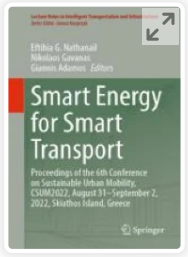

Conference on Sustainable Urban Mobility

CSUM 2022: **Smart Energy for Smart Transport** pp 335–347

A Review of Use Cases of Gamification in Mobility Systems and Services

Luís Barreto, António Amaral, Teresa Pereira & Sara Paiva

Conference paper | First Online: 11 March 2023

601 Accesses

Part of the Lecture Notes in Intelligent Transportation and Infrastructure book series (LNITI)

Abstract

Nowadays, Mobility, in all its dimensions (transport mobility, sustainable mobility, active mobility, and Mobility as a Service (MaaS)), is an essential dimension in sustainable development goals, allowing to increase in the quality of life, the health, the social inclusion and to reduce climate action in any society. To increase the citizens' awareness and promote a true behavioral change, the citizens need to feel part of the process. Gamification has

proved to be effective in raising citizens' awareness, encouraging their participation, and promoting a gradual but profound behavior change in various areas such as participatory governance, tourism, culture, education, etc. Gamification can also propel a Smart Living Society 5.0 among the younger groups of the society, especially in the context of academic communities that are more knowledgeable and eager to foster a healthier, more sustainable, and more inclusive society. Smart Living Society 5.0 is an activity in the scope of the TECH - Tecnologia, Ambiente, Criatividade e Saúde - a project of NORTE 2020, focusing on creating an Academic MaaS (AMaaS). At this stage, it is essential to know about gamification use cases related to new mobility solutions and practices. The paper presents successful cases of mobility systems and services that consider gamification to promote and incentivize their use concerning active mobility and sustainable mobility; it discusses the potential of gamified systems to achieve a gamification proposal approach to implement in the AMaaS under development.

Keywords

Mobility **Maas** **AMaaS** **Gamification** **Smart living**

Notes

1. https://www.norte2020.pt/.

2. https://www.wepush.org/en/projects/traffico2/.

3. https://www.apnor.pt/pt_index.html.

References

1. UN. Habitat: Planning and Design for Sustainable Urban Mobility: Global Report on Human Settlements. UN Habitat (2013)

2. Heinonen, J., Czepkiewicz, M., Árnadóttir e J. Ottelin, Á.: Drivers of car ownership in a car-oriented city: a mixed-method study. Sustainability **13**, 1–26 (2021)

3. Casadó, R.G., Golightly, D., Laing, K., Palacin e L. Todd, R.: Children, young people and Mobility as a Service: opportunities and barriers for future mobility. Transp. Res. Interdisc. Perspect. **4** (2020)

4. Johansson, M.: Mobility as a Service: exploring young people's mobility demands and travel behavior (Dissertation). http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-215509

5. Gebhardt, L., Krajzewicz, D., Oostendorp, R., Goletz, M., Greger, K., Klötzke, M., Wagner e D. Heinrichs, P.: Intermodal urban mobility: users, uses, and use cases. Transp. Res. Procedia **14**, 1183–1192 (2016)

6. Deterding, S., Dixon, D., Khaled, R., Lennart, N.: From game design elements to gamefulness: defining “gamification”. In: Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments (MindTrek ’11), pp. 9–15 (2011)

7. Whitmarsh, L., Gerger Swartling, Å., Jäger, J.: Participation of experts and non-experts in a sustainability assessment of mobility. Environ. Policy Gov. **19**, 232–250 (2009)

8. Schröder, P., et al.: Advancing sustainable consumption and production in cities - A transdisciplinary research and stakeholder engagement framework to address consumption-based emissions and impact. J. Clean. Prod. **213**, 114–125 (2019)

9. Gallo, M., De Luca, G., De Martinis, V.: The effects of urban traffic plans on noise abatement: a case study. WIT Trans. Ecol. Environ. **191**, 583–594 (2014)

10. Böhm, M., Flechl, B., Frötscher, A.: ICT concepts for optimization of mobility in smart cities. Publications Office of the European Union, 213

