Reducing Screen Time with Screen2Green – An EPS@ISEP 2026 Project

Abstract. Screen2Green is a smart plant pot system developed during the European Project Semester (EPS) at the Instituto Superior de Engenharia do Porto (ISEP) in 2026. It focuses on the problem of excessive smartphone use, especially among students and young adults. The idea is to connect screen-time awareness with the care of a real plant, so users can receive simple and visible feedback about their habits instead of only digital reminders. The system includes an indoor planter, sensors, a gravity-fed watering system, and a mobile application for focus sessions and plant information. This paper explains the main research background, related work, marketing and ethical considerations, sustainability decisions, product design, packaging, and prototype development. The final prototype shows how a physical product can support digital well-being in a more engaging way. It also reflects the project goals of making the design simple, affordable, repairable, sustainable, and respectful of user privacy.

Keywords: Engineering Education, European Project Semester, Smart Planter, Digital Well-being, Screen Time, Sustainable Design.

1 Introduction

The Screen2Green project was developed in 2026 as part of the European Project Semester (EPS) at the Instituto Superior de Engenharia do Porto (ISEP). It was carried out by an international team with backgrounds in engineering, design, media technology, security, and web development, supporting a multidisciplinary approach [24].

Screen2Green addresses excessive smartphone use, which can affect attention, stress, and well-being [29]. Existing screen-time apps often rely on digital reminders, which may not lead to lasting behavior change. At the same time, indoor plants can support mental health but require regular care [17]. Therefore, the project needed a simple indoor system that connects smartphone habits with plant care and gives visible feedback. As such, the team proposes the Screen2Green smart plant pot and mobile application. Users can set screen-time limits and focus sessions through the application. This information is used to show progress and provide feedback on digital habits. The watering system, however, is controlled by plant-care data, such as soil moisture, to keep the plant healthy. As a result, the plant works as a visible indicator of user behavior without being negatively affected by it.

The remainder of this report presents the related work, design process, prototype development, testing, and conclusions.

2 Preliminary Studies

2.1 Related Work

Excessive screen time negatively affects mental health, particularly among young people. Studies link high screen use to anxiety, depression, stress, sleep problems, and reduced well-being [35,3]. Social media also promotes repeated phone checking through notifications and feedback loops [29]. These findings highlight the need for tools that support healthier smartphone habits.

Several digital well-being tools, such as Forest, Liven, and Minimalist Phone, aim to reduce phone use [31,23,15]. They use timers, rewards, usage tracking, and simplified interfaces. Some adopt the Pomodoro Technique to structure focus sessions [9]. However, these solutions remain fully digital and users can bypass their feedback.

The growing medium also influences the design of a screen-time-linked smart planter. Soil is less suitable because it is messy, attracts pests, and retains water [16]. Hydroponic and semi-hydroponic systems provide a clean and controlled alternative. Real plants also promote a stronger sense of responsibility than virtual representations [22].

Smart indoor growing systems use sensors, the Internet of Things (IoT), and automation to support plant care [25,4]. Commercial products, such as AeroGarden Harvest, apply hydroponics, light-emitting diode (LED) lighting, and automated cycles [1]. However, these systems focus on plant growth and do not link plant status to user behavior.

Table 1 compares the main contributions and limitations of these works. It

Table 1. Comparison of related work

Focus	Type	Contribution	Limitation / relevance
Screen time and mental health	Scientific	Identify negative effects on well-being.	Motivate need for intervention tools.
Digital well-being apps (Forest, Liven, Minimalist)	Commercial	Timers, rewards, tracking, app blocking.	Fully digital; feedback easily ignored.
Hydroponics / Semi-hydroponics	Technical	Clean, controlled plant growth.	Enable clear physical feedback.
Basil cultivation	Scientific / Practical	Reliable indoor growth; visible response.	Suitable prototype plant.
Lighting studies	Technical	Define light effects on growth.	Support simple, low-cost design.
Smart growing systems (e.g., AeroGarden)	Commercial / IoT systems	Automated plant care with sensors and LEDs.	No link to user behavior.

reveals a clear gap between digital well-being tools and smart growing systems. Screen2Green addresses this gap by linking smartphone habits with real plant-based feedback. It connects user behavior with plant response and integrates digital monitoring with a physical system, which provides a tangible and engaging intervention. Basil was selected as the target plant because it grows well in controlled systems and shows clear responses to environmental changes [5,30].

