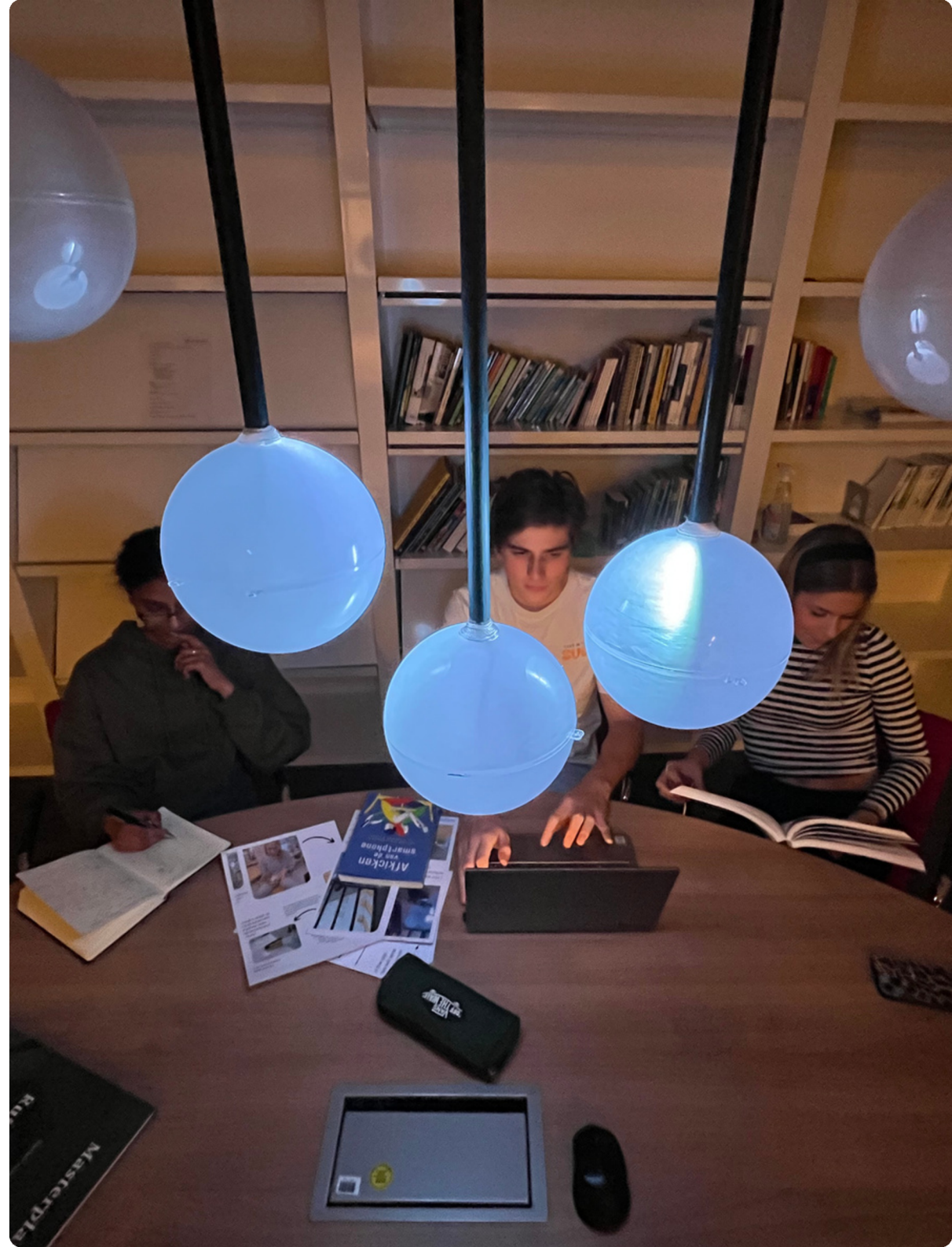


LightLock

Helping the company
become more socially and
environmentally sustainable.

Mats van Deijck (2050862)
DAB200 Design Innovation Methods
08-04-2025



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Introduction: The *Sustainable* Business Model Canvas - LightLock (currently)

Key Partnerships

- External **lighting technology supplier** provides the lighting hardware, which is then integrated into the system.
- **Universities**: the primary partners who adopt and deploy the LightLock system within their study spaces.

Key Activities

- Ongoing **improvement of the app's** functionality and user experience (through feedback and data).
- Ensuring that the physical **lighting systems** are correctly **installed and maintained** across university study spaces.
- **Promoting LightLock** to universities (and students).

Key Resources

- **Internal team** develops, maintains, and improves app.
- **Lighting system is outsourced** but LightLock manages the operational technology (servers/software) and design of the system.
- **Intellectual property**: the system's integration of lighting cues and a smartphone app.

Value Propositions

LightLock is an **interactive lighting system paired with a gamified app for shared university study spaces**.

Key Values:

- LightLock creates an environment that supports concentration and helps students **get their work done** efficiently.
- The gamified app rewards students for maintaining focus, providing an **engaging study process** and a **sense of accomplishment**.
- By integrating digital interventions and social nudges, LightLock promotes consistent, distraction-free study behaviours that lead to **better results**.

See Appendix 1 & 2 for more explanation on LightLock, or watch an explanatory video here: <https://www.youtube.com/shorts/71DKUBiOM6o>

Customer Relationships

- Universities: long-term, collaborative partnerships focused on integrating LightLock effectively into study spaces. Costs are medium to high.
- Students: direct, continuous interaction through the app, fostering co-creation to improve the experience. Costs integrated with app development.

Channels

- Universities: awareness is built through **networking** with campus planners. After purchase, there is ongoing support for the system.
- Students: awareness is built just by implementing it. There's direct interaction with the app and responsive ambient lights. **In-app notifications** and **surveys** for feedback will enable a co-creation relationship.

Customer Segments

LightLock is creating value for university students for example by helping them get their work done and having better results.

However, LightLock's primary customer is not its user. It is **educational institutions (universities)** that want to improve study productivity and create focused environments for their students. Therefore, LightLock focusses on a **niche market**.

Cost Structure

- Expenses related to **software** development, updates, and server hosting.
- Costs of producing and setting up the interactive **lighting system** for universities.
- Expenses for **promoting** LightLock to universities and students.
- Ongoing costs related to **customer service** and **operational management**.

Revenue Streams

- **Subscription** model: universities pay a subscription fee to use LightLock in their study spaces (could be annual or per semester).

Eco-Social Costs

- **Manufacturing** of the **lighting hardware** has an environmental impact.
- **Servers and lamps** operating the system require a lot of energy.
- **Social pressure** might negatively impact students' study performance and/or willingness.