11. High-level Advisory Group on Sustainable Transport, “MOBILIZING Sustainable Transport for DEVELOPMENT,” United Nations (2016)

12. Gerike, R., de Nazelle, A., Nieuwenhuijsen, M., Panis, L. I., Anaya, E., Avila-Palencia, I., Boschetti, F., Brand, C., Cole-Hunter, T., Dons, E., Eriksson, U., Gaupp-Berghausen, M., Kahlmeier, S., Laeremans, M., Mueller, N., Orjuela, J.P., Racioppi, F., Raser, E., Rojas-Rueda, D., Schweizer, C., Standaert, A., Uhlmann, T., Wegener, S., Götschi, T.: Physical activity through sustainable transport approaches (PASTA): a study protocol for a multicenter project. BMJ Open **6** (2016)

13. Held, M., Schindler, J., Litman, T.: Cycling and active mobility—establishing a third pillar of transport policy. em Cycling Futures. From Research into Practice, pp. 209–225 (2015)

14. Koszowski, C., Gerike, R., Hubrich, S., Götschi, T., Pohle, M., Wittwer, R.: Active mobility: bringing together transport planning, urban planning, and public health. In: em Towards User-Centric Transport in Europe, Lecture Notes in Mobility. Springer (2019)

15. World Health Organization: Prevention and control of non communicable diseases in the

European Region: a progress report. World Health Organization (2014)

16. Mueller, N., Rojas-Rueda, D., Basagaña, X., Cirach, M., Cole-Hunter, T., Dadvand, P., Donaire-Gonzalez, D., Foraster, M., Gascon, M., Martinez, D., Tonne, C., Triguero-Mas, M., Valentín e M. Nieuwenhuijsen, A.: Urban and transport planning related exposures and mortality: a health impact assessment for cities. Environ. Health Perspect. **125**, 89–96 (2017)

17. Méline e B. Chaix, J.: Mobility, personal exposure to noise, and blood pressure in hypertensives in the Paris region. Eur. J. Public Health **25** (2015)

18. Aapaoja, A., Eckhardt, J., Nykänen, L., Sochor, J.: MaaS service combinations for different geographical areas. In: 24th World Congress on Intelligent Transportation Systems. Montreal, Canada (2017)

19. Barreto, L., Amaral, A., Baltazar, S.: Mobility in the Era of Digitalization: Thinking Mobility as a Service (MaaS). In: Jardim-Goncalves, R., Sgurev, V., Jotsov, V., Kacprzyk, J. (eds.) Intelligent Systems: Theory, Research and Innovation in Applications. SCI, vol. 864, pp.

275–293. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-38704-4_12

20. Çeker e F. Özdaml, E.: What "Gamification" is and what it's not. Eur. J. Contemp. Educ. **6**, 221–228 (2017)

21. Chou, Y.-k.: Actionable Gamification: beyond points, badges, and leaderboards. Octalysis Media (2015)

22. Sharma, S., Siu, K.W.M.: Gaming as a driver for social behaviour change for sustainability. In: Advances in human factors in wearable technologies and game design. AHFE 2017. Advances in intelligent systems and computing, vol. 608, pp. 258–266. Springer, Cham (2017)

23. Wee, S.-C., Choong, W.-W.: Gamification: predicting the effectiveness of variety game design elements to intrinsically motivate users' energy conservation behavior. J. Environ. Manage. **233**, 97–106 (2019)

24. Werbach, K., Hunter, D.: For the win: how game thinking can revolutionize your business. Wharton Digital Press (2012)

25. Werbach, K., Dan, H.: The gamification toolkit - dynamics, mechanics, and components for the win. Wharton Digital Press, Philadelphia (2015)

26. Toda, A.M., Klock, A.C.T., Oliveira, W., Palomino, P.T., Rodrigues, L., Shi, L., Bittencourt, I., Gasparini, I., Isotani, S., Cristea, A. I.: Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learn. Environ. **6**(16) (2019)

27. Goethe, O.: "Visual Aesthetics in Games and Gamification", em Gamification Mindset, vol, pp. 85–92. Springer International Publishing, Human-Computer Interaction Series (2019)

