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# St Andrews Botanic Gardens Database Web Portal UX Design

**Joseph Cameron**

University of St Andrews  
St Andrews, Fife, Scotland, UK  
jmc42@st-andrews.ac.uk

**Anli Hu**

University of St Andrews  
St Andrews, Fife, Scotland, UK  
ah373@st-andrews.ac.uk

**Edvin Pohto**

University of St Andrews  
St Andrews, Fife, Scotland, UK  
ejp27@st-andrews.ac.uk

**Jingwen Zhu**

University of St Andrews  
St Andrews, Fife, Scotland, UK  
jz98@st-andrews.ac.uk

**Motivation of the Project**

In St Andrews Botanic Garden's pursuit to refresh the scientific mission and overall purpose for professionals and visitors alike, they teamed up with students from CS5042 at the University of St Andrews. This collaboration aims to design a new web portal for a database the Garden has under development. As described in the project outline, the project's overall goal is to make the Garden's scientific data accessible to users in a range of formats.

Currently, the Garden is in possession of a vast quantity of tabulated data, that the new database system is aiming to make more accessible and easier to work with. As a part of this effort, the UX Design Team's goal is to research, design, and prototype a web portal that allows the Garden to "develop skills in research, curation, and interpretation to new audiences" (as per the project brief). Furthermore, the web portal aims to make the data accessible to user groups ranging from staff members and visitors to curators and managers. The web portal should also include a mapping capability to interrogate the database for relevant locations around the Garden.

The project's objective is therefore to design the web portal's appearance and functionality with various users in mind, up until a user experience prototype.

## Results from the Questionnaire

We received a total of eleven responses, out of which seven were valid. Two came from visitors, three from curators, one from a non-managerial staff member, and one from the director.

While limited in sample size, the responses gathered increased the reliability and actionability of the information elicited from other parts of the process. All curators valued easy usability over advanced tools, and half of them thought the existing database is hard to use. One visitor, who mainly visits the garden to have fun, thinks all information they are interested in is readily available. The other visitor, who indicated more interest in interacting with the garden, thought the information available was not helpful and effective enough.

## Design of the Data Elicitation Process

Approaching the project of designing a web portal for the Botanical Garden's database, the very first task was to design a data elicitation process. At this point, the Director of the Garden, Harry Watkins, had already introduced the general concept of the project through an online presentation and a written brief. The next steps were therefore to identify potential experts and user groups to consult, decide on viable research methods to conduct, ensure the ethicality of all processes, make a roadmap for data analysis, and – most crucially – make arrangements with all relevant parties to initialise execution of the process.

The data elicitation process ultimately opted for consisted of a first interview with the client, who also doubled as a Subject Matter Expert (SME) (Hartson and Pyla, 2018: 125), a questionnaire (aimed at the Garden's staff, outside researchers, and visitors), a second interview with the SME, and finally an observational exercise with the client during the second interview.

### *First Client and SME Interview*

The very first step of the data elicitation process was to conduct an interview with the client. The purpose of this interview was to specifically learn about the rationale and purpose behind the project at hand, the identity and values of the Botanic Garden Trust, and the client's vision for the web portal. Simultaneously, the team had identified the director/client, Harry, as an SME, and therefore the interview questions asked were specifically designed to elicit information with regard to both these roles of the client. In our questions, we combined an initial open ended question about the values and history of the garden, with more specific

close-ended questions about the project and its intricacies. This was intended to mimic the large scope early funnel VS small scope late funnel concepts (Hartson and Pyla, 2018: 128), where we started by getting an overall view of the situation and closed in at reliable and actionable answers towards the end. In general, we avoided using confusing or vague questions, in order to keep the responses useful. Overall, the careful design of this step of the data elicitation process was crucial, as it would come to lay the foundation to all successive research methods employed. Refer to appendix A for the full interview script.