Eco-Social Benefits

- By promoting focus and reducing distractions, LightLock contributes to students' **mental well-being** and reduces stress associated with inefficient study habits.
- **Less smartphone use** means a slower depreciation of the device and less energy consumption.

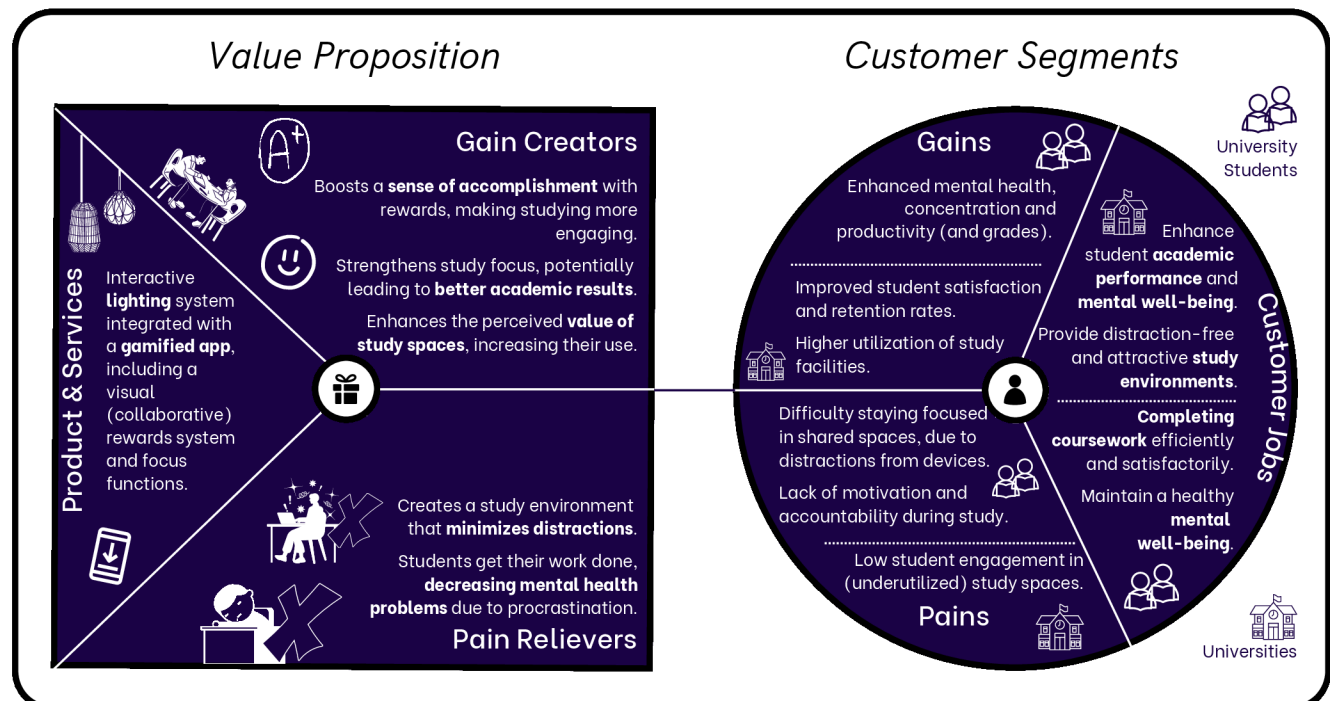
Analysis

What is LightLock's current value?

LightLock is designed for university students who want to study in open on-campus study areas. It helps students stay focused, leading to **better results**, improved **mental health**, and a stronger **sense of accomplishment**. These benefits also matter to universities because they want their students to succeed and perform well compared to other universities (see the Current Value Proposition Canvas).

LightLock uses an interactive lighting system and a smartphone app to deliver this value. The lighting system provides a social nudge, encouraging focus, while the app allows individual students to use the system. The app also locks smartphones to minimize distractions and offers visual, collaborative rewards to boost motivation.

Current Value Proposition Canvas



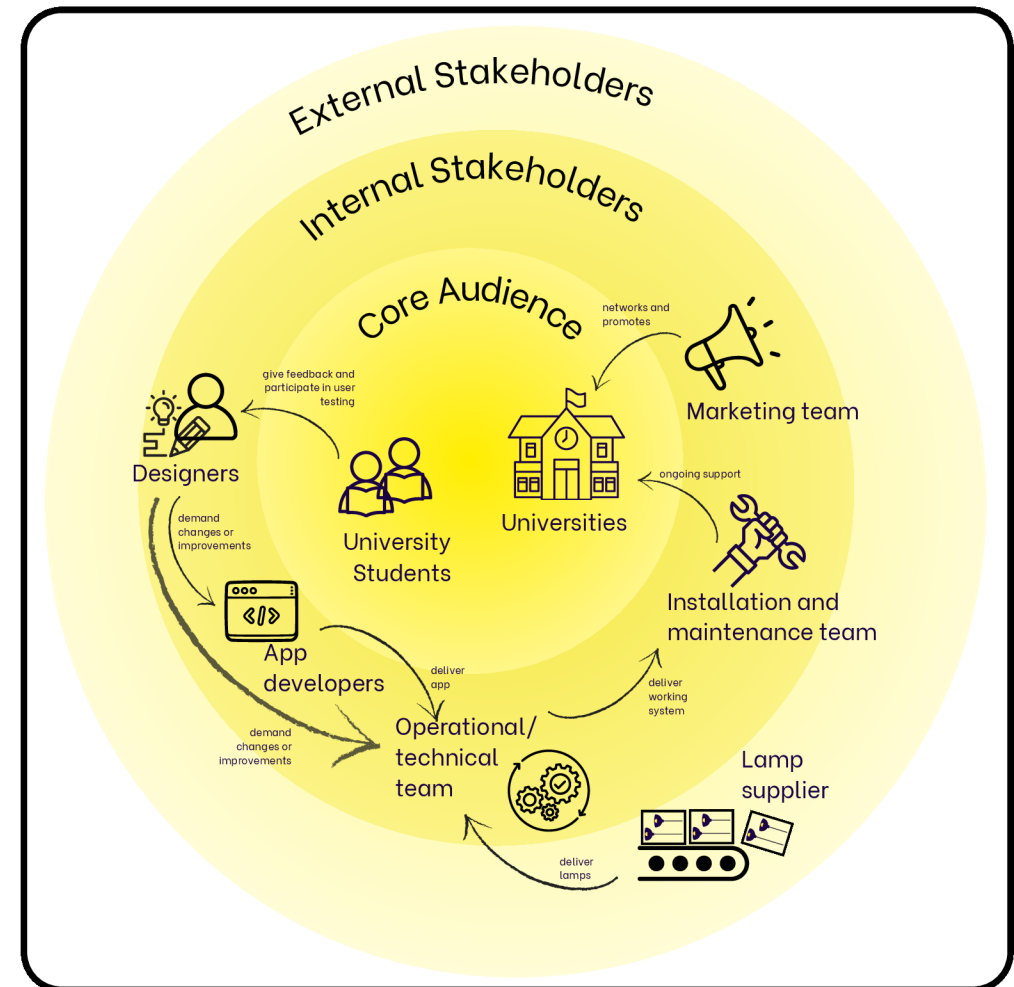
Who are LightLock's stakeholders?

