Published in Proceedings of the 7th international conference on gamification & serious game, Geneva, Switzerland, 2022-06-29, 2022-07-01, which should be cited to refer to this work.

# 4 A SERIOUS GAME FOR FIRMS WILLING TO REDUCE THEIR ECOLOGICAL FOOTPRINT BY USING INFORMATION SYSTEM

**Steve Berberat, Rosat Damien**
Haute école de gestion Arc, HE-Arc, HES-SO, Neuchâtel, Switzerland
*steve.berberat@he-arc.ch*

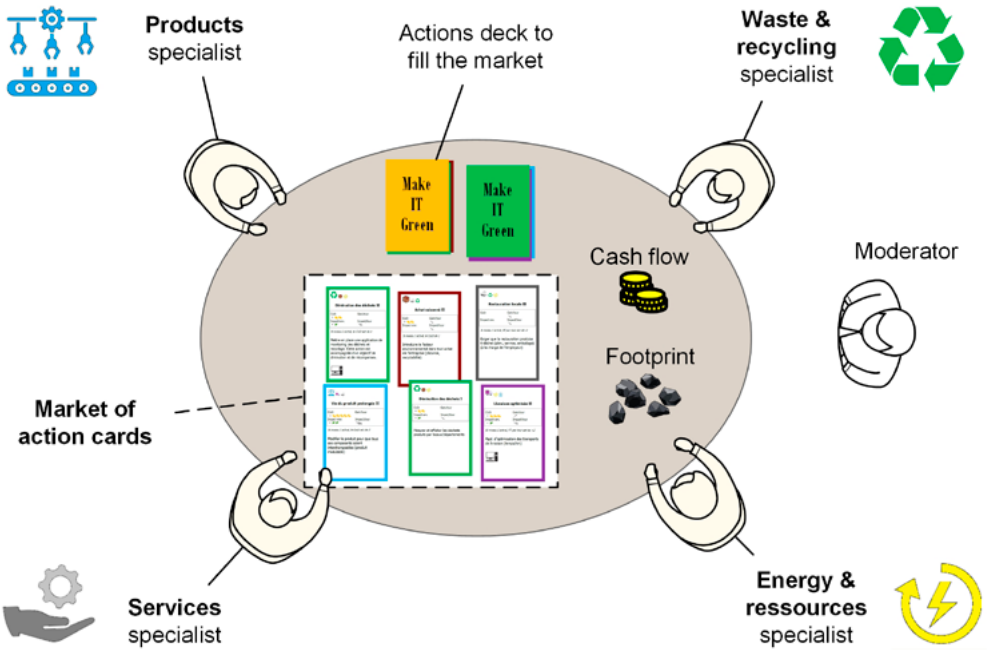


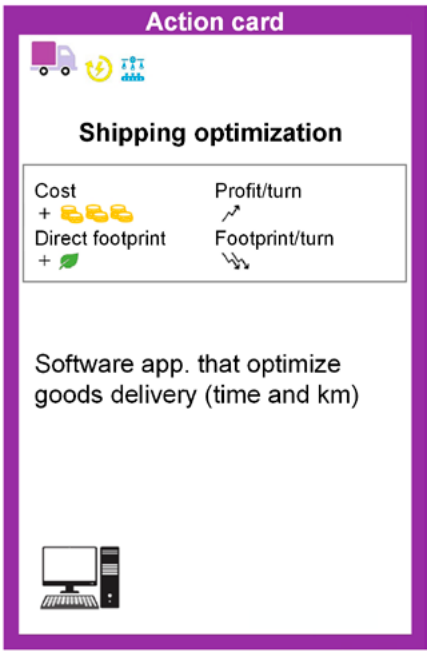
## ABSTRACT

Global warming increasingly becomes our society's main issue, implying an urgent need to reduce the global ecological footprint. Everyone and every entity are responsible for taking actions, however studies show that firms are not sufficiently engaged. We developed a serious game that makes them aware of, first, the green actions' benefits and, second, the opportunities offered by Green IS, which is a high-potential solution that uses software applications in order to reduce the firm's footprint.