### *Questionnaire*

Due to constraints inflicted by both COVID-19 and the Garden being in the midst of other similar projects, our client wished he alone would remain the point of future contact, and that possible interviews with members of staff or visitors would be conducted in the form of questionnaires. The team therefore designed a survey for targeted users (staff, visitors, etc.), with the purpose of eliciting both new qualitative data and reinforcing the validity of existing data. Furthermore, a questionnaire was deemed an advantageous method to gather data, given the time constraints and abridged nature of the project. This allowed us to efficiently target tailored questions to specific user groups that we had identified from our first SME interview.

In designing the questionnaire, a conscious choice was made to target specific questions to specific user groups. This was achieved by a filtering question at the beginning, to decide what questions the respondent would be asked. Due to there being two CS5042 teams working on the same project, the client helped us

distribute the questionnaire to two unique populations of respondents. This was done to avoid confusion with the respondents, ensure justice between the two teams, and maintain the reliability and consistency of the gathered data.

#### *Second SME Interview*

After our first SME interview and its subsequent analysis, we noticed some gaps in our information. For example, the garden has a project exploring plant communities and their relationships with one another called the "Tangled Bank" (see Garden website). We highlighted these projects as potential wells of insight for the garden's mission. Discussing this with the client would allow us to think thoroughly about the types of information that are important to display through the web portal.

We formatted our questions in a similar manner to the first interview, aiming to avoid vague and confusing questions. We also allowed scope for open-ended questions to enable the SME to elaborate without inhibitions. The general nature of the interview was to supplement the knowledge gained from the first interview.

#### *Observation*

For our fourth and final data elicitation method, we opted to conduct an adapted version of the classic method of observation (Hartson and Pyla, 2018: 38) in order to better understand the difficulties our client was describing during the first interview. The client demonstrated his everyday workflow by sharing his screen while using the current database. During this, we asked the client to speak their thoughts out loud. Additionally, we asked if he could navigate to another

Botanical Garden's website and use their system for a similar task. The observation complimented all the previous methods of data elicitation as our team got a much better understanding of the context and realities of the previously described issues with the existing system. Moreover, the latter part of the observation could well be categorised as a brief competitive analysis (Hartson and Pyla, 2018: 126). Here, it was especially valuable to have the client/SME commenting on encountered functionalities. All in all, the observation session reinforced the reliability of the already gathered data and provided new information for future analysis.

Together, the three data elicitation methods combine to provide a holistic depiction of issues, needs, wishes, and possible solutions with regard to the project.

### **Ensuring Ethicality**

As a part of setting up the User-Centred Interaction Design course, the lecturers Kenneth Boyd and Loraine Clarke submitted an ethics application, regarding contextual enquiries, to the University Teaching and Research Ethics Committee (UTREC). Following this procedural precedence, the team conducted all official data elicitation online and provided all participants with a Consent Form and a Participant Information Sheet. With regard to the interviews with the client/SME, the information sheet was filled in with the relevant details (such as contact details and project purpose) and sent to them for keeping. Similarly, the consent form was filled in and signed by the client before sending it back to the team. In the case of the questionnaire, the same forms were attached to the first page of the survey. Here, the consent form had been adapted to be read

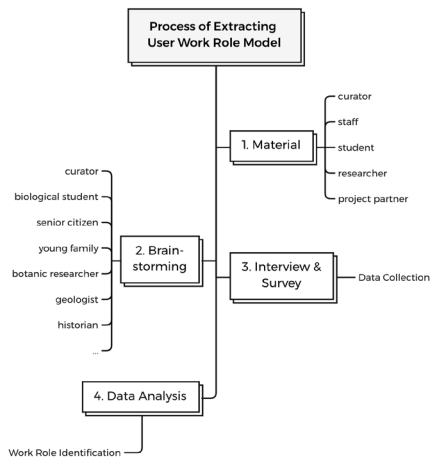


Figure 1. Process of Extracting User Work Roles

and accepted by the participant before continuing to the actual survey. The information sheet was attached as a link to both the beginning and end of the survey, and the participants were urged to download the sheet at multiple occasions. Finally, it is mentionable that no questionnaire answers have been/are utilised unless the participant has fully agreed to all conditions.