LightLock's internal stakeholders include app developers, the technical team, and designers, while the only external stakeholder is the lamp supplier (see the Stakeholder Onion Map).

Designers play a key role by guiding what the team builds. They focus on the needs of the users, mainly university students, through a user-centered approach. However, this may overlook the needs of universities and sustainability goals.

Additionally, the process of making the lamps is not overlooked. Ideally, the company could make the lamps internally, as this would improve control and sustainability. However, since this is not always possible, LightLock must ensure strong agreements and regular checks with suppliers.

Current Stakeholder Onion Map



What are the important external factors?

This strategic advice focuses on making LightLock more socially and environmentally sustainable. However, the PESTLE Analysis also shows that budget constraints and legal regulations may challenge LightLock's implementation in universities. On the other hand, using new technologies for innovation in LightLock system might create valuable opportunities.

Analysing LightLock through external social and environmental factors, two main issues emerge.

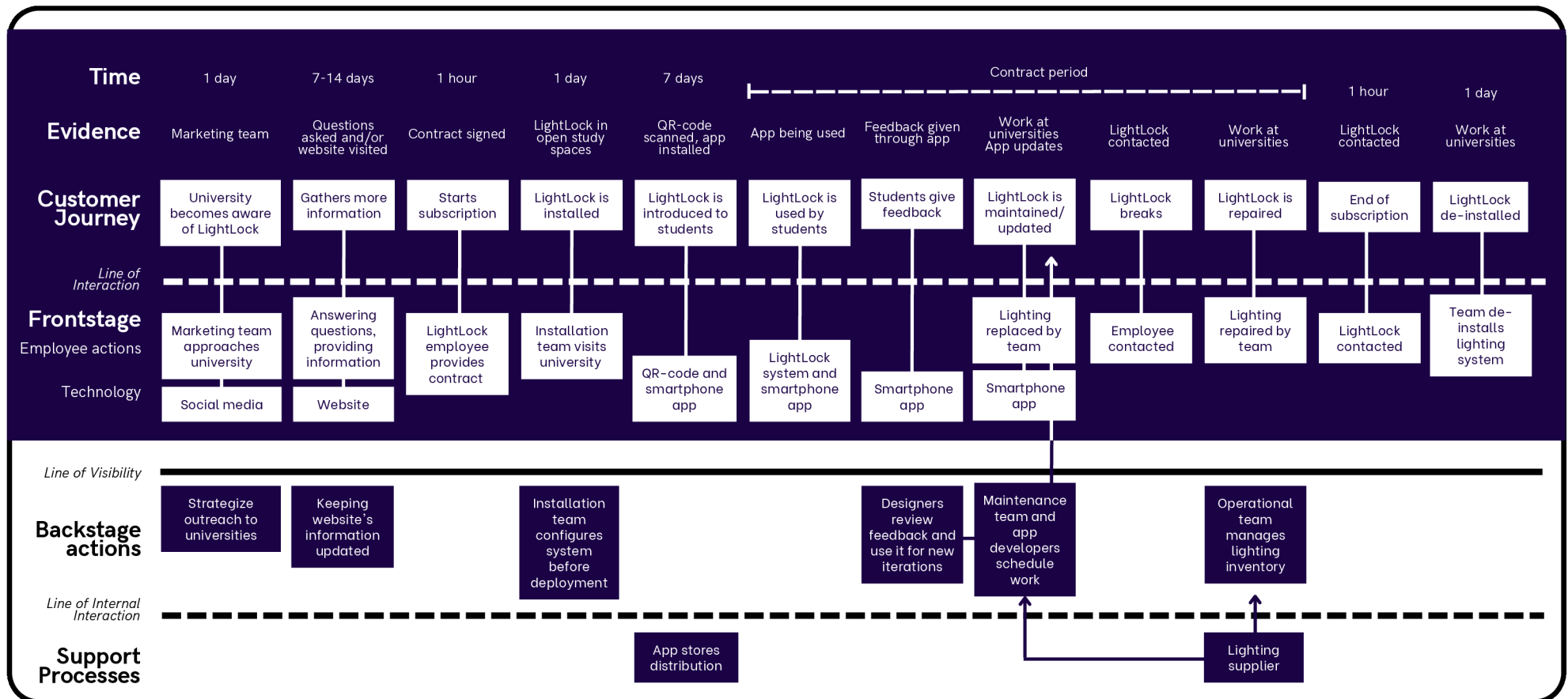
- LightLock should reduce its environmental impact through energy-efficient or circular solutions, or offset it with other sustainability efforts.
- The system may negatively affect mental health if seen as intrusive. LightLock should decide whether to adjust or rethink the entire concept to address these concerns without compromising its core purpose and values.

PESTLE Analysis

Political Government policies could mandate the use of energy-efficient LED lights. Budget cuts in academic education (Ministerie van Financiën, 2024) limits universities' ability to invest in new technologies like LightLock. Strong market arguments could help to convince.	Economic Fluctuating electricity costs (Centraal Bureau voor de Statistiek, 2025) can make it challenging for universities to maintain large-scale LightLock systems in open study spaces. Tight university budgets may reduce their willingness to invest in non-essential technologies.	Social Open study spaces' popularity might fluctuate. Students might prefer cafés or home environments for example. Rising awareness of screen time risks and digital distractions (Wacks & Weinstein, 2021) makes LightLock more attractive. Social acceptance of LightLock's nudging system might vary; some students may find light-based social pressure intrusive or stressful rather than motivating.
Technological AI, IoT, and other technological advancements could innovate LightLock's system to tackle current problems.	Legal Ethical concerns about behavioural influence may raise questions about whether LightLock respects academic freedom and student autonomy. Data privacy laws like GDPR (General Data Protection Regulation (GDPR) – Legal Text, 2024) require careful handling of user data.	Environmental Sustainability is a growing priority, also for universities (Jack, 2025). LightLock should actively take initiatives or join in existing initiatives to address this issue. LightLock could consider circular lamp systems and services to reduce ecological impact.

What does LightLock's service look like?