## KEYWORDS

Serious game; ecological footprint; environmental impact; information system; green IS; green IT; awareness raising; organization.



## CONTEXT

Climate change is now obvious to everyone and has become one of our society's main concerns. The fact is that the Earth can only offer hospitality to humanity if its biomass capacity is sufficient, but this capacity is continuously decreasing mainly due to deforestation and greenhouse gas emissions, involving global warming, melting ice and natural catastrophes [1]. Researchers and almost everybody now recognize the urgent need to tackle climate change by reducing the global ecological footprint. Although everyone and every structure are involved and responsible for the ecological footprint reduction, it is noticed that firms have a particular and important role to play in this issue [2].

Green Information System appears as a good means to help firms reduce their footprint. Indeed, while the well-known green IT concept is about reducing consumption of information technology (IT), the concept of green IS is about implementing software applications – also called Information Systems (IS) – to leverage new and better practices in a firm to reduce its overall footprint [3]. Green IS has a great and unexploited potential: whereas IT is about 2% of a firm footprint, the green IS can take part in reducing the other 98% [4]. Combining technological innovation and requirements to lower environmental impacts, the green IS concept hence appears as an evident solution for the future.

## TARGETED ISSUE

According to studies, actions to reduce ecological footprint have to be taken in all scopes, from individual to global. We see actions in several levels, but there is a deficit in the organizational one. On the one side, governments are committed to the Sustainable Development Goals (SDG) 2030 and set up incentive programs; regions and cities have established local policies and planned green projects related to eco mobility, energy production or buildings renovation; citizens try to adopt responsible behaviors. But on the other side, firms are not sufficiently engaged and do not initiate enough actions for sustainable development [5] whereas they have a strategic role to play and could provide an essential contribution [2]. Thus, there is a need to motivate them to take part in the issue.



There are two main reasons that keep a firm from initiating ecological actions. The first one is the lack of information about benefits and collaborators who take decisions need to be aware of them. They should understand that having gone green will increasingly provide a competitive advantage, as well as green projects often involve return on investment (ROI), despite the belief that these projects represent loss-making expenditures. The second reason is the lack of practical tools and methods to address this issue. Indeed, there is a need for efficient tools that helping and guiding firms to implement concrete solutions and give them confidence in the actions they undertake [2].

## PROPOSED SOLUTION

The main objective of the GreenIS-UP project was to provide a tool which makes firm's collaborators aware of possible green actions and of their ecological and financial benefits. The tool particularly focuses on Green IS actions, given that researchers point out a huge lack of environmental consideration in the IS research field [3].

The developed tool is a collaborative serious game (SG). Two reasons explain this choice: first, studies confirm that SG has a real potential to promote learning and awareness; second, it has been demonstrated that participants who have played a serious game on sustainability adopt significantly more sustainable behavior [6].

*The main objective of the Green IS-UP project was to provide a tool which informs firm's collaborators on possible green actions and their ecological and financial benefits.*

The result is a turn-based board game in which 4 participants, assigned as specialists in environmental impact area, must collaborate to invest in actions that will reduce the firm's footprint. In each turn, the participants must choose, in a market, which action cards to play. To achieve their choices, they must consider the firm's available cash flow and discuss the given cost and the given financial and environmental impacts of each of them. After 4 turns, the game ends, and the financial and ecological scores are established. At that time, participants observe a higher cash flow than initially and understand that actions involve a ROI and a company's footprint drop. As the game can be played on several tables simultaneously, it allows the score comparison of different tables.


Green IS serious game conception



## RELEVANT INNOVATION

The proposed SG was the construction from both researchers and serious game practitioners. It was designed according to a rigorous methodology which directly incorporated scientific studies results in game elements: [1] areas of environmental impacts of action cards and their information were retrieved from studies published by the ADEME agency; [2] game mechanics was evaluated and selected from scientific census of learning mechanics [7] in order to guarantee an effective learning process during the SG – something that was managed by including at least one mechanic per learning phase; [3] drivers for adoption of green IS were integrated in the game, to increase the likelihood of participants to adopt some green IS ideas.

