

Improving the Climate Outcomes of Digital Climate Start-ups

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Extended abstract

Problem

Despite the collective international efforts made in the last twenty years to address the challenge of climate change, progress has been underwhelming (IPCC, 2022). Notably, the average worldwide temperatures during this timeframe have attained unparalleled levels, with 2023 being identified as the hottest year on record (Copernicus, 2024).

In this context, there have been increasing efforts to understand the significance of involving businesses in addressing this challenge, where entrepreneurs are key players as they have the capacity to develop highly innovative solutions and implement financially viable business models (Gregori & Holzmann, 2020). Furthermore, it is expected that digitalisation and the transformation of existing traditional businesses will have a major role in the search for a more sustainable planet (Bican & Brem, 2020, Gregori and Holzmann, 2020). Although this dominance of sustainability and digitalisation, as drivers for societal changes and the increasing overlap between them, academic research on their interconnectedness is still scarce (Feroz *et al.*, 2021; Kraus *et al.*, 2019, Lenz, 2021, Stuermer *et al.*, 2017, Vilchez, 2023), therefore providing a fertile ground for research on this topic.

This research presents Business Models (BM) developed by entrepreneurial and pioneering firms that use digital technologies (Digital Climate Start-ups or DCS) as a core element of their environmental value proposition (EVP) to tackle climate change (CC). It seeks to contribute to the literature on Stakeholder Theory, as it provides new insights on the natural environment as a key stakeholder, extending the stakeholder value creation (SVC) framework proposed by Freudenreich *et al.* (2020).

The research question (RQ) addressed in this paper is: *How can digital climate start-ups improve their value proposition for the natural environment as a key stakeholder?*

Methodology

This research is based on multiple-case study analysis of companies that emerged as a response to the business opportunities derived from climate change. Using a mixed methodology, where the main source of information was semi-structured interviews with CEOs, founders or high-level executives of 27 firms from eight European countries, providing services to diverse sectors, from agriculture, to financial services, and from different sizes (large, SMEs, and micro). Interviewing high-level representatives was essential to this research given the strategic nature of the questions contained in the interview protocol (i.e. the importance of interviewing knowledgeable actors as described by Gioia *et al.* 2012). Similarly, having a great diversity of companies (based on size, sector, technology, and country), as opposed to concentrating in only one sector or technology, was considered a strength to acquire a broader understanding of the landscape of DCS and their value propositions. The interviews were recorded and transcribed for thematic analysis, being transferred to NVivo 20 software, a tool that facilitates the identification of connections within the qualitative data. Secondary data was also analysed from public sources, such as web sites from the interviewed organisations.

Results

The data analysis showed that the natural environment is a key stakeholder for DCS. Indeed, the cross-case comparison showed that for most of the studied companies the environment is a key stakeholder, as their value offering is built around objectives of climate change (e.g., biodiversity protection, restoration of ecosystems, CO₂ sequestration, efficient use of energy, improved water management, etc.). Furthermore, value is explicitly expected to be created for the natural environment by, for example, protecting a forest and its biodiversity. In return, society receives benefits from the environment, like ecosystem services in general or carbon sequestration. This outcome of the BM is expected to also have other positive impacts in the local community and, given the global nature of the CC challenge, on human society as a whole. Thus, these companies aim to have economic success through a strong environmental value proposition.

Furthermore, DCS can be classified based on their specific objectives and strategies to address the challenge of climate change. Thus, from the cross-case comparison it is observed that firms fall into one of the following categories: mitigation, adaptation, impact creators or impact enablers.

Together with this, from the analysis of the data it was possible to identify certain attributes that are essential to improve the value proposition for the natural environment of DCS. These attributes are: the need to have a joint purpose with focus on the natural environment and climate change, identifying and managing unintended consequences, the use of science as enabler, measuring climate impact (having a climate hypothesis), and information transparency.