LightLock's current Service Blueprint (for Universities)



Analysing LightLock's Service Blueprint for universities reveals three key insights. First, it is unclear how students are introduced to the system. If it relies on QR codes around the space, it may feel disconnected and create extra work for staff. Second, feedback is only collected through the app, meaning students who stop using the study spaces due to discomfort with social nudging are not accounted for, potentially overlooking important concerns. Lastly, LightLock's current system has a considerable environmental impact, relying on energy-intensive servers, numerous lights, and frequent updates due to its iterative design process, leading to sustainability challenges.

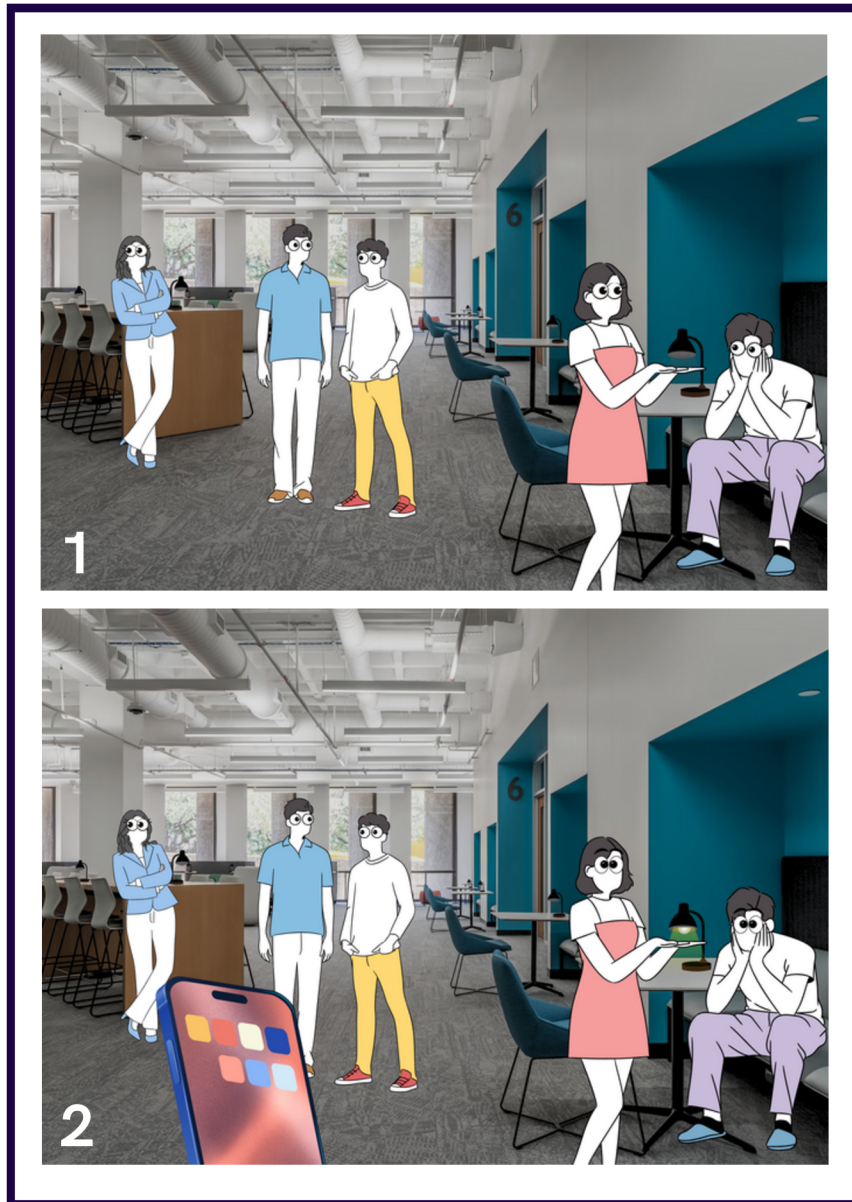
Proposed Innovation

The proposed innovation which will help LightLock become more socially and environmentally sustainable is a radical change to LightLock's system.

- Instead of a single central light, multiple smaller ambient lights will be placed throughout the study space, creating a **subtler social nudge**. This makes the nudging effect less intrusive, improving student comfort.
- The new system works without a smartphone app, servers, or cloud storage. A simple **Bluetooth scanner** (possibly a ESP32 chip (Hübschmann, 2024)) inside the lamps detects nearby active electronic devices and adjusts the lighting accordingly. When no devices are in use, the lights remain off to save energy. As devices become active, the lights gradually turn on, nudging for focus and optimizing energy efficiency.
- LightLock's lights, now table lamps, are placed beneath the existing university lamps. In this case, the new *ambient lights* can be powered by the already existing lights in the study space through built-in **solar panels** (Can You Charge Solar Panels With Artificial Light Instead of Sunlight?, 2025). This eliminates reliance on external electricity, lowering energy costs and simplifying installation.

See the next page for visualisations of the proposed innovation.

Visualisations of Proposed Innovation



Visualisations of LightLock's current lighting system



Looking at the *Sustainable* Business Model Canvas, the following section changes:



In the updated Service Blueprint for the proposed innovation (Appendix 4), two key changes are made visual. Firstly, the installation and de-installation of the lighting system is much simpler. Secondly, instead of providing feedback through an app, designers visit universities in person, allowing them to incorporate multiple perspectives into the iterative improvement process.

Evaluation

Is it the right solution to the problem?

Following the Problem-Solution Fit Canvas, the proposed innovation effectively addresses key problems by using solar-powered ambient lights to lower costs and enhance sustainability while creating a socially comfortable, non-intrusive environment for students. Bluetooth sensors remove the need for apps, making the system simple (easy to understand) and eco-friendly. Overall, this approach strengthens LightLock's commitment to both environmental and social responsibility.

Is it solving the right problem?

The solution fits the market by addressing universities' needs for affordable, sustainable, and socially comfortable study focus tools for students, improving their mental-health and academic performance (Yara Bastidas, 2024).

Problem-Solution Fit Canvas

Customer segment(s) Universities that want to improve study productivity and create focused environments for their students.	Customer limitations <ul style="list-style-type: none"> Tight budget Social standards in open study spaces Sustainability efforts 	Available solutions Implement energy-efficient, modular lighting systems to reduce energy consumption and support circularity. Cons: costs, complexity. Use adaptive, customizable light signals to gently influence behaviour while meeting user preferences. Cons: Development costs.
Problems/pains <ul style="list-style-type: none"> The additional energy costs The social pressure LightLock might bring to open study spaces 	Problem root/cause <ul style="list-style-type: none"> The high costs for energy/the low budget of universities Individuals feeling judged by other students 	Behaviour Users feel stressed or resistant to the LightLock system due to its perceived intrusiveness, potentially impacting their mental well-being and study focus.
Triggers to act Lights activate via Bluetooth when devices are used, signalling users to focus by adjusting brightness/colour.	The solution Ambient solar-powered lights for subtle nudging, reduced installation costs, and energy savings. The system operates offline via Bluetooth, improving sustainability and simplicity in study spaces.	Channels of behaviour No app required; lights work autonomously. <div>Online</div> <hr/> <div>Bluetooth sensors and physical placement of ambient lights.</div> <div>Offline</div>
Emotions Promotes calmness and comfort by being non-intrusive while empowering users with a sense of study load control.		