2.2 Ethics

This chapter presents the main ethical concerns considered in the development of Screen2Green. Since the product combines electronics, water control, plant care, screen-time data, and a mobile application, the main concerns are safety, privacy, responsible feedback, environmental impact, plant welfare, and liability.

Engineering safety is important because Screen2Green uses electronic components, sensors, a microcontroller, and a water supply system. Possible risks include water leakage, electrical faults, sensor errors, and wrong irrigation decisions [26,18]. To reduce these risks, the design separates water and electronic parts, uses waterproof protection, applies safe watering limits, and includes testing in real-world conditions.

Screen2Green aims to support healthier screen habits, but the feedback should not make users feel guilty, controlled, or pressured [20]. Therefore, the app should use encouraging feedback instead of punishment, while keeping the plant protected within safe care limits.

Regarding data privacy and cybersecurity, Screen2Green collects screen-time and environmental data, such as soil moisture, temperature, humidity, and light levels. Since screen-time data can show personal habits, users should clearly know what data is collected, why it is needed, how it is used, and whether it is shared [12]. The system should collect only necessary data and consider secure communication, authentication, and software updates [10].

Professional competence is relevant because the project combines electronics, sensors, water control, user data, and automated plant care. The team should recognize technical limitations, ask for support when needed, use relevant guidance, and test the product to make sure it works safely and reliably.

Considering sales and marketing ethics, Screen2Green should be presented honestly as a digital well-being and lifestyle tool, not as a medical product [32]. Marketing should avoid claims about curing phone addiction or treating mental health problems, as well as fear-based messages, guilt-based messages, dark patterns, and stressful notifications [27].

Environmental responsibility was considered through energy use, repairability, product lifespan, end-of-life management, and plant welfare. Low-power components can reduce energy use, while modular parts make repair and replacement easier [19]. Electronic parts should be separated for e-waste collection, and safe watering limits help prevent overwatering or underwatering.

Liability is important because a system failure could affect the user, the plant, nearby objects, or user data [11]. Therefore, the main design decisions include separating water and electronics, adding waterproof protection, using reliable sensors, limiting irrigation, collecting only necessary data, giving clear user information, avoiding manipulative feedback, using modular repairable parts, sending alerts, and including a manual override function.

2.3 Marketing

This chapter presents the main marketing considerations for Screen2Green, including the target users, market gap, design decisions, marketing strategy, and control methods.

Screen2Green targets students, young adults, and urban users who spend a lot of time on smartphones and want to improve their daily habits. Since high screen time can affect young people's mental health [6], the product connects digital habits with a real plant to make screen-time feedback more visible and engaging. Moreover, this analysis identified a gap between screen-time apps and smart plant systems. Screen2Green fills this gap by combining digital well-being with plant care in one product [7].

The market study showed that Screen2Green should be affordable, simple, and easy to use. This is important because the main target users are price-sensitive and may not want a product that is too complex. The main challenges are privacy concerns, maintenance, technical reliability, and competition with free screen-time apps. Therefore, the product needs to clearly explain how screen-time data is used [14] and show why a real plant can offer a more meaningful experience than a typical screen-time app [7].

Based on the market study, Screen2Green was designed as a hybrid product that combines a smart indoor plant pot with a mobile application [8]. The main design decisions were automated watering, screen-time tracking, focus sessions, simple notifications, plant-based feedback, compact size, easy maintenance, and clear privacy information.