Finally, recognising the natural environment as a key stakeholder in the context of BM of DCS is a central finding of this research, implying that the SVC Framework proposed by Freudenreich *et al.* (2020) can be expanded. In fact, even though under this framework the environment was included as part of Societal Stakeholders, based on the empirical results obtained, this research is proposing to increase the relevance of the environment as a key stakeholder and thus extending the framework by adding a sixth category.

Conclusions

This investigation makes contributions to theory and practice. First, it contributes to the literature on BMfs, DCS and Stakeholder Theory by means of proposing an extended Stakeholder Value Creation Framework for Business Model Analysis (SVC Framework), and five attributes that are considered essential to improve the value creation potential of DCS.

Secondly, the outcomes of this research are expected to be relevant for entrepreneurs through an improved understanding of their value proposition. In fact, the five essential attributes here proposed (i.e. define a joint purpose, identify unintended consequences, use of best available knowledge, develop a climate hypothesis, and ensure information transparency) are expected to be useful insights for entrepreneurs when (re-)designing their value offering, in understanding the positive and negative aspects of their value proposition, and in the identification of conflicting values (i.e. unintended consequences). These attributes may also contribute to venture capital investors who need to understand the true value of these firms in relation to the fight against climate change and thus make investment decisions based on *ad-hoc* criteria.

Keywords

Business Models for Sustainability, Digital Climate Start-ups, stakeholder theory, climate change, case study.

References

- Bican, P. & Brem, A. (2020) Digital Business Model, Digital Transformation, Digital Entrepreneurship: Is There A Sustainable “Digital”? *Sustainability*. 12(13), 5239, DOI: <https://doi.org/10.3390/su12135239>
- Copernicus (2024) Copernicus: 2023 is the hottest year on record, with global temperatures close to the 1.5°C limit. European Commission. [online]. Available from: <https://climate.copernicus.eu/copernicus-2023-hottest-year-record> [Accessed 11.01.24].
- Feroz, A. Zo, H. & Chiravuri, A. (2021) Digital Transformation and Environmental Sustainability: A Review and Research Agenda. A Review and Research Agenda. *Sustainability*. 13(13), 1530, DOI: <https://doi.org/10.3390/su13031530>
- Freudenreich, B., Lüdeke-Freund, F. & Schaltegger, S. (2020) A Stakeholder Theory Perspective on Business Models: Value Creation for Sustainability. *Journal of Business Ethics*. 166, 3–18, DOI: <https://doi.org/10.1007/s10551-019-04112-z>.
- Gioia, D.A., Corley, K.G. & Hamilton, A.L. (2012) Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*. 16(1), 15-31, DOI: <https://doi.org/10.1177/1094428112452151>.
- Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L. & Spitzer, J. (2019) Digital entrepreneurship: A research agenda on new business models for the twenty-first century. *International Journal of Entrepreneurial Behavior & Research*. 25(2), 353-375, DOI: <https://doi.org/10.1108/IJEBR-06-2018-0425>.
- Gregori, P. & Holzmann, P. (2020) Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation. *Journal of Cleaner Production*. 272 (2020), 1-9, DOI: <https://doi.org/10.1016/j.jclepro.2020.122817>.
- IPCC (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R.

Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)). Cambridge University Press, Cambridge, UK and New York, NY, USA, DOI: 10.1017/9781009157926

Lenz, S. (2021). Is digitalization a problem solver or a fire accelerator? Situating digital technologies in sustainability discourses. *Social Science Information*. 60(2), 188-208, DOI: <https://doi.org/10.1177/053901842110121>

Stuermer, M., Abu-Tayeh, G., & Myrach, T. (2017). Digital sustainability: Basic conditions for sustainable digital artifacts and their ecosystems. *Sustainability Science*, 12(2), 247–262, DOI: <https://doi.org/10.1007/s11625-016-0412-2>.

Vilchez, P. (2023). Venturing on a double trend: Digital startups for climate action in Mexico. *HIIG Discussion Paper Series 2023-3*, 22 pages, DOI: <https://doi.org/10.5281/zenodo.7915646>.