### Data Analysis

After the data elicitation process had concluded, it was time to organise and analyse the acquired information. For this, we modelled an abridged version of the more extensive methodology outlined by Hartson and Pyla (2018, Ch. 8), with an end goal of constructing an affinity diagram. First, we organised the raw data into a Word document according to the categories they were asked in. We then boiled everything down to so-called work activity notes. We subsequently organised these notes into groups such as user story inputs, requirements, wishes by the client, and other suitable categories. Utilising the web platform Miro, we organised the notes on a large online whiteboard, that allowed for us to implement all of the categories into the aforementioned affinity diagram. This way we were able to draw connections between categories and map the grand scheme together with the finer connections and details.

### Models

Finally, after analysing and organising the data from its raw form into more refined requirements and insights, the next step was to create models.

### User Work Roles

To provide a solid foundation for the project to move forward, we saw it essential to understand users of the web portal. As one of the most important models in UX design (Hartson and Pyla, 2018), the User Work Role Model can help us identify the different roles users have. By using this model, our group can produce a clear and consistent definition of user roles in an established framework, hence reducing confusion and helping ensure that all situations and targeted users are covered.

As seen in Figure 1., the process of extracting the model was divided into four stages. During a visit to the Botanic Garden, we noticed that the potential users can be more diverse than the project brief described. Hence, in the second stage, we came up with different potential user roles that can connect with the web portal and classified them into corresponding groups.

In the first SME interview, we prepared questions about user work roles for the SME. This was done to prevent any knowledge gaps in our understanding and ensure we did not miss any relevant users. After combining the above with the data obtained from the questionnaire, the user work role model was extracted to be as follows:

1. Manager, who is responsible for managing the plants, the science and research associated with that, and looking after the database.

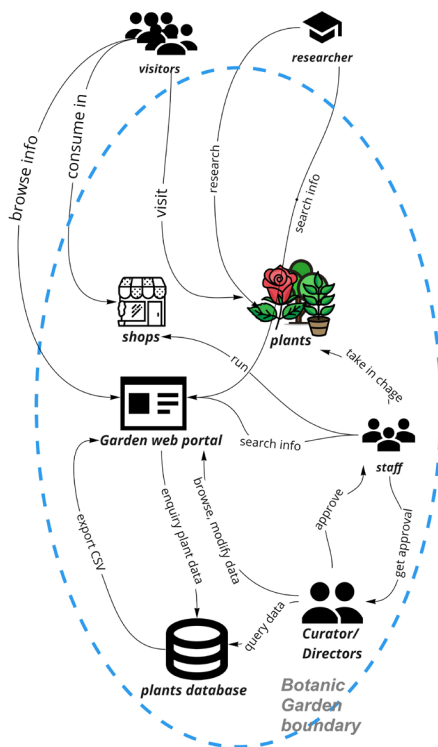


Figure 2. The Flow Model

2. General staff, who do not directly amend data in the database but use the data in their work and submit update suggestions through the portal.
3. Outsider, who interacts with the Botanic Garden database by only accessing data.

As a further step, we have divided certain work roles into user classes. For managers, they have two user classes. The director is the person who has the highest authority regarding the garden database. Curators are responsible for managing the plants, the science and research associated with that, and looking after the database. In terms of general staff in the garden, we classified them by their functions of work. For example, a development officer is someone who works on education and engagement (such as visitor/welcome admissions) and a gardener is someone who looks after the plants in the garden.

For outsiders, we classify them by the extent to which they can interact with the data. This includes researchers, who have access to search and download data about certain plants. According to their diverse backgrounds, we also have classified them as plant physiologists, historians, or botanists. Microbiologists and climate scientists will also interact with the garden in the future. Furthermore, visitors also have fallen into the category of outsiders. Among them, there are keen gardeners, who are regular visitors to the garden and are interested in everything in it; biology students (20%), who come to learn about plants, such as comparing differences among similar species; and ordinary consumers, who barely have no interest in data of plants, such as people who come to the garden for a walk or coffee.