Screen2Green is positioned as a smart lifestyle product that connects productivity, digital well-being, and indoor gardening. The proposed price range is 50 € to 70 €, using value-based and market penetration pricing to stay affordable and attract early users [8]. The product would mainly be sold through digital channels, such as a website, online platforms, and app stores. Promotion would focus on social media, short videos, university activities, introductory offers, and collaborations with creators related to productivity, wellness, and student life.

The marketing strategy could be checked using indicators such as social media engagement, click-through rate, conversion rate, customer acquisition cost, pilot participation, and app downloads [33]. A plan, do, check, act approach could also be used to plan, test, evaluate, and improve the strategy based on user feedback and market response [2].

2.4 Sustainability

Sustainability was considered for Screen2Green through environmental, economic, and social aspects. The project focuses on reducing material waste, saving water and energy, improving repairability, and supporting responsible end-of-life management.

Environmental sustainability was addressed through material choice, water and energy use, and disposal strategy. The pot uses bio-based polylactic acid (PLA) for the 3D-printed parts and Portuguese cork for the base and outer structure [21,28]. The system uses soil moisture sensing to water the plant only when needed, which helps reduce unnecessary water use and overwatering. The gravity-fed design lowers energy use by avoiding an electric pump. The modular structure also makes it easier to separate electronic and bio-based parts for repair, recycling, and responsible disposal [13].

Economic sustainability was considered by making the product durable, repairable, and affordable. Replaceable components, such as sensors, the relay module, and the solenoid valve, allow single parts to be changed instead of replacing the whole product. Simple manufacturing, local suppliers, and modular assembly can also help reduce costs, making the product more suitable for students and young adults.

The social aspect of Screen2Green focuses on digital well-being and simple indoor plant care. The product encourages users to become more aware of their smartphone use by connecting screen-time habits with the care of a real plant. It also gives people in small living spaces an easy way to interact with nature indoors, while still keeping users involved in basic plant care.

Screen2Green contributes to the Sustainable Development Goals (SDGs), especially SDG 3, SDG 6, SDG 12, and SDG 13 [34]. It supports SDG 3 by encouraging healthier digital habits and more contact with nature [6,17]. It supports SDG 6 through soil moisture monitoring and optimized irrigation. It contributes to SDG 12 through bio-based materials, replaceable parts, modular design, and responsible end-of-life management. It also supports SDG 13 by using local materials, reducing transport impact, and keeping the system low-energy.

3 Proposed Solution

3.1 Concept

Figure 1 shows the overall concept of Screen2Green. The concept includes three main parts: the smart plant pot, the mobile application, and the sustainable packaging. The product connects smartphone screen-time behavior with the care of a real indoor plant. The app supports focus sessions and gives feedback, while the plant pot makes digital habits more visible through plant growth and care.

3.2 Design

The final design of Screen2Green includes the smart planter structure, control system, user application, and packaging. It focuses on safe indoor use, automatic plant care, and sustainable packaging.

Structure Screen2Green was designed as a compact smart planter for indoor use. It includes a removable inner pot, a transparent polyethylene terephthalate (PET) wrap-around water tank, a cork outer body, and a protected base for the electronic components. The inner pot holds the plant and growing medium, while the water tank allows easy water-level checking and supports gravity-fed

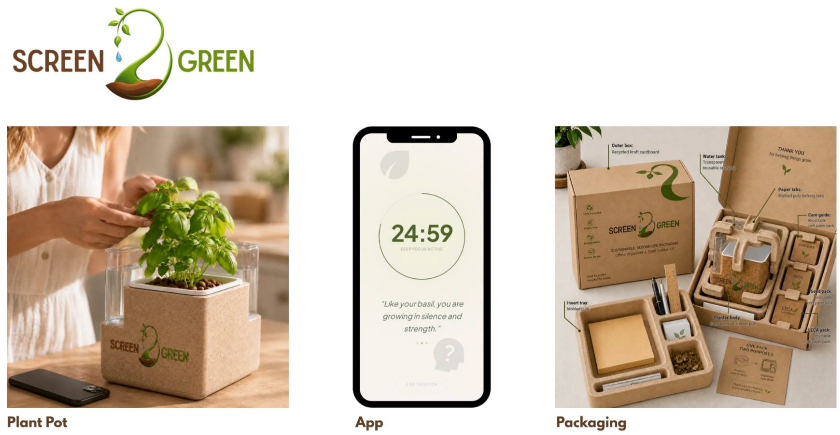

Fig. 1. Screen2Green concept.

