

Gamification in Electrical Energy Monitoring

Patrick Antonio Morelo^{1*}, Jorge Anderson de Jesus Santos², Pericles Vinicius Cerqueira Marques, Rebeca Oliveira dos Santos², Paulo Henrique de Jesus Santana², Marcus Vinicius Mendes²

¹*Federal University of Santa Catarina; Florianópolis, Santa Catarina;*

²*SENAI CIMATEC University; Salvador, Bahia, Brazil*

The project aimed to develop, in 8 months, a gamified digital platform for monitoring electrical parameters. A flexible user interface was designed to accommodate various usage requirements. The innovative factor lay in the application of gamified workflows, which facilitated the user experience and promoted greater engagement. In the current technological scenario, apps and digital platforms play a crucial role in many corporate sectors. Several service and industrial sectors have explored this trend to improve customer experience and optimize business management. In this project, the results culminated in the optimization of graphical visualizations on the platform, enabling detailed analyses at any time. The development also included gamification resources, such as a point system converted into currency (DeepCoin) and interactive screens with user-friendly navigation.

Keywords: Gamification. Energy Consumption. Electric Power. Conscious Electricity Consumption.

Digital transformation has driven significant innovations across sectors, making gamification a promising strategy to enhance user experience and optimize system management. In the context of monitoring electrical parameters, the application of gamified elements can increase engagement, ease of use, and efficiency in data analysis [1,2].

This project aimed to develop, over an 8-month period, a gamified platform for monitoring electrical parameters, called Deep Monitor. The proposal focused on creating a flexible and customizable interface that incorporates interactive resources, encouraging active user participation through a point-and-reward system.

Additionally, the project encompassed conceptual research on gamification in the context of energy measurement and consumption, interface redesign implementation, solution architecture enhancements, and the development of additional functionalities. This expanded abstract presents the main challenges, methodologies, results, and

conclusions obtained during the development of the platform.

Materials and Methods

The Deep Monitor platform was developed using lean inception (Paulo Caroli, 2017) and DIP&T, SENAI CIMATEC's product development and innovation methodology. The project followed five stages: (1) conceptual and informational research; (2) development; (3) implementation; (4) user testing; and (5) validation.

A literature review was conducted on gamification in energy monitoring, analyzing intrinsic and extrinsic approaches, and reviewing competitor platforms to identify trends and opportunities. Lean inception [3] was applied to understand technical requirements and user needs, using shared kanban boards segmented into critical functions and product features.

Conceptual design produced preliminary layouts and improved graphical interfaces, optimizing user navigation and developing a billing system for financial visualization of consumption. Due to the rigid software architecture, flexibility was limited; however, a future-scalable concept was proposed.

Gamification features were mapped using the Game Model Canvas (GMC) [4], defining points, leaderboards, achievements, virtual

Received on 24 May 2025; revised 21 July 2025.

Address for correspondence: Patrick Antonio Morelo. Rua Eng. Agrônomo Andrei Cristian Ferreira, s/n - Trindade, Florianópolis, Santa Catarina, Brazil. Zipcode: 88040-900. E-mail: patrick.a.morelo@gmail.com.

Original extended abstract presented at SAPCT 2025.

currency (DeepCoin), and rewards. During the implementation stage, gamified flows were integrated to provide tips, promote competition, track energy savings through rankings, and assist users in achieving their consumption goals. Usability tests were conducted [5] using the Task Success Rate (TSR) and System Usability Scale (SUS) metrics. Participants aged 20–40, from administrative, engineering, marketing, and design fields, performed tasks under controlled conditions.

Results and Discussion

The improvements led to a more intuitive and efficient platform, reducing cognitive load. Gamification research-informed redesigns of user flows, functionalities, and navigation. Code refactoring solved existing issues. Usability tests spanned three days:

Day 1: 2 users, TSR $\approx$ 55.6%. Some obstacles with incomplete tasks.

Day 2: 3 users, TSR $\approx$ 59.3%. Better performance overall.

Day 3: 3 users, TSR $\approx$ 33.4%. Decline attributed to higher task complexity.

Post-test surveys praised the interface but noted technical terms that required clarification and steps that required external assistance. These insights were compiled into recommendations. The findings confirm that gamification and improved interface design enhanced user experience and platform efficiency.

Conclusion

The Deep Monitor development enhanced the interface structure and visualization of energy

monitoring data, making interpretation more transparent and intuitive. Gamified features such as point-to-currency conversion (DeepCoin) and interactive navigation provided a more immersive user experience.

The project demonstrated that gamification increases engagement and usability in electrical monitoring. The redesign, code refactoring, and testing improved usability and efficiency. The implementation of a documentation and billing system added value, making data analysis more accessible. The project achieved its goals and left a roadmap for future improvements.

Acknowledgements

The authors thank SENAI CIMATEC for the research scholarships.

References

1. Huseynli B. Gamification in energy consumption: a model for consumers energy saving. *Int J Energy Econ Policy*. 2024;14(1):312-20.
2. Cravinho J, Lucas R, Brito M, Albuquerque DP, Mithoowani U, Mateus NM. Energy gamification: design and development of a user interface tool to upgrade social experience and energy literacy. *Open Res Eur*. 2023;2:130.
3. Caroli P. *Lean inception*. São Paulo: Caroli.org; 2017.
4. Keshmiri F. The effect of gamification in entrepreneurship and business education on pharmacy students' self-efficacy and learning outcomes. *BMC Med Educ*. 2025;25(1):491.
5. Albert B, Tullis T. *Measuring the user experience: collecting, analyzing, and presenting usability metrics*. Amsterdam: Newnes; 2013.
6. Cummins RA, Gullone E. Why we should not use 5-point Likert scales: the case for subjective quality of life measurement. In: *International Conference on Quality of Life in Cities*; 2000; Singapore. p. 74-93.