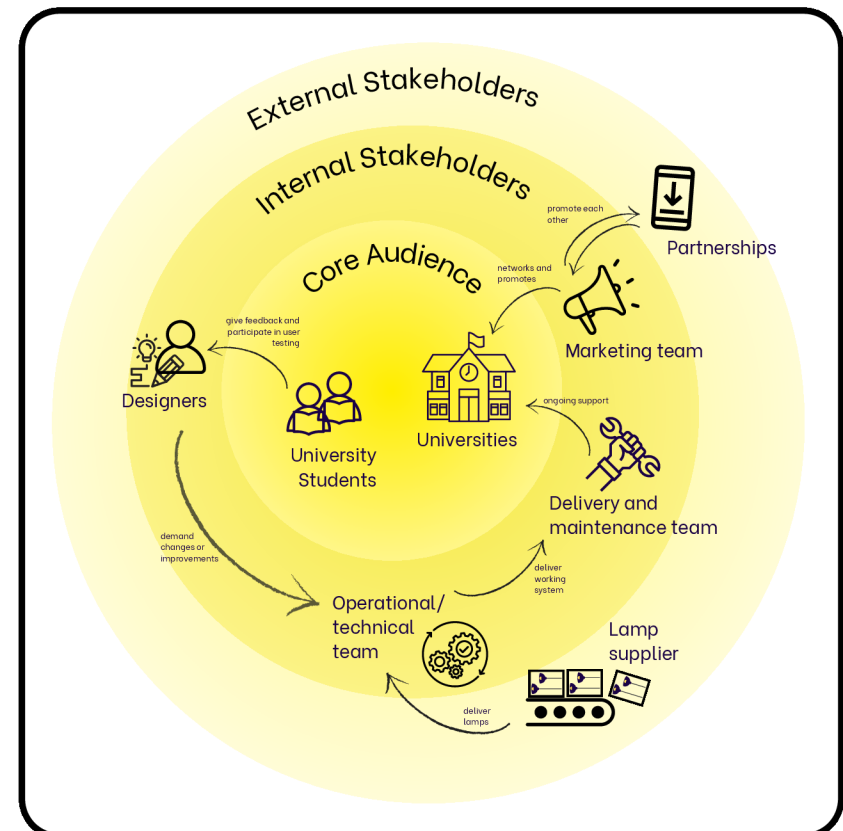
What happens to LightLock's value?

Three out of four LightLock attributes are removed due to the proposed innovation. However, evaluating the Value Laddering (see the canvas on the next page) and the Value Proposition Canvas, only one consequence—removing smartphone distractions—seems to be lost. The interactive lighting system still supports most consequences and core values.

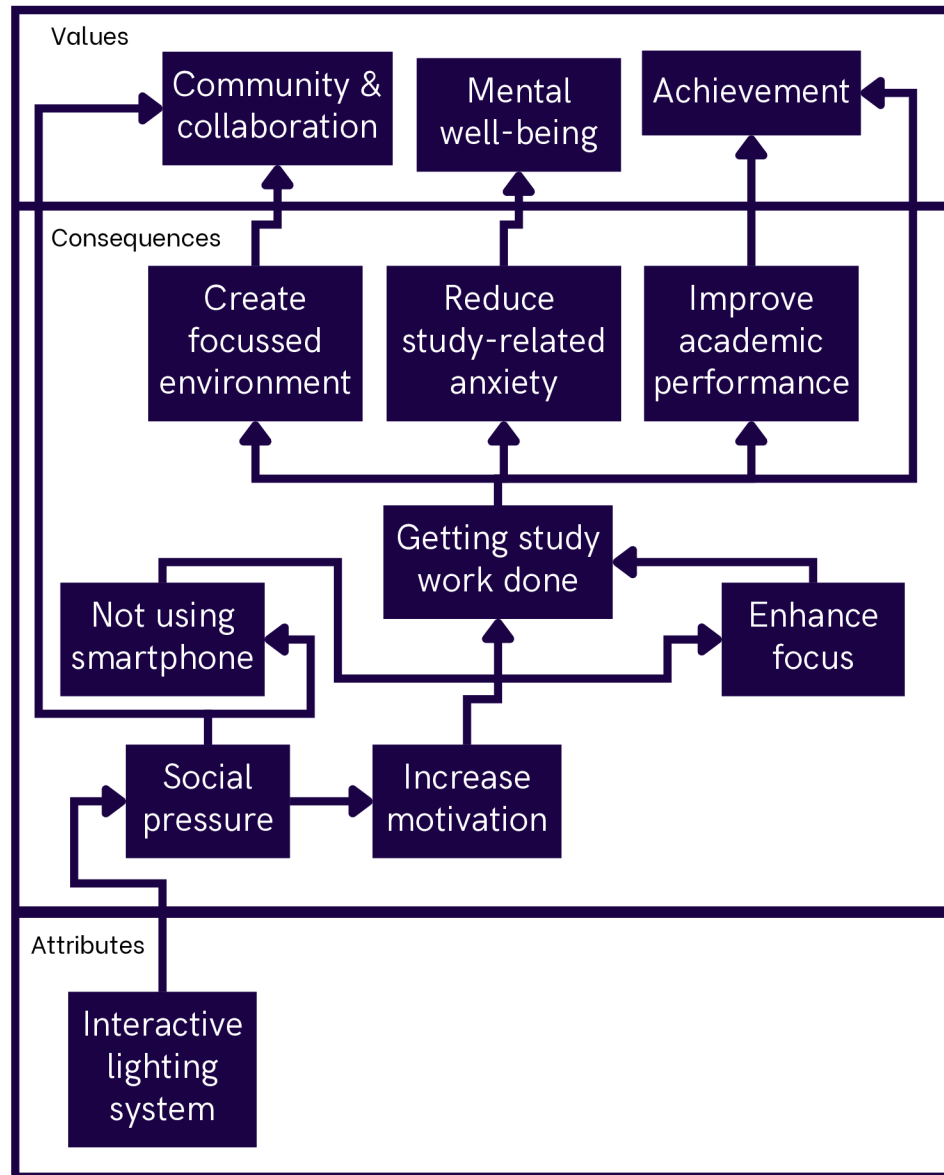
Furthermore, the proposed innovation makes LightLock's interactive lighting system the standout unique selling point. Apps like Forest already provided digital features such as visual rewards and focus timers. To still maintain accessibility for a wider audience, LightLock could partner with focus apps like Forest (Forest, n.d.), as some users may prefer a personal focus timer over a social lighting system, for example.