irrigation. The tank shape helps maintain stability and a balanced appearance. The electronics are placed in the lower part of the product and separated from the water area to improve safety. Cork was selected for its natural appearance, while PET was used because it is waterproof and transparent.

A basic structural check was carried out using 3D-printed test models to see whether the main parts could fit together properly. The check focused on the inner pot, wrap-around water tank, cork outer body, and lower electronics compartment. It also considered basic stability, water flow direction, and the separation between the water and electronic components. The results showed that the main parts could be arranged in a compact form and that the water tank position supported gravity-fed irrigation. The electronics could also be placed below and away from the water area. No major interference between the parts was found. Further computer-aided design (CAD) simulations and physical load tests are still needed to check strength, deformation, and long-term durability.

Smart Control The smart control system uses a microcontroller, a soil moisture sensor, and a solenoid valve to manage watering. When the moisture level is below the set threshold, the valve opens for a short time and water flows to the plant by gravity. This pump-free system helps reduce energy use, while the limited watering time helps prevent overwatering. The system also updates the plant status in the user application.

User Application The user application connects screen-time behavior with plant care. Users can check the plant status, start a focus session, view their progress, and change basic settings. The interface was designed to be simple, so users can focus without extra distractions. In the main flow, the user opens the app and chooses either to check the plant or begin a focus session. During the session, the app monitors phone use. If the user uses the phone, the app sends a gentle reminder. If the user stays focused, the session continues as normal. At the end, the app updates the user's progress and changes the plant feedback based on the session result.

Packaging The packaging protects the smart planter and its accessories while reducing plastic use. It uses recycled kraft cardboard and a molded pulp tray. The tray keeps the parts organized during transport and can be reused after unpacking as a desk organizer or seed starter. Figure 2 illustrates the sustainable packaging design of Screen2Green.

Fig. 2. Packaging solution.

4 Prototype Development

4.1 Assembly

The Screen2Green prototype was assembled to test the main parts of the proposed solution, including the planter structure, smart irrigation system, and mobile application. Some details were simplified, but the prototype helped check the overall layout, watering function, and basic user flow.

Structure The structural prototype was made to check the main layout of the smart planter, including the plant area, water tank position, and space for technical components. It was used to see if the main parts could fit together in a compact form.

Smart Control Compared with the first smart system design, the main idea did not change. The system still uses sensor data to control the watering process. However, for the prototype, the control part was kept simple and focused on soil moisture sensing and valve control. The smart control prototype was built using an ESP32, a soil moisture sensor, a relay module, a step-down converter, and a 12 V solenoid valve. The ESP32 reads the soil moisture value and controls the valve through the relay. The 12 V power supply is used for the valve, while the step-down converter provides 5 V for the other components. When the sensor value shows that the soil is too dry, based on a predefined threshold, the ESP32 activates the relay and opens the valve for a short time. This allows water to flow to the plant by gravity.

User Application The companion mobile application prototype was developed to show the main user flow. It includes account creation, planter connection, plant monitoring, focus sessions, progress tracking, and user settings. The plant page shows the main plant status, while the focus page helps users set focus sessions and receive feedback based on phone use. The Journey and Profile pages support progress tracking and basic settings. The application was developed using Flutter, with Supabase selected for backend functions.

