Q1 report: a tool for scheduling circular economy lighting projects

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7th April 2024

Introduction

This short report provides a summary of work done in Q1 and work planned for Q2. My timing plan shows that I have made faster than anticipated progress on the user research and digital tool development, while delaying research/literature review and model development. This was intention to allow me to validate my assumptions with user research, and to develop a prototype digital tool that will allow me to implement and test model development faster than if done in a theory-first approach.

My aim for Q1 was to quickly progress on a number of fronts in order to gain a good grasp of the project scope and any unforeseen challenges. The main avenues explored were:

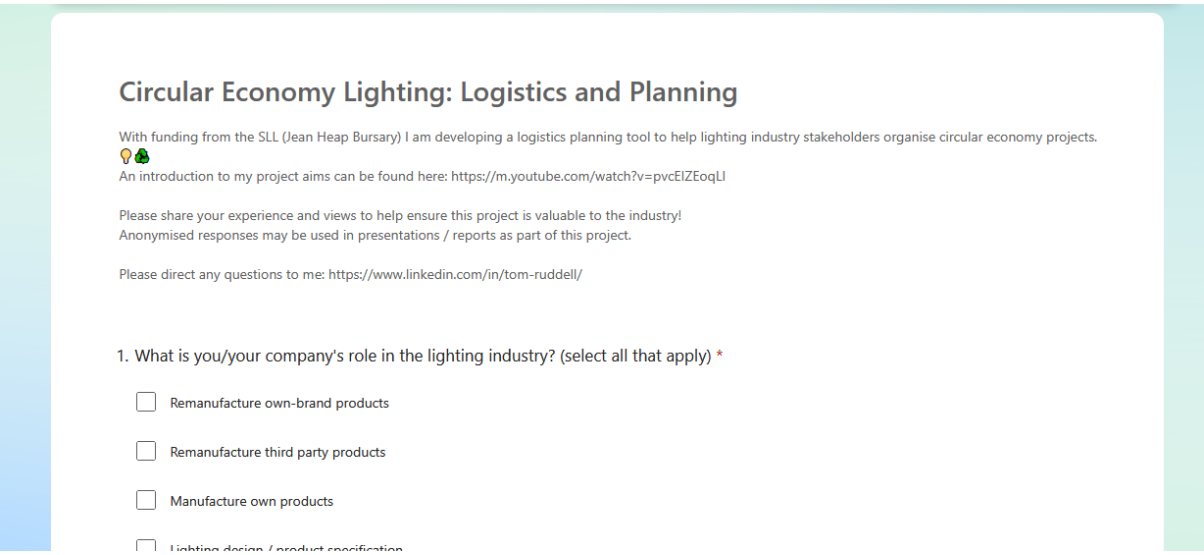
- Researching and selecting the web development tools which would be used to produce and realise the website
- Drafting, releasing and processing data from an industry survey, to gain feedback
- Brainstorming a visual identity and layouts / wireframes for the website and tool
- Developing the basic logistical algorithms and programming these into a tool which can be practically used to plan and visualise projects

I was thus able to cover a lot of material in Q1 and this sets the project up well for confident progress in the following quarters.

Contents

Industry survey on CE-LPs, challenges and barriers

In January I released a survey with contacts across the lighting industry. This was aimed to review my project aims and to raise awareness of my project in order to prepare individuals for beta testing or further feedback sessions. The survey was made using Microsoft Forms and shared on LinkedIn.



Respondents

- 21 respondents, who spent an average of 10 minutes on the survey
- A range of stakeholders, many of whom who worked in varied roles:
    - 13 respondents worked at companies which manufactured lighting products
    - 13 respondents worked at companies which remanufactured lighting products
        - 11 of which remanufactured both 1st party and 3rd party products
        - 12 of which also manufactured 1st party products
    - 5 respondents worked at companies which installed lighting products
    - 8 respondents worked at companies which specified lighting products
    - 4 respondents worked at companies which purchased lighting products

Opinions on challenges

57% of respondents felt that planning CELPs had posed a moderate or significant challenge to their company. This provides clear evidence that work in this field can be beneficial to the industry, especially given the responder bias to my survey will favour pioneering organisations