This shift leads to an updated stakeholder map, as shown on the right.

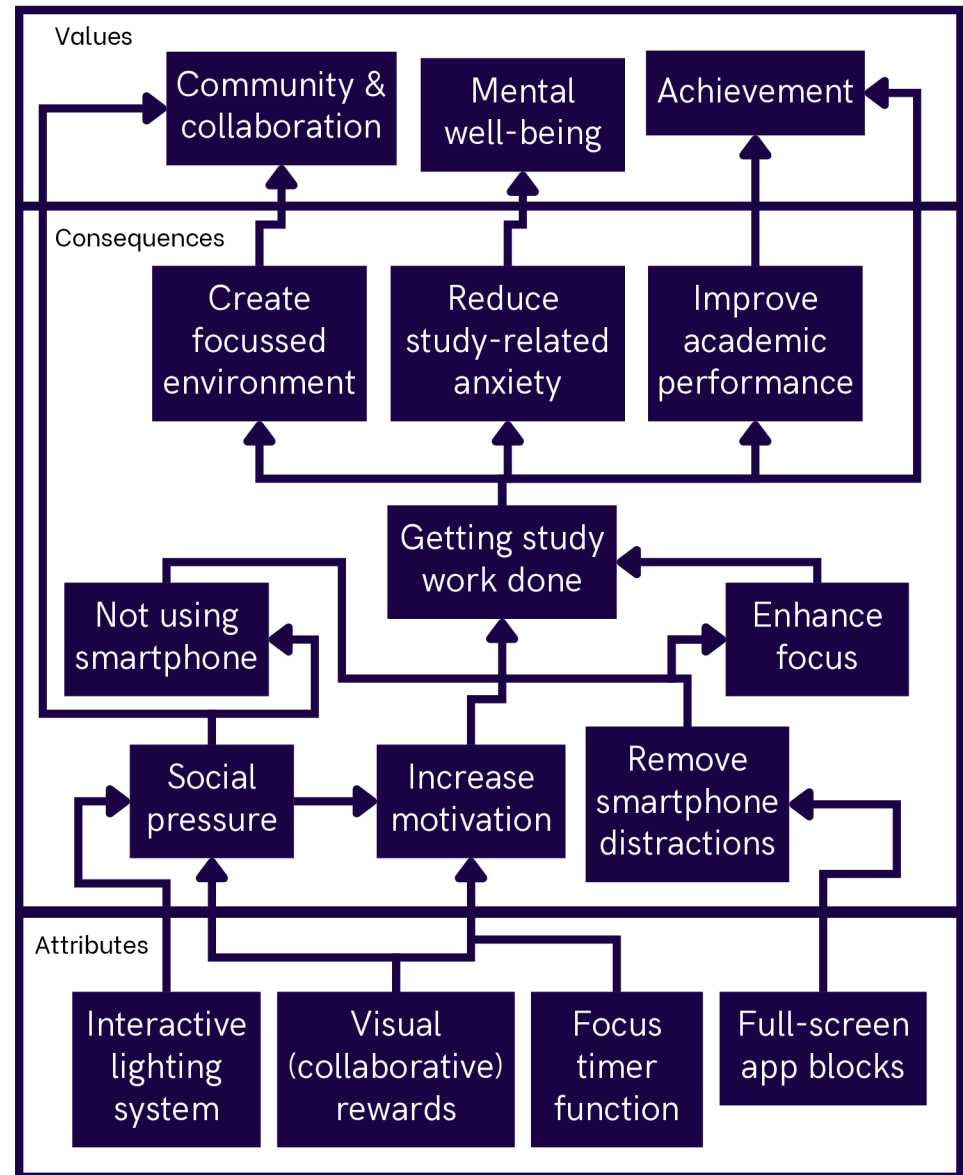
Stakeholder Onion Map



New Value Laddering



Current Value Laddering

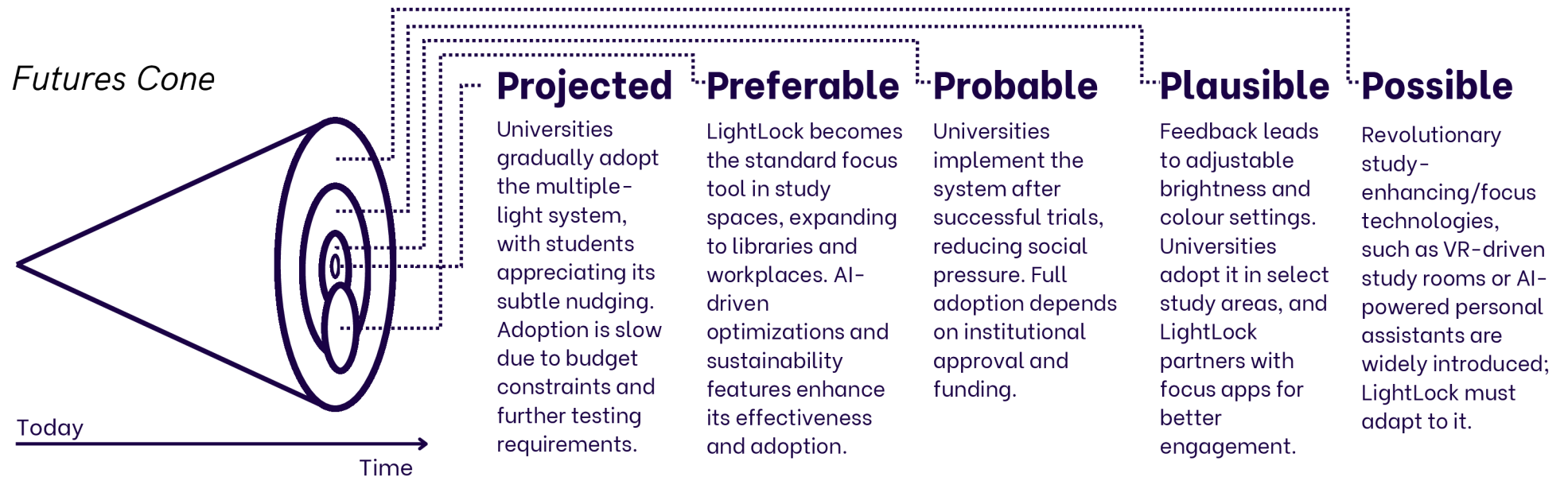


What does LightLock's target audience think about it?

