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Equity crowdfunding platforms and sustainable impacts: encountering investors and technological initiatives for tackling social and environmental challenges

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Abstract

Purpose – Innovative initiatives focusing on social and environmental impact often need help to secure traditional financial resources for their launch. Equity crowdfunding platforms (ECF) provide a potential funding source for these initiatives, particularly for technological inventors. This research paper aims to theorize how ECF campaigns attract investors to invest in technological initiatives with social and environmental value proposition impacts.

Design/methodology/approach – Using an inductive qualitative approach, the authors have gained insights, from 35 sustainable technological projects sponsored by a Chilean equity-crowdfunding platform, regarding the business model's transformation to achieve sustainable social and environmental impacts.

Findings – Findings show that disruptive technologies and sustainable aims are pivotal factors in successfully attracting investors to support sustainable technological initiatives through ECF platforms or campaigns. These factors led investors to actively engage with these projects and contribute to the value-creation process by transforming business models with social and environmental impacts and utilizing sustainable technology to enhance efficiency and optimize available resources.

Research limitations/implications – Due to the nature of this research, researchers must test the proposed conceptual framework using longitudinal quantitative data from multiple ECF platforms, technological solutions and investors worldwide in future research to enhance the comprehension of this phenomenon.

Practical implications – The findings highlight the significant contribution of ECF platforms and technological portfolios toward creating sustainable impacts. It is a good signal for investors interested in investing in technological initiatives and addressing social and environmental challenges.

Social implications – The contribution of disruptive technological projects from ECF platforms and ECF investors to tackle social and environmental challenges.

Originality/value – This research theorizes how ECF platforms tackle social challenges by encouraging investors to invest and participate with entrepreneurs in the co-creation process of sustainable technological solutions.

Keywords Crowdfunding, Equity-crowdfunding, Technological projects, Social innovation, Environmental innovation, Sustainable impacts, Investors

Paper type Research paper

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1. Introduction

Technological developers face the challenge of persuading investors to back their innovative solutions and provide the required resources for successful implementation (Mollick and Robb, 2016). It is crucial because, without the support of investors, technological innovations risk not reaching the market (Stanko and Henard, 2017). In this context, crowdfunding has emerged as an innovative solution to the matching between innovations and investors, making it possible by democratizing access to financial resources to support the development of disruptive technologies (Mollick and Robb, 2016). More specifically, previous studies have suggested that equity crowdfunding platforms (ECF) act as intermediaries between entrepreneurs seeking funds for their projects and investors interested in investing resources (and expertise) in disruptive projects (Hervé and Schwienbacher, 2019; Yasar, 2021).

Previous studies have shown that during each round of investment, specific features such as technological innovation, project viability, expected performance and impacts are evaluated. Therefore, the degree of disruptive technologies increases the investors' attractiveness, especially if the project looks promising and cost-effective (Mollick and Robb, 2016; Petruzzelli *et al.*, 2019). Disruptive technological solutions also imply viability, performance and sustainable impacts (Gafni *et al.*, 2021), attracting investors, partners and stakeholders (Vismara, 2019, 2022). Based on these arguments, ECF platforms would represent an opportunity to encourage the participation of third parties (investors, partners) or outsiders (users) across the co-creation process and the development of the disruptive technologies (Mochkabadi and Volkmann, 2020; Troise and Tani, 2020). However, little is known about how ECF platforms promote sustainable technological solutions to address societal challenges and connect their entrepreneurial developers with potential investors who prioritize economic and sustainable goals (Gafni *et al.*, 2021; Vismara, 2016).

Our research theorizes how ECF campaigns attract investors to invest in technological initiatives with social and environmental value proposition impacts. By implementing a qualitative data analysis from a Chilean ECF platform portfolio of 35 innovative projects, our findings provide insights into the ECF campaigns' inputs (matching entrepreneurs' needs and investors' resources), processes (co-creation among entrepreneurs, investors and users) and outcomes (innovation performance and societal/environmental impacts) related to disruptive technological solutions. Our study contributes to the crowdfunding literature threefold. First, our study theorizes new outcomes of ECF platforms related to the sustainable impacts of technological projects to tackle social and environmental challenges, representing an initial step toward a more detailed study of the ECF platforms (Vismara, 2016, 2019; Ardito and Dangelico, 2018). Second, we expand the understanding of new roles of ECF platforms, including more than exchanging information, such as the intermediation role for encouraging sustainable and technological initiatives (Cillo *et al.*, 2019a, b; Mochkabadi and Volkmann, 2020; Troise and Tani, 2020; Troise *et al.*, 2021). Third, we provide new insights into the use of disruptive technologies as a feature that legitimizes sustainable innovation business models and enables the success of ECF campaigns (see Callaghan, 2014; Jenik *et al.*, 2017; Hervé and Schwienbacher, 2018).