### Flow Model

The team chose to build a flow model to show how the information passes through different roles inside and outside the Botanic Garden. The Flow Model seen in Figure 2. combines the existing functionalities of the current database with the intended design of the web portal. The model was created as it will aid us in identifying how the entities within the project system will communicate and coordinate with each other (Hartson and Pyla, 2018: 187).

The flow model starts with the web portal directly linked to the database. Next, user work roles such as directors, curators and other members in the Botanic Garden team are involved in the information flow. As the SME told, only staff at the management level, such as curators and directors, can access the data and make modifications to it. Other garden staff members are to make suggestions about modifications to the database, that the moderators then approve.

In addition, the client suggested most visitors would not be too interested in all the intricate data accessible through the portal. Nevertheless, everyone who accesses the website should have some privilege to enquire the data. As the director said, there are mainly two types of user roles within the user group 'Outsiders': general visitors and researchers. These two groups naturally have different purposes visiting the garden and the website. For the general visitors, they might only want to get a nice cup of coffee and appreciate the beautiful view of the garden. The researchers, on the other hand, might focus on the data they need to do scientific research.

## References

Hartson, R. and Pyla, P.S. (2018) *The UX Book - Agile UX Design for a Quality User Experience*, 2nd ed., Cambridge, United States.

St Andrews Botanic Garden, Available at: <https://standrewsbotanic.org/>

### *User Personas*

From our activity notes and affinity diagram, it became clear that we have multiple user groups who could be interacting with the proposed web portal. Having constructed three unique User Work Roles and a comprehensive Flow Model based on the data gathered, we decided to approach analysing the needs and challenges of the project from one final direction: through User Personas. These were designed to contrast the very specific and mechanical user work roles, and to essentially get an outside-the-box understanding of the actual users of the web portal. The User Personas were quite un-orthodoxically not designed to inform us of specific requirements and design choices of the final project, but rather challenge the team to look at the problem from a more personal and empathetic perspective. While the User Work Roles were intentionally limited to three clear modes of interaction with the web portal, six User Personas were designed to reflect the diverse group of individuals that will in reality use the portal. We believe that combining the three models we derived will ultimately yield a concrete and holistic foundation to build the next steps of the project on. Refer to appendix B for all the User Personas.

### **Client Interaction**

Throughout the data elicitation process, the interaction with the client was undoubtedly smooth and successful. At the start, we approached the client through emails, and swiftly set up the first meeting for Thursday 30th September. After the meeting, we discussed the project requirements thoughtfully with the client. Based on our initial interaction, we were able to both design complimentary questions to be asked in a second interview and design a questionnaire. At the end of this

process, we had a truly comprehensive understanding of the project. According to the client, the main problem of the current system is the lack of a web portal for their database. In addition, their old database is not usable enough. Currently, only managers can query and alter data from the garden, and it does not have a user interface for other people to access. As the Garden is developing a new, improved database, our job is to design the web portal to complement it. The client showed great interest in designing both an easy-to-use and functional user interface to interact with the backend database. This means a challenge of ours will be balancing advanced capabilities with a user experience suitable for more than just one expert user. He wished to track and add data easily and provide plant information on the webpage. Moreover, the client expressed a desire to rebuild the garden's scientific mission towards an emphasis on research and not only visiting purposes. For example, when searching the data from the web portal, there is a desire to show more specific and expansive information than just the species and the origin of the plant. Furthermore, here a mapping capability was wished for. As mentioned, a challenge will be to balance the web portal's user experience based on expected users constituting both professionals and casual users.

Having together with the client distinguished the different user roles of the web portal, as well as the expected requirements, we aim to combine these requirements with consulting our own analysis and research methodology. Ultimately, the web portal will come to help Garden staff members and the interested public, such as researchers and visitors, to utilise the valuable information in the Garden's database.

# Appendix A.

## Interview Script (30/09/2021)

First SME Interview with Harry Watkins

### General Instructions for Interviewers

- If we ever want to know any more details, just ask a follow up question, like “Interesting, can you tell more about that? etc.”
  - Black = Required Question
  - Blue = Backup Question
  - Red = point of interests
  - Green = Tips
- 

### First, we Introduce Ourselves.

- Take turns to introduce all of ourselves.
- Thank Harry for coming and asking him to introduce himself.
  - Since we are currently in the pandemic and it is difficult to interview multiple people, could you introduce other members of your team at the garden?  
Introducing his team (aka who works there).
  - What is your role at the garden? Briefly, what does that entail? What does Harry do in the garden?
  - How long have you worked at the garden?

### General Questions for Background Information

“After reading the project brief, we understand you would like a web portal for managing information and data at the garden.”

- Would you like to start off by talking about the project in question?
- What inspired you to come up with this idea and approach us?  
HARRY’S WORDS: Garden had a research purpose, but now it has lost its way.  
HARRY’S WORDS: Scientific machine/mission.
- User work roles ( target users)
- Holobiont - TAKE LAST BUT MENTION?

“Moving away from the web portal, let’s talk about any existing systems/methods you use...”

- How do you currently keep track of all the plants and their information at the moment?
- How is this information stored?

- What technology is used to store this technology?
- What do you like about your current process?
- What do you dislike about your current process?
  
- In the past, when using your existing database, have you ever had a scenario where you wished for a certain feature, but it was not available? If so, can you elaborate?

## User Work Roles

1. Which kinds of people need to access information on the web portal?
  - a. Backend (Curators) 2-4 people
  - b. Garden team - csv files
  - c. Researchers - csv files
  - d. Visitors - map etc
  
2. Who needs to edit and update information on the plants in the garden?
  - a. Curator
  - b. Harry
  - c. Team?
  
3. How does each user group interact with the information?
  - a. Insert/change info (R, Python?)
  - b. See info (Map, csv?)
  - c. Export info (csv?)
  
4. What kind of information is relevant to each user group ?
  - a. Names/Location for staff,
  - b. Names/Descriptions for researchers
  
5. What level of expertise in botany does each user group require?
  
6. Is there any user group that would need a specific level of technological expertise?
  
7. What variety of backgrounds do the researchers / co-workers have that are requesting access to the web portal?
  - a. Language?
  - b. research field?
  
8. What do visitors usually do in the Botanic Garden?
  
9. What role do you see visitors playing interacting with the web portal?
  - a. Do we want visitors to access the database as well as a map, or just the map?

## User Work Practice



1. What forms of technology do you (Harry) use most on a day-to-day basis?
  - a. What functions are these technologies used for?  
 Mobile?  
 Also needs to be asked in Questionnaire.
2. What form of technology (if applicable) do garden staff use to access the old system?
3. Are there any protocols in place associated with working in the garden (/with the system)?
  - a. IF SO: Is there anything you like/dislike about these protocols?
  - b. GET IP ADDRESS ISSUE
4. How are the plants currently recorded in the garden?
5. How many labels are there around the garden in total?
6. Are there any features you LIKE in the St Andrews botanic garden webpage?
7. Are there any features you DISLIKE in the St Andrews botanic garden webpage?

## Work Domain

1. Could you evaluate how the St Andrews Botanical Garden fits into the greater context of Botanical Gardens around the world?
  - a. IF ANSWER about the uniqueness of the St Andrews Garden  
 →How important is this for botanical research?
2. How many researchers request info from the garden compared to how many visitors visit the garden?
3. Is the web portal intended to have an effect on the financial future of the garden?
  - a. If Harry says yes to above: Where is most income coming from now?

## Competitors

1. Are there any related existing systems that are similar to the proposed web portal?
  - a. direct competitors
  - b. non-direct competitors
2. Which features do you like in other existing systems?
  - a. Why?
3. Which features do you dislike in other existing systems?
  - a. Why?

## Conclusion

Thank you very much for your time today. We hope you had a good time. If it fits your schedule, we'll email the questionnaire link (via Qualtrics) for the garden members and staff members to fill out tomorrow.

- Set next meeting with Harry for a second interview and potentially an observation.

Everyone thanks Harry and concludes the meeting.

# Appendix B.

