organized.	Complete front-end
6	4/3-10/3 2024	-Define API endpoints -Implement server-side logic by writing code to handle incoming requests and generate appropriate response -Implement business logic and any algorithms to fill functionality of each API endpoint -Use MongoDB for database setup and integration -Implement validation checks for incoming data	Complete back-end
7	11/3-17/3 2024	-Connect front-end to back-end and ensure proper handling of request and responses between the two layers -Modify or enhance any front- end components if needed -Ensure data consistency between front-end and back-end -Implement user authentication and authorisation	Connect front-end to back-end
8	18/3-24/3 2024	-Prepare for deployment and choose a hosting platform Deploy the application	Complete deployment
	Easter Recess	3-week Easter Recess will be used as a break. I have deliberately not planned anything in the Easter recess as a contingency measure. This means if I am behind on any of the other weeks which will cause a delay then I will be able to catch up during the holiday. The aim is to complete the MVP by the end of the Easter recess so I can go into testing and reviewing in week 9	Completion of app development and achievement of the MVP
9	15/4-21/4 2024	-Conduct and collect feedback from user acceptance testing (UAT) to ensure the application meets user expectations. - Perform usability, Accessibility, Compatibility, Performance, and Security Testing - Address and resolve any bugs or issues identified during testing -Update documentations for final report	-Conduct UAT and Collect Feedback -Complete all testing and update documentation -
10	21/4-27/4 2024	- Analyse the feedback collected during user testing and prioritise the identified issues or suggestions. -Enhance existing features based on user feedback and identified priorities. -Implement new features or improvements to address specific user needs or enhance overall functionality. -Conduct a thorough code review of the entire application codebase. -Identify and address any remaining code issues, readability concerns, or potential optimizations.	-Analyse feedback and make necessary enhancements - Review all the code and make final refinements

11	28/4-4/5 2024	- Begin assembling and organising all documentation for the final report - Initiate detailed documentation on apps features and coding processes	Initial documentation for the final report,
12	5/5-11/5 2024	- Make final adjustments to the app based on feedback - Ensure clear alignment with original aims - Complete the final report, including a detailed analysis of all features	Completion of the final report

Gantt chart



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