MVP Experiment Canvas (testing the subtler social nudge)

<h3>4. Customer Engagement</h3> <p>Showing university students two sets of images demonstrating interactions with both LightLock’s current and proposed lighting systems and gathering their reactions. After students view the MVP images, short informal on-campus interviews will be conducted.</p>		<h3>7. Experiment Scenario/Workflow</h3> <ol style="list-style-type: none">1. Show students both sets of images (single vs. multiple lights).2. Ask key questions:<ol style="list-style-type: none">a. Which scenario feels more comfortable?b. If you had to choose one lighting system (scenario) for your study space, which would it be? Why?c. Does scenario 2 create enough social pressure for you to stay focussed compared to scenario 1?		<h3>10. Results</h3> <p>11 university students have given feedback:</p> <ul style="list-style-type: none">• 91% of the students find the multiple-light setup more comfortable than the single-light setup.• 100% of the students prefer the multiple-light setup. Reasons included that it feels less intrusive, gives less pressure, and that the effect stands out more.• 64% of the students find the multiple-light setup has enough social pressure compared to the single lights.
<h3>1. Customer Segment</h3> <p>The MVP targets university students who use shared study spaces; the current target audience of LightLock.</p>	<h3>2. Value Proposition</h3> <p>LightLock is developing a radical change to its system to help university students study with a social pressure lower than with LightLock’s previous interactive lighting system by using multiple smaller ambient lights.</p>	<h3>8. Metrics</h3> <ol style="list-style-type: none">a. Percentage of students preferring multiple lights.b. Percentage of students selecting the multiple-light setup + reasons given in qualitative feedback.c. Percentage of students answering positive.		
<h3>3. Channel(s)</h3> <p>Conducting short unstructured on-campus interviews with university students after showing them the MVP.</p>		<h3>9. Success Criteria</h3> <ol style="list-style-type: none">a. At least 70% of students find the multiple-light setup more comfortable than the single-light setup.b. At least 65% of students prefer the multiple-light setup + answers should include some words like comfort, reduced pressure, or improved ambiance et cetera.c. At least 50% of students find the multiple-light setup has enough social pressure compared to the single lights.		<h3>11. Learnings & Insights</h3> <p>Following this MVP experiment, the new lighting system offers a subtler social nudge, making LightLock more socially sustainable. It creates a more comfortable, private, and less stressful experience. While the social pressure is slightly reduced, most students still find it sufficient for LightLock to remain effective.</p>
<h3>5. Riskiest Assumption(s)</h3> <ul style="list-style-type: none">• Students will prefer multiple smaller lights over a single light.• The proposed innovative system won’t create a social pressure high enough.	<h3>6. Experiment Format</h3> <p>Show students two sets of edited images of study spaces (see Appendix 3).</p> <ul style="list-style-type: none">• One (scenario 1) with a single ambient light, where all students appear disturbed after the light switches off (second image).• One (scenario 2) with multiple smaller ambient lights, where only a few students disturbed after the light switches off (second image). <p>Feedback will be gathered through brief interviews comparing reactions to the two image sets.</p>			
				<h3>12. Next Steps</h3> <p>The next step should be to develop a small-scale working prototype for live user testing in a study space. During the MVP experiment, students suggested using varying brightness and colours based on smartphone usage duration. This is something worth exploring further through additional user testing.</p>

How could this develop in the future?



The Futures Cone shows the following insights. LightLock has strong potential to improve student focus, but its success depends on funding, institutional support, and user engagement. Early adoption may be slow, but if trials prove effective, broader use in educational and professional settings is likely. Integration with AI and personalization features could boost its impact. However, future competition from more advanced tech like VR and AI assistants may challenge LightLock's relevance, so adapting should always be key.

Conclusion

The proposed redesign of LightLock will be a meaningful shift toward greater social and environmental sustainability. A single intrusive light will be replaced with multiple solar-powered ambient lights. This new system offers a more comfortable and non-intrusive experience for students. Furthermore, this proposed innovation will make LightLock more environmentally sustainable by eliminating the need for smartphone apps, servers, and external electricity, instead using simple Bluetooth sensors and solar energy to power the lights.

The innovation directly addresses key user concerns around social pressure and mental wellbeing while also improving installation efficiency and energy use. Initial feedback from 11 university students supports the changes as 100% preferred the new setup over the old one, with most finding it more comfortable and still effective as a social nudge to limit smartphone usage.

Additionally, the updated system simplifies stakeholder engagement and promotes a more inclusive feedback loop through in-person university visits. This ensures diverse perspectives are considered and helps LightLock evolve with real student needs in mind. Although some app-based features like focus timers and digital rewards are removed, which improved users' focus even more, potential partnerships with existing focus apps (for example, Forest (Forest, n.d.)) could restore this functionality and therefore keep make LightLock appeal to a broad audience.

Overall, this innovation will make LightLock more socially and environmentally sustainable. The next step is to further develop and test the prototype in real-world study spaces, with an emphasis on optimizing lighting behaviours and exploring partnerships to support diverse student preferences.

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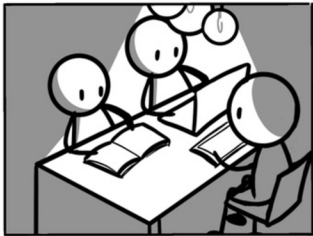
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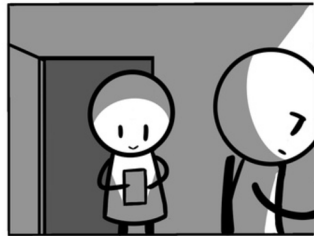
Yara bastidas. (2024, October 9). <https://www.iesalc-unesco.org/2024/10/09/new-brief-on-student-mental-health-support-in-higher-education-released/>

Appendices

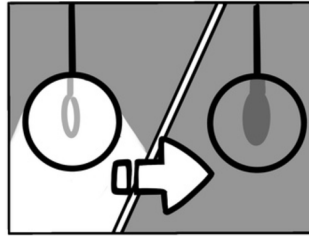
Appendix 1: LightLock User Scenario Storyboard



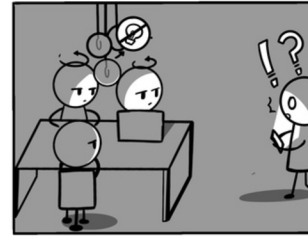
Students are concentrating on their studies with the help of LightLock.



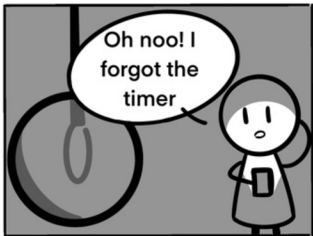
Max enters, chatting on his smartphone.



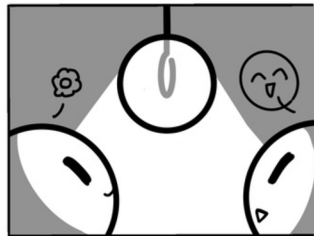
A light flickers and turns off.



