# Chapter 2 Literature Review

## The purpose of this literature review is to explore existing research and real-world platforms that inform the development of the Personal Accounting Climate Economics (P.A.C.E) website platform. The objective is to establish a foundation for building a user-focused platform that encourages sustainability habits and the active participation of individuals in achieving all the sustainable development goals [1]. To achieve those objectives, it requires very careful attention of how users engage with the system, therefor the adoption of a method User Experience (UX) design becomes a key activity in the design life cycle.

## 2.1 User Experience Design Process

User Experience (UX) design process is critical when developing digital platforms, particularly those that would further sustainability. The process helps in ensuring that the product is user centred, intuitive and interactive. Berni et al. [2] gives a checklist of the normal UX design cycle that includes user research and requirements gathering, UX Defining, Ideating, prototyping, testing, Implementing and evaluating and iterating.

User Research and Requirements Gathering is the initial step in the process. During this step designers attempt to understand the users, their needs, behaviours, and pain points. This process includes online surveys, personal interviews or focus groups which aims to extract general user requirements to inform the design of a solution to satisfy the users’ needs.

The second phase is UX definition. In this stage research findings are synthesized to define the problem and user personas.

The third phase, ideating involves generating ideas and potential solutions. This includes low fidelity wireframing and creating information flow architecture. Low-fidelity wireframes are simple visual the layout of a platform such as a website. They are usually hand drawn.

The next phase is designing detailed prototype of the solution. This includes creating High-Fidelity Mock-ups and an interactive prototype. High-fidelity prototypes, typically made with tools such as Figma, are more realistically detailed and interactive, and they can be used to explore possible user interactions with a platform more deeply.

The next phase is Testing where the designed solution is validated by real users. At this stage feedback on the design is collected. The prototype is presented to users to determine if the prototype meets users’ needs and expectations. Feedback is also obtained regarding the ability of users to achieve critical tasks without having to struggle (so-called red routes).

The final phase includes implementation where developer finalize the solution and then continuously evaluates the product. This is a vital part of the process and makes certain the product is always meeting the users’ changing needs.

This User Experience (UX) design process is becoming a standard in modern website design and is especially helpful in platforms whose design is intended to encourage ongoing user interaction. Following these principles of design will help platforms direct users to actions that are meaningful and impactful. This can clearly be seen in research done by Moustafa et al. [3].

## 2.2 The SCRUM Process for software Development

Although UX design can guarantee the user-friendly interface and the purposeful interaction with the user, the development of such systems demands a systematic approach to address the changing needs and make sure that the results are delivered on time- this is where SCRUM process will prove to be very efficient. The SCRUM is a popular approach to the contemporary software development. It pays special attention to iterative development, joint planning and constant improvement. This methodology is especially useful in dealing with complicated projects in which requirements could change over time.

The Scrum Process first consist of Product Backlog Creation in which a prioritized list of features, enhancements, bug fixes, and technical tasks is created. This is managed by the product owner and is continuously refined based on feedback and changing needs.

After Product Backlog Creation, Sprint Planning is done. This consist of team selecting items from the product backlog to work on during defined periods called sprints (usually 1–4 weeks). The third stage of the process is sprint execution in which the team works on the tasks selected in the second stage. During execution the team holds daily scrum meetings (usually 15-minute stand-ups) to share progress and plan for the current sprint.

At the end of the sprint, the team delivers a product increment. The product increment is considered done when it meets the team’s approval. A Sprint Review is held at the end of the sprint in which stakeholders provide feedback on what went well, what didn’t, and how to improve. After reviewing the Product backlog is updated accordingly and action items are created for the next sprint. The cycle continues with the next sprint, incorporating feedback and improvements.