The paper is organized as follows. After this introduction, Section 2 includes the theoretical foundations to better understand ECF platforms. Section 3 proposes propositions to better understand how technological entrepreneurs and investors tackled societal challenges and achieved our research objective. Section 4 describes the methodological design used during the data collection and data analysis. Section 5 presents the results across the ECF campaigns' inputs, processes and outcomes. Section 6 discusses our findings in light of previous studies, our proposed propositions and our proposed conceptual framework resulting from this discussion. Section 7 concludes our study by encouraging a continued debate on this phenomenon in future research.

2. Theoretical framework

Crowdfunding involves individuals registering their projects on digital platforms and seeking financial contributions from investors (Brem *et al.*, 2019). Platforms can either specialize in specific niches, such as innovative and creative projects, start-ups, sustainability, or charity projects or be generalists (Presenza *et al.*, 2019). Platforms have experienced significant growth and continue to develop worldwide, representing an opportunity to fund entrepreneurs (Belleflamme and Lambert, 2014). In recent years, research has highlighted the importance of crowdfunding as a funding option and source of knowledge to support innovative initiatives and harness the wisdom of crowds (Hervé and Schwienbacher, 2018; Troise and Tani, 2020). Crowdfunding initiatives are special cases of open innovation intermediaries that allow fundraisers to seek valuable resources from third parties (Stanko and Henard, 2017), with the primary goal of raising the necessary financial resources from individuals to develop projects (St John *et al.*, 2022).

The projects to be financed through crowdfunding platforms include various industries where innovation is a relevant factor in generating impact on the environment (Troise *et al.*, 2021). In addition to product novelty, investors value the social and environmental impacts of solutions when deciding to finance projects (Vismara, 2019). Therefore, the business model value proposition is based on a combination of goods, services, systems, processes and technologies (Skog *et al.*, 2018), and when communicating the benefits of equity crowdfunding, it is important to highlight factors such as efficiency, quality of goods and services, and resource optimization. This method of financing involves selling shares or stakes in a venture to a group of investors through an open call on online platforms (Brown *et al.*, 2018). Concretely, ECF platforms act as intermediaries that help entrepreneurs and their ventures establish interpersonal networks that allow their users to interact and share information (Cosma *et al.*, 2022; Vismara, 2016); these interactions intensify innovation performance, fundraising and scaling-up of technological projects (Troise and Tani, 2020).

ECF platforms have substantial potential to facilitate innovation through new capital sources and actively engage the crowd in the innovation process (Hervé and Schwienbacher, 2018). Interaction between actors enables feedback through the generation of social capital and intellectual capital due to collaborative relationships, which influence the development of the innovation (Freudenreich *et al.*, 2020; Meyer, 2023). Interaction with diverse network partners can help entrepreneurs gather more information from external sources, providing broader learning that better prepares the venture for new business opportunities (Cosma *et al.*, 2022). ECF platforms secure funding for ventures and projects that traditional funders reject. In the next section, we propose propositions that allow an understanding of the encounter between ECF platforms, technological initiatives, investors' willingness and sustainable impacts.

3. Propositions

3.1 ECF campaign, technology-based initiatives and investors' willingness

The success of an ECF campaign depends on several factors. One factor is the creativity or originality of the projects (Vismara, 2019). It could be represented by technology-based initiatives that increase fundraising success if they have a sustainability orientation (Petruzzelli *et al.*, 2019; Troise *et al.*, 2021). Since most projects are considered innovative initiatives, the degree of technological advancement in the proposals would be a crucial factor influencing trust and backing (Zhang and Chen, 2019), as people invest money in projects which they consider viable (Hornuf *et al.*, 2022). ECF Investors often look for investment opportunities that offer high potential for long-term growth and profitability, and technological initiatives are one of the areas where high potential for growth and disruption can be found (Stevenson *et al.*, 2019). ECF projects that offer innovative technology-based solutions may also be more attractive to investors because they may have a