In addition to be designed from these scientific elements, the game was constructed in collaboration with "Entrée de jeu", a company specialized in game conception and composed by serious games experts. Our game is the first, innovating and fun game that is relevant to inform organizations about the possibilities of ecological and green IS actions. It includes real and comprehensive action samples that really could improve a firm's ecological footprint.

## PROJECT OUTCOMES & RESULTS

The SG was tested and improved in 3 phases. The first one focused on playing with practitioners who were game and serious game experts. In this phase, the game was played 5 times; experts from "Entrée de jeu" and pro-gamers were selected in order to get reliable point of views and advice. The second test phase consisted in playing the game with newbies, which allowed us to verify the playability and the rules' ease of understanding. To carry out sufficient improvement, we organized 4 game tests. Finally, the third phase was about playing the game in real conditions in firms. For this purpose, we selected 2 firms interested in sustainability. During each test of these 3 phases, we wrote every question and remark, given by participants and adjusted the game accordingly. We finally obtained a balanced and fully playable game that lasts 1 hour.

We measured the perceived benefits of the SG from firms' collaborators, using a questionnaires them before and after each play. Results showed an increased awareness about both sustainability and green IS opportunities. After the play, all participants said they were convinced that ecological actions could be compatible with the firm's financial expectations. Furthermore, participants increased by a half their intention to promote green actions in their firm. In one firm, a green IS project construction was even initiated after our intervention.

## CONCLUSION

In a context where humanity is facing climate change, we have looked for a solution that combines innovation and firms' ecological footprint reduction and developed a serious game (SG) for firms that make them aware of the opportunities that Green IS offers, which is a high-potential solution to reduce the footprint by using

software applications. The results showed that the developed SG effectively raised the participants' awareness and, moreover, increased their intention to promote real actions in firms.

## PERSPECTIVES & NEEDS

The green IS serious game could provide much more than raising awareness in the firms. The feedback we received demonstrates that it can help to generate ideas on green actions and initialize real green IS projects. Thus, including it within a workshop should allow every firm to lever change and reduce its footprint.

The next step is to promote such a tool in a large number of firms and collect feedback for quantitative research. For this purpose, an online version of our SG might be developed.

## ACKNOWLEDGEMENTS

This project is supported by ISnet RCSO research found of University of Applied Sciences and Art of Western Switzerland (HES-SO). We thank  them as well as, the HEG Arc and HES-SO Wallis for the resources, Entrée de jeu and Planair for their partnership and all the contributors.

## REFERENCES

[1] J. R. Schramski, D. K. Gattie, and J. H. Brown, "Human domination of the biosphere: Rapid discharge of the earth-space battery foretells the future of humankind", Proc. Natl. Acad. Sci., vol. 112, no. 31, pp. 9511–9517, 2015.

[2] C. Mio, S. Panfilo, and B. Blundo, "Sustainable development goals and the strategic role of business: A systematic literature review", Bus. Strateg. Environ., pp. 1–26, 2020.

[3] R. T. Watson, M.-C. Boudreau, and A. J. Chen, "Information systems and environmentally sustainable development: energy informatics and new directions for the IS community", MIS Q., vol. 34, no. 1, pp. 23–38, 2010.

[4] J. Dedrick, "Green IS: Concepts and issues for information systems research", Commun. Assoc. Inf. Syst., vol. 27, no. 1, pp. 173–184, 2010, doi: 10.17705/1cais.02711.

[5] S. Bonini, S. Gorner, and A. Jones, "How companies manage sustainability", McKinsey, 2010. Available at: www.mckinsey.com/business-functions/sustainability/our-insights/how-companies-manage-sustainability-mckinsey-global-survey-results.

[6] L. Whittaker, R. Russell-Bennett, and R. Mulcahy, "Reward-based or meaningful gaming? A field study on game mechanics and serious games for sustainability", Psychol. & Mark., vol. 38, no. 6, pp. 981–1000, 2021.

[7] S. Arnab et al., "Mapping learning and game mechanics for serious games analysis", Br. J. Educ. Technol., vol. 46, no. 2, pp. 391–411, 2015.