28. PUSH design lab: TrafficO2. [Online]. Available: http://www.traffico2.com/en/

29. BetterPoints Ltd.: BetterPoints Ltd—Behaviour change technology. [Online]. Available: https://www.betterpoints.ltd/

30. Bella Mossa: Bella Mossa—Vivere con lo sport e sostenibilità. [Online]. Available:

https://www.bellamossa.it/

31. BetterPoints: Bella Mossa: One Italian city, two massengagement programmes—a comparison (2019)

32. Viaggia Trento e Rovereto Play&Go.: Viaggia Trento e Rovereto Play&Go—Smart Community. [Online]. Available: https://www.smartcommunitylab.it/apps/viaggia-trento-e-rovereto-playgo/ (2019)

33. Marconi, A., Ferron, M., Loria, E., Massa, P.: Play&Go, an urban game promoting behaviour change for sustainable mobility. Interac. Des. Architect. J. **40**, 24–45 (2019)

34. Fireware: greenApes—The sustainability app," [Online]. Available: https://www.greenapes.com

35. Fireware: SMART CITIES AND ENVIRONMENTAL SUSTAINABILITY—Sustainable living app welcomes new cities onto digital platform. FIWARE Foundation (2021)

36. Prato, C. d.: Prato Urban Jungle. [Online]. Available: https://www.pratourbanjungle.it/

37. Leach, K., Grigg, A., O'Connor, B., Brown, C., Vause, J., Gheyssens, J., Weatherdon, L., Halle, M., Burgess, N.D., Fletcher, R., Bekker, S., King, S., Jones, M.: A common framework of natural capital assets for use in public and private sector decision making. Ecosyst. Serv. **36** (2019)

38. Jetté, M., Sidney, K., Blümchen, G.: Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. Clin. Cardiol. **13**(8), 555–565 (1990)

Acknowledgments

This work is funded by the European Regional Development Fund (ERDF) through the Regional Operational Program North 2020, within the scope of Project TECH - Technology, Environment, Creativity and Health, Norte-01–0145-FEDER-000043.

Author information

Authors and Affiliations

ADit-Lab, Instituto Politécnico de Viana Do Castelo, Rua Escola Industrial E, Comercial Nun'Álvares, 4900-347, Viana Do Castelo, Portugal

Luís Barreto & Sara Paiva

Instituto Superior de Engenharia Do Porto, Rua Dr. António Bernardino de Almeida, 431, 4249-015, Porto, Portugal
António Amaral

INESC TEC—Institute for Systems and Computer Engineering, Technology and Science, 4200-465, Porto, Portugal
António Amaral

Departamento de Sistemas de Informação, Universidade Do Minho, Campus de Azurém, 4804-533, Guimarães, Portugal
Teresa Pereira

Corresponding author

Correspondence to Luís Barreto .

Editor information

Editors and Affiliations

Department of Civil Engineering, University of Thessaly, Volos, Greece
Eftihia G. Nathanail

Department of Planning and Regional Development, University of Thessaly, Volos, Greece
Nikolaos Gavanas

Department of Civil Engineering, University of Thessaly, Volos, Greece
Giannis Adamos

Rights and permissions

Reprints and Permissions

Copyright information

About this paper

Cite this paper

Barreto, L., Amaral, A., Pereira, T., Paiva, S. (2023). A Review of Use Cases of Gamification in Mobility Systems and Services. In: Nathanail, E.G., Gavanas, N., Adamos, G. (eds) Smart Energy for Smart Transport. CSUM 2022. Lecture Notes in Intelligent Transportation and Infrastructure. Springer, Cham. https://doi.org/10.1007/978-3-031-23721-8_29

.RIS .ENW .BIB

DOI	Published	Publisher Name
https://doi.org/10.1007/978-3-031-23721-8_29	11 March 2023	Springer, Cham

Print ISBN	Online ISBN	eBook Packages
978-3-031-23720-1	978-3-031-23721-8	Engineering Engineering (R0)