competitive advantage over other products and services already on the market (Akyuwen *et al.*, 2022). In addition, technology projects may be more scalable and have a lower cost base than traditional projects, increasing the potential for long-term profitability and growth (Brem *et al.*, 2019). A second factor is the ECF investors' willingness, the social capital within the ECF platform depending on the amount of capital to be raised and the number of backers involved in the first days' (Brown *et al.*, 2018; Buttice *et al.*, 2017). ECF campaigns require investors to be confident in the positive repercussions of the initiative once it is launched (Petruzzelli *et al.*, 2019). If the ECF investors do not have experience or receive professional investment advice, so they could base their decisions on interests and knowledge (Hornuf *et al.*, 2022). As a result, platform participants tend to be less risk-averse for low levels of investment but more risk-averse for higher amounts (Vieider *et al.*, 2016). However, it is important to note that not all technology projects are equally attractive to ECF investors. We assume that ECF investors' attractiveness will depend on the disruption of technological projects combined with an experienced and competent management team enrolled in viable/growing markets, solid sustainable value propositions and cost-benefits generated for both the investor and the society (Ahlers *et al.*, 2015; Piva and Rossi-Lamastra, 2018; Shafi, 2021; Troise *et al.*, 2022). Based on these arguments, we propose,

P1. Investors are more willing to invest in ECF campaigns if the projects offer innovative solutions linked to disruptive technologies.

3.2 ECF campaign, investors' engagement and performance

Investors are an important source of open innovation for organizations, as they contribute to knowledge creation through their cooperation and information sharing (Cillo *et al.*, 2019a, b). Engaged investors are early adopters of the product and offer advice, design ideas and even criticism throughout the development process (Stanko and Henard, 2017). Thus, ECF is a form of social exchange and, specifically, a more advanced form of co-creation of innovation projects (Brem and Bilgram, 2015). Given that ECF campaigns are managed on openly available platforms, it allows stakeholders and technological-based entrepreneurs the co-creation of value through the exchange of ideas (Laffey *et al.*, 2021). Unlike traditional financing sources (venture capital and bank loans), the ECF platform allows investors to become shareholders (Yasar, 2021), be motivated to co-create innovative solutions, generate sustainable impacts (Shafi, 2021) and serve as an investor feedback forum for project improvement (Mochkabadi and Volkmann, 2020). The investors' feedback can strategically guide the entrepreneur and the team to meet market needs and expectations, increasing their investment return on the innovative projects (Laffey *et al.*, 2021). By working together, the entrepreneurial team and investors can generate innovative ideas and solutions that increase the value of the project and make it more successful (Brem and Bilgram, 2015; Laffey *et al.*, 2021). Meanwhile, for the investees, one of the primary motivations for participating in ECF is to "make things happen" (Ingram *et al.*, 2019; Kshetri, 2018). ECF campaigns significantly affect entrepreneurs' market success as the campaign is used to validate ideas with investors (Nitani *et al.*, 2019). We assume that ECF campaigns with investor involvement in product and service development are more attractive. Based on these arguments, we propose.

P2. ECF project potentially engages investors to value co-creation and innovation performance.

3.3 ECF campaign, sustainable solutions and investors' willingness

Investor preferences influence investment decisions (Riedl and Smeets, 2017), translating these flows into substantial market-wide funds toward sustainable investments (Hartzmark and Sussman, 2019). The sustainable investment aims to reduce negative impacts through prosocial

investors (Døskeland and Pedersen, 2016; Hornuf *et al.*, 2022; Troise *et al.*, 2021). Technological initiatives have the potential to solve environmental and social issues, such as reducing emissions, saving resources and enhancing life quality (Petruzzelli *et al.*, 2019; Vismara, 2019). Technological initiatives improve the efficiency and profitability of entrepreneurs offering sustainable solutions, for example, using AI and data analysis can enhance production processes and reduce costs (Audretsch *et al.*, 2019; Fernando *et al.*, 2019). ECF platforms enable the development of new products and services, as well as new ways to address social needs due to market and public sector failures (Le Pendeven and Schwienbacher, 2023; Troise *et al.*, 2021). A successful innovation must be feasible and involve the social inclusion of disadvantaged target groups (Leong *et al.*, 2022; Thomas and Hedrick-Wong, 2019). The dissemination of sustainable objectives is crucial to legitimize and give credibility to the technological initiative, so the publication of their mission statements allows stakeholders to review and evaluate them according to their interests (Kshetri, 2018; Mersland *et al.*, 2019). Socially responsible investing integrates sponsors' values and social concerns into the investment decision-making (Troise and Tani, 2020). ECF investors have a portfolio composed of ventures with good environmental practices or entrepreneurs expressing respect for people's rights. Thus, ECF investors act as gatekeepers for the emergence of new ventures due to their role in selecting risky ideas (Cosma *et al.*, 2022). We assume that investors are more willing to fund ECF projects that offer sustainable solutions through technology due to their potential to address environmental and social issues and improve the efficiency and profitability of ventures. Based on these arguments, we propose.