4.2 Tests & Results

The prototype was tested to evaluate the structure, smart control system, and mobile application. The structure was checked through visual inspection and assembly review, and the smart control system was tested using the ESP32, soil moisture sensor, relay module, step-down converter, 12 V solenoid valve, and 12 V power supply. For the mobile application, functional, performance, load, and usability tests were performed using the app prototype, Dart DevTools, k6, and the System Usability Scale. The results helped identify the main limitations and possible improvements for the next version.

Structure The prototype structure was checked through visual inspection and assembly review. This confirmed that the main parts could fit together and that the electronics area was separated from the water area. The tank shape was also considered to guide water toward the outlet and keep the product balanced during handling.

Smart Control The smart control prototype used an ESP32, a soil moisture sensor, a relay module, a step-down converter, and a 12 V solenoid valve. The ESP32 reads the moisture value and controls the valve through the relay. The valve uses 12 V, while the control components use 5 V from the step-down converter. When the moisture level is below the threshold, the valve opens for a short time and water flows by gravity. Since the test was done on a breadboard, the final version still needs waterproof protection and longer real-watering tests.

Web/Mobile Software Application The mobile application prototype was tested through functional, performance, load, and usability tests. The functional tests checked the main user flows, including account creation, planter connection, focus sessions, plant monitoring, settings, and focus history. Performance testing with Dart DevTools showed fast rendering, with an average user interface (UI) build time below 2 ms and an average raster build time below 5 ms. This suggests that the interface can run smoothly in normal use. A preliminary load test was prepared with k6 using 200 user profiles, but larger testing was limited by Supabase application programming interface (API) restrictions. Usability was evaluated using the System Usability Scale. Six users tested the app and gave an average score of 74.17. This shows that the prototype is generally usable, but the focus controls and planter connection process should be made clearer in the next version.

5 Conclusion

5.1 Project Outcomes

The main outcomes of the project are the Screen2Green design and a functional prototype of a smart plant pot integrated with a mobile application. The prototype incorporates a planter, water reservoir, sensors, a gravity-fed irrigation system, and an application interface.

The project showed that screen-time feedback can be connected to a real plant in a simple and engaging way. The prototype supports focus sessions, plant monitoring, notifications, focus history, and basic automatic watering.

However, the prototype still needs more testing. The main limitations are sensor accuracy, long-term watering reliability, water leakage prevention, back-end stability, and the real effect on user behavior. Overall, Screen2Green works as a proof of concept, but further development is needed before it can become a complete product.

5.2 Personal Outcomes

These personal outcomes synthesize the team's testimonies from this semester-long learning experience in the design of Screen2Green and the development of a corresponding proof-of-concept prototype.

The EPS@ISEP experience developed competencies in Agile practices, including Scrum Master responsibilities, and strengthened skills in application development, ethics, and front-end design using modern frameworks. The team acquired practical experience with Flutter and Supabase and enhanced capabilities in project management and marketing. It increased interest in applied IoT through the development of a functional product.

Participants acquired fundamental skills in electronics, including circuit design, component selection, and assembly. The team developed cross-disciplinary communication skills and integrated sustainability considerations into product development while working in an international and multidisciplinary team. The experience emphasized the importance of clear communication in international contexts. It strengthened teamwork and time management and promoted a pragmatic approach to task execution.

Team members improved their ability to manage tasks systematically, collaborate effectively, and incorporate ethical considerations into product development. The project also fostered interest in design and innovation.

Finally, the project strengthened project management, leadership, and collaboration skills. Work across disciplines required trust in team expertise and enabled contributions in areas such as product design and 3D modeling.

5.3 Future Development

Future work should include extended user testing with larger samples and longer evaluation periods. This would enable assessment of whether plant-based feedback improves focus and reduces screen time. The application can then be refined by providing clearer progress indicators, improved focus settings, and basic privacy controls.

The hardware requires further development. Sensor calibration must be improved, and electronic components must be better protected against water exposure. The watering system should be validated under diverse indoor conditions to prevent overwatering and underwatering. Future iterations may support a wider range of herbs or small plants.

Screen2Green should remain simple, affordable, and user-friendly while improving reliability as a tool for digital well-being.

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