The approach can be particularly effective in both individual and team-based developmental settings where project with several parts such as web-based platforms need to be created. For example, **Julianto et al. (2022)** developed an e-commerce website using the Scrum methodology that focuses on sprint-centered development, the importance of the backlog, and stakeholder feedback as the means of creating a working online store. Their example indicates the flexibility and format provided by Scrum to the development of iterative websites. [4]

## 2.3 Current Best Practices in Sustainability Web Applications

Expanding on the systematic process of development facilitated using Scrum, the following issue how do the existing sustainability-oriented web-based applications develop and how they are implemented, with the latest development technologies.

2.3.1 Front-End Development

When designing a website, the two components need to be considered: the front-end and the back end. The front (or the client-side) is the visual component of the site that the user interacts with, i.e. buttons, menus, and pages they view in their browser. The backend (or server-side) refers to the back-room system, which manages data, user accounts, processing requests and database interactions.

In the frontend, modern web development frequently employs a set of tools (HTML, CSS, and JavaScript frameworks such as React, Angular, or Vue.js). React is commonly known to be strong in terms of performance and ability to develop speedy and reactive user interfaces [4]. It has a Virtual DOM (Document Object Model) which is a programming interface that allows users to easily manipulate web documents used to create webpages [5]. React is also has groups of reusable code which reduces development time [6].

The other aspect that is significant in the modern frontend development is the styling technique that allows complete customization of the appearance of a web page. Certain frameworks such as Tailwind CSS provide pre-built styles, although plain CSS is frequently favored by developers who want more control over design features particularly in sustainability-conscious designs where minimalism is a design best practice [7].

Good examples of front-end development are GoFundMe and Ecosia. GoFundMe website enables people and groups to crowd source their personal or social money [8]. The design of the platform is on a streamlined layout that requires few steps to donate. The interface is not overloaded with visual clutters and users can therefore focus more on the important actions. Such simplicity promotes increased participation of users in the use as confusion is minimized, and accessibility is enhanced. Ecosia on the other hand is a website that gives the user live counters and impact visualizations indicating how many trees have been planted depending on user action. Such real-time feedback can allow users to interpret the immediate impact of their interaction, potentially encouraging users to engage in the process again and be more conscious of the environment.

The design features of these platforms highlight the following best practices on web development:

* Minimalist interfaces that reduce distractions and energy usage.
* Real-time impact displays and progress bars make one feel that they contribute to and are responsible for making real life impact.
* Easy to navigate flows that allow users to make actions fast, particularly with donation-based or purpose-driven websites.

These characteristics can be canvassed as broadly recommended best practices for user experience (UX) and as tactics to create meaningful, and accessible digital environments for sustainability initiatives [7].

2.3.2 Back-End Development

On the back end, the developers need software that will handle data storage, processing and movement between the front end and the database. Firebase, MongoDB, MySQL and Supabase are some of the common software used to create backend databases. Of these Supabase is considered the friendliest.

Supabase is developed using PostgreSQL, which is a relational database, that enables the organization of data (which can be helpful when dealing with user profiles, donations, and records of volunteers). Supabase can also be customized completely, is open-source and has self-hosting and real-time data sync features. It also has inbuilt APIs (Application Programming Interfaces). APIs are considered messengers between the backend and front end transmitting and receiving information between the database and the user interface [9].

Modern web development mainly depends on backend technologies that guarantee effective data manipulation, retrieval, and storage. For instance, Supabase makes backend development easier with its integrated authentication systems, real-time data syncing, and automatically generated RESTful APIs. The development of a donation management system, where user contributions are entered into a PostgreSQL database, updated in real time, and then dynamically displayed on a user's dashboard, is a useful example of backend development with Supabase. The use of Q-learning logic in a backend constructed with Node.js and Express, where user actions are recorded and fed into a model to suggest subsequent actions, is another example.

The literature review was useful in selecting the appropriate tools and techniques to develop the P.A.C.E. website. It demonstrated the user experience design in order to simplify a platform and make it more interactive. The Scrum process provided a proper format to plan the system in stages and its development. Getting to know about such backend tools as Supabase helped to establish a secure and well-organized database.