P3. Investors are more willing to invest in ECF projects that offer sustainable solutions linked to disruptive technologies.

3.4 ECF campaigns and sustainable viability

Early ECF platforms primarily funded entrepreneurial technological initiatives, but nowadays, ECF platforms also specialize in sustainability-oriented campaigns (Hornuf *et al.*, 2022; Vismara, 2019). Entrepreneurs with different value propositions and sustainable business models drive the ECF campaigns and empirical studies have evidenced the growing interest of ECF investors in supporting technological and sustainable projects that aim to address environmental and social challenges (Calic and Mosakowski, 2016; Hartzmark and Sussman, 2019). Technological entrepreneurs that offer sustainable solutions have a competitive advantage on the ECF platform if entrepreneurs effectively communicate the value propositions and impacts. While a sustainable approach may be an important factor for ECF investors, most ECF investors are ultimately interested in getting an investment return (Le Pendeven and Schwienbacher, 2023). The success factors of ECF platforms are classified depending on the characteristics of the campaign, including (1) funding targets, minimum investments, campaign duration and provision of financial data (Ahlers *et al.*, 2015; Calic and Mosakowski, 2016); (2) the role of private networks and social media networks (Cosma *et al.*, 2022; Kshetri, 2018); and (3) the comprehensibility of the venture's concept or product offering (Ingram Bogusz *et al.*, 2019; Nitani *et al.*, 2019). We assume that sustainable ECF campaigns can succeed by convincing investors that technological initiatives are viable, profitable, and impactful to the environment or society. Based on these arguments, we propose.

P4. ECF campaigns promoting sustainability will have a greater impact if entrepreneurs convince investors of the viability and profitability of their technological initiatives.

4. Methodology

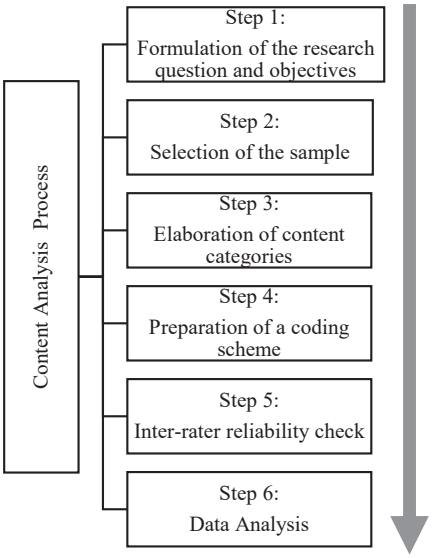
We use a content analysis approach to qualitative data from ECF campaigns to address the research objective and proposed hypotheses. Content analysis is a research method for

making replicable and valid inferences from data in context. The purpose is to provide new knowledge, a representation of facts and a practical guide for action and achieve a condensed and comprehensive description of the phenomenon (Krippendorff, 1980). The outcome of the analysis is concepts or categories that will allow us to categorize the impacts associated with each initiative (Lindgren *et al.*, 2020). Figure 1 shows the content analysis steps.

Step 1*: Research question or objectives.* Our research theorizes how ECF campaigns attract investors to invest in technological initiatives with social and environmental value proposition impacts. We will obtain information that will allow us to address the internal transformation aspects of the technological project and the outcomes of the ECF campaigns.

Step 2: Sample selection. We revised the projects allocated in the Chilean ECF platform using random sampling procedures between 2020 and 2021. Our sample selection criteria included: (a) the novelty of the product/service offered by the initiative; (b) the disruptive technologies implemented by the platforms (e.g. Internet of things, artificial intelligence, among others); and (c) the sustainable focus on social and environmental challenges. Based on this selection criteria, we selected 35 technological projects ranging from health, agri-food, financial, entertainment, real estate and job search (see Appendix).