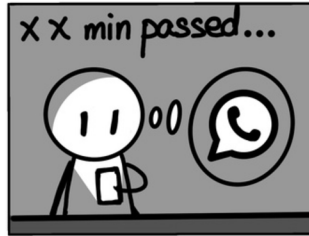
Everyone turns to look at Max and he feels ashamed.



Max opens the LightLock app and starts a timer.



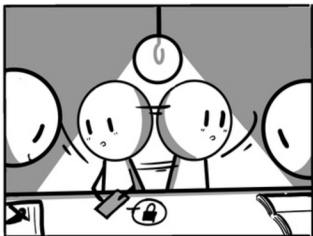
The light turns on again. Time to study with focus, like his peers.



Oh, oh, Max is distracted, he wants to chat again.



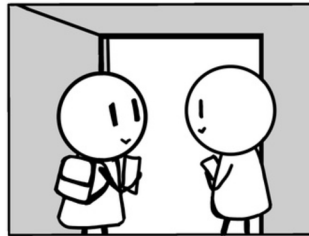
The LightLock app makes him wait for 10 secs.



Max looks at his peers, and puts his smartphone away.

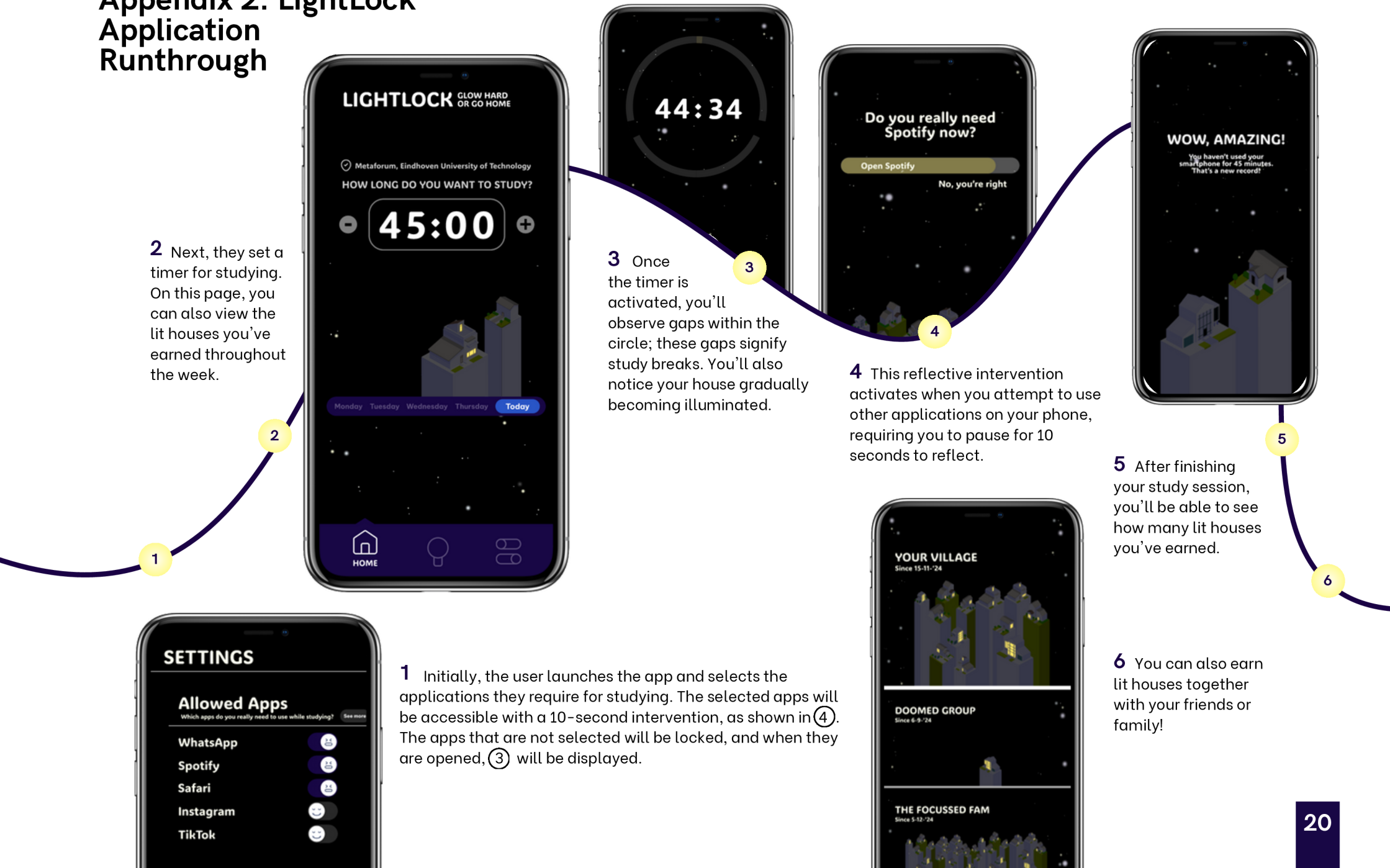


Max has completed his study session and has earned 2 lit houses.



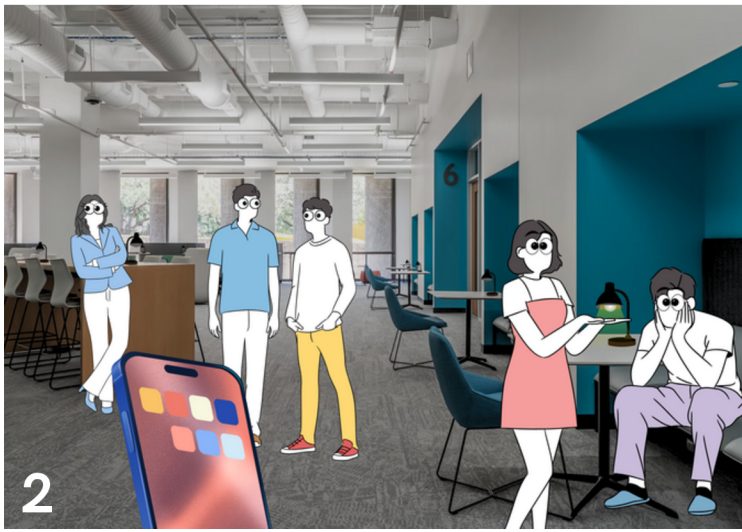
Illustrations
by Lu Jinlin

Appendix 2: LightLock Application Runthrough



Appendix 3: Visualisations of Proposed Innovation and LightLock's current lighting system

Visualisations of Proposed Innovation



Visualisations of LightLock's current lighting system



Appendix 4: Service Blueprint for Proposed Innovation