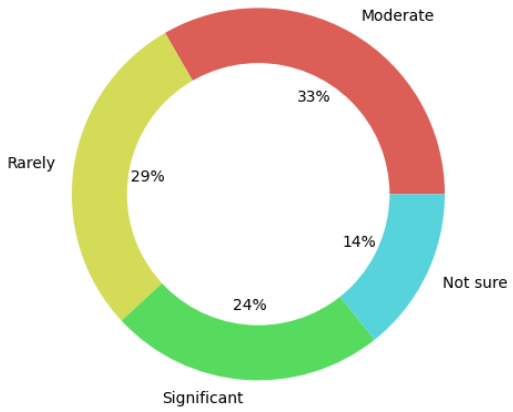


Figure 1: Has logistics or planning for CELPs been a challenge for your company?

Experience on training

81% of respondents indicated that their organisation had already conducted training or development relating to the planning of CELPs and would continue to do so. This shows the engagement and energy with which the industry is responding to circular economy and that new resources are likely to be explored

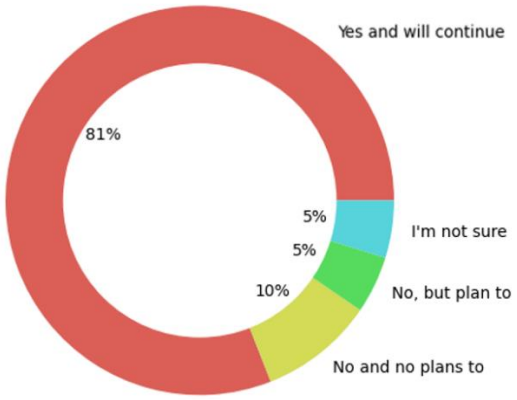


Figure 2: Has your organisation conducted training for planning CELPs?

Access to tools and resources

62% of respondents felt that the industry had adequate resources to plan CELPs, but that these were not widely adopted. Respondents may be referring to a number of recent developments, such as CIBSE TM66 and TM65, as well as BS 8887-221:2024, all of which support a circular economy ecosystem. On the other hand, 29% still felt that resources were significantly lacking, indicating a desire for further tools relating to planning

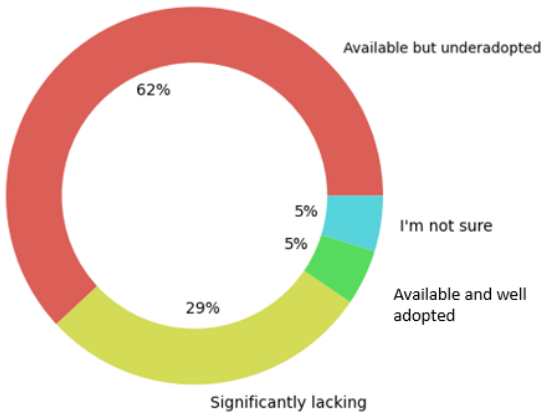


Figure 3: Does the industry have the knowledge and tools required to plan CELPs?

Level of understanding

Asked about specifier familiarity with CELPs, 48% of respondents indicated that there are frequently significant misunderstandings about how CELPs are planned and work logistically. This may indicate a gap in shared terminology or expectations (many remanufacturing organisations have developed their own phrases and guidance materials), a lack in experience or a gap in communication or educational practice

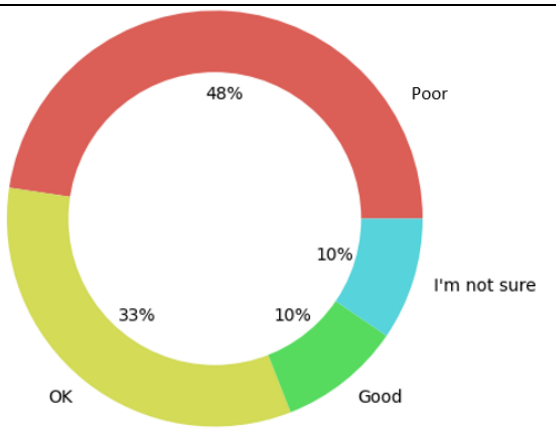


Figure 4: Do specifiers understand planning and logistics for CELPs?