Step 3: Content categories. The coding schemes start from an inductive approach and then establish constructs that reflect the functioning of the initiatives. The initial research approaches are not *a priori* codes but the initial questions we seek to answer. Our questions guide the initial approach to the data, but the process is inductive. The initial research scheme was based on abstract concepts related to our proposed propositions. *Inputs* related to project management and entrepreneurial goals with raised funds are addressed (*how*). *Process* related to the ECF funding rounds of technological initiatives and successful funding goals connecting entrepreneurs and investors (*what*). *Outcome* related to the impacts that were not so clearly defined, such as social and environmental in the first stage. But, we observe that most innovative technology projects focus on tackling societal challenges (*why*).



Source(s): Authors

Figure 1.
Data analysis

Step 4: Coding program. We create a dataset in an Excel document with the information obtained from each ECF campaign. The coding scheme used for the analysis was initially based on Step 3. The coding scheme adopted an inductive approach based on previous studies about ECF initiatives. Using NVivo software, we identified key phrases and text segments to assign them to the initial codes' themes and identify new dimensions.

Step 5: Inter-rater reliability and validity check. We ensure code reliability by validating separately coded sections. Following Lindgren *et al.* (2020) recommendations to evaluate data validity, we decontextualize codes and group information, then recontextualize based on our research objectives. The abstraction process allows us to identify the first-order and second-order categories (Lindgren *et al.*, 2020).

Step 6: Data analysis. We summarize and group the codes following the initial approach (input, process and outcomes). It helps us to identify the process of ECF campaigns, the encounter between ECF investors and entrepreneurs along the investment and co-creation process, and the social and environmental impact. As a result, we propose a conceptual framework.

5. Results

We identified 17 projects that combine social and environmental impacts in their strategy and 18 that only have social objectives. By classifying and categorizing the codes, we could identify more clearly the impacts of technological innovation projects (see Table 1). Regarding the ECF campaigns, of the total number of projects, 28 were overfunding, raising more money than they had initially set out to grow, which es why we consider them to be successful ECF campaigns. The remaining seven did reach 100% of the fundraising by meeting the funding objective. The content analysis of the ECF campaigns allowed us to identify a pattern of technological projects. The dissemination of technological projects allows for identifying the value proposition communicated to ECF investors to obtain the expected funding. The ECF campaigns highlight both the characteristics business model and sustainable objectives. With the coded, sorted and ordered data, we identify the sustainable business model characteristics, the intermediary role of the ECF platform and the impacts of technological initiatives. Therefore, we identified the transformation process for the technological projects (Garud *et al.*, 2013) and the three sequential phases.

5.1 Input → how: encounter innovative projects and investors

A sustainable business model is fundamental to achieving a competitive advantage within the market (Casadesus-Masanell and Zhu, 2013). Our analysis shows how ECF technological initiatives represented an opportunity to tackle societal challenges more efficiently than the existing solutions. Most of the analyzed projects use disruptive technologies like AI, IoT and digital platforms to create solutions, promoting local and international growth for technological ventures (e.g. P2, P16, P14). The ECF campaign analysis must consider the time and external conditions; for example, the COVID-19 pandemic influenced multiple funding rounds due to new sustainable business models emerging to address social distance restrictions and health needs. The ECF campaigns try to attract investors to invest in technological projects based on sustainable business models. Our findings show that the use of disruptive technology is relevant in the approach to attracting investors in ECF campaigns. It is possible thanks to effective communication about how technological solutions efficiently and optimally could impact communities' well-being or environmental quality. The interesting part is that the ECF platform allows stakeholders (users and investors) to interact and co-create with entrepreneurs to identify the best technological and sustainable solutions for the different societal challenges. In the analyzed cases, the food tech and agri-food technology platforms were successful in their ECF

Codes	First order	Second order
Community integration and increased participation	Community	Social Impact
Community development with tools for users		
Sport as a way of life		
Reducing the use of physical resources in communication		
Recreational and sporting activities		
Collaborative e-commerce		
Knowledge sharing with users and producers		
Health tool includes an app and social network		
The information available to users	Communication	
Social isolation of people over