Barriers to success

- When asked to rank different barriers to conducting successful CELPs, respondents with experience in remanufacturing and specifying provided notably different views.
- Many remanufacturers emphasised issues with project uncertainty, with difficulty being mentioned frequently but not as the primary barrier. Remanufacturers tended to indicate that not having enough people or time were lesser challenges to planning CELPs. Interestingly, there was little consensus among remanufacturers as to whether a lack of information was a significant barrier, with some indicating this as the primary barrier and many indicating it was a lesser barrier. This may point to differences in the vertical

integration or sales channel of organisations resulting in different access to project or client information

- Certain trends were clear among respondents working at organisations who specified lighting products. A lack of project information was consistently indicated to be a significant but never primary barrier, suggesting that specifiers feel more in control of project information. Instead, a lack of time consistently emerged as a key concern, with uncertainty and difficulty also important but also sometimes considered less urgent. Again, a lack of personnel was ranked the least important barrier.

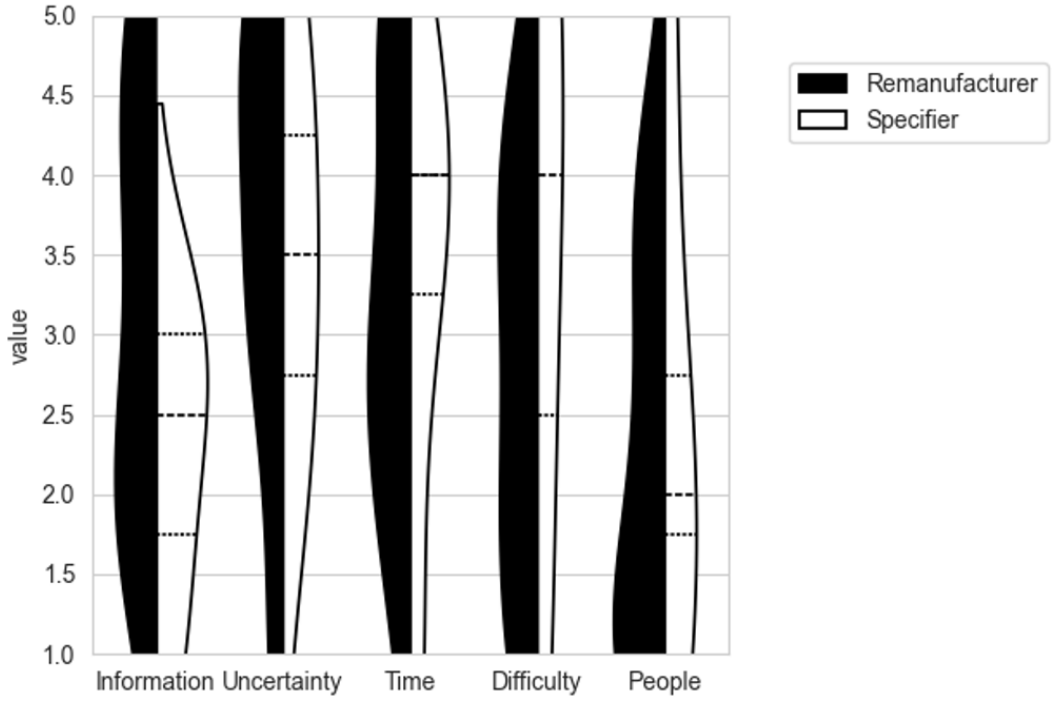


Figure 5: Rank the barriers to planning CELPs for your organisation (higher = more significant)

Table 1: Mean average position (1-5, with 5 most significant) for barrier ranking, sorted by stakeholder group

Barrier	Among Remanufacturers	Among Specifiers
Lack of project information	2.9	2.3
Project uncertainty	3.4	3.5
Time for project planning	3.1	3.3
Difficulty in planning / logistics	2.6	3.5
Personnel to complete planning / logistics tasks	2.0	2.5

Researching and selecting web-development tools

The first major decision to make was how to structure the website architecture. The website needs to take in user inputs and recalculate / manipulate information, then display graphs or other elements to the user. This may be done a number of times until the user is satisfied with the results. The high-level options are a 'traditional web application' which works by processing inputs on a web server, then displaying results to the user, or a 'single page application' which works by using the user's browser to process and display changes.

Structure	Pros	Cons
Traditional	• Can bookmark individual pages • Less compatibility challenges and demand placed on the user/client browser/computer • Faster page loads	• Slower and more difficult to carry out several / complex updates to the page • User data is sent to a server, which requires careful consideration of data privacy and security • I have no prior experience working with web-servers, or back-end web development or the languages required • Cost of web hosting and higher complexity technology stack
SPA	• Increasingly common modern approach to building complex and highly interactive website applications • Enables quick prototyping, debugging and iteration of the web application • Greater simplicity of technology stack	• Higher processing load and compatibility challenges on the user's browser • Search-engine optimisation is reduced • Users cannot bookmark individual 'pages' within application and back button will not work as expected

I decided to use a SPA in order to accelerate prototyping and iterating, as well as enabling a responsive and highly interactive user experience. Researching techniques for programming SPA's, I wanted to use well-known programming languages and avoid proprietary frameworks. The main options are a javascript-based application or a WASM (Web-Assembly) language. I have a large amount of experience using the Python programming language, and using a WASM platform for Python (Pyodide or Pyscript) enables me to use pre-existing skills – HTML, CSS, and Python.

Website visual identity

To help with initial web design, I prototyped page appearance using PowerPoint. I established some basic principles for the website:

- The website should follow consistent visual identity and design
- Pages should be simply laid out and easy to navigate. Content should be visible when the page loads
- High Information density - elements are to be sized and arranged to allow a relatively high information density
- Navigation within and between pages should be intuitive
- Page load should be as fast as achievable, for example, avoiding unnecessary animation
- Pages should be, as far as practical, accessible on mobile

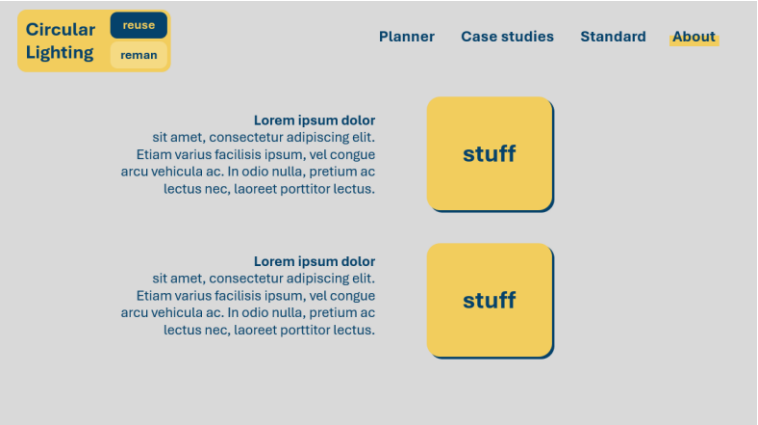


Figure 6: Prototype for landing page

Figure 7: Prototype for map view of remanufacturer directory

Figure 8: Prototype for carbon calculator configuration page

Figure 9: Prototype for logistics planner app

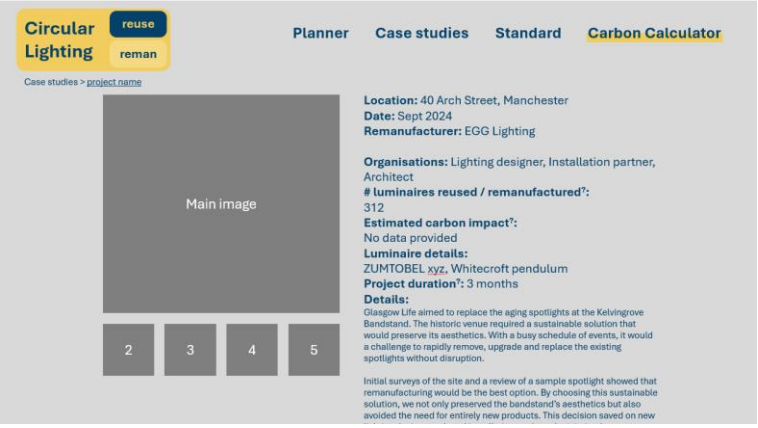


Figure 10: Prototype for case study page

Web development progress

Key achievements:

- Learned and implemented Pyscript / Python WASM script in testing environment
- Programmed stable implementation for most basic logistical algorithm, and developed input-output methods for interactive HTML elements
- Developed basic web HTML and CSS template

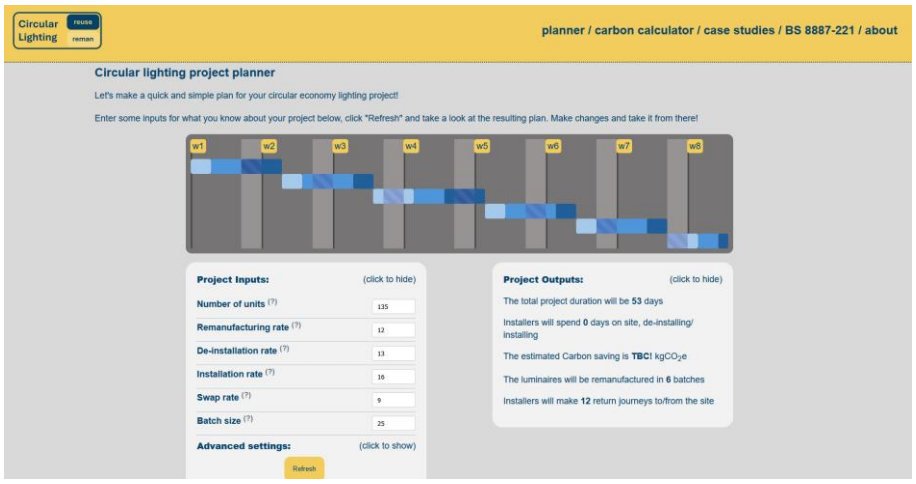


Figure 11: Basic timing plan produced from user inputs in web browser

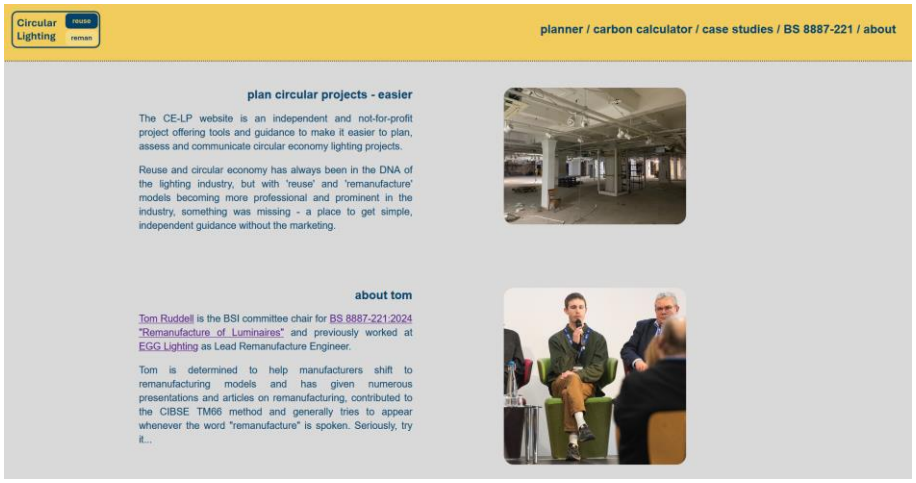


Figure 12: Placeholder / draft "about" page

Key objectives for Q2:

- Research and confirm approach for stable hosting of website with Pyscript / WASM access
- Develop already-identified logistical algorithms into programming scripts, to enable selection on website
- Using the tool, develop methods to allow users to visualise the differences between different logistical methods or values
- Using the tool, develop estimates of transportation and labour costs, to help users visualise the differe
- Produce supporting notes and information for users: logistics and BS 8887. This was identified as very important by survey respondents
- Develop web architecture for storing and displaying case study data, and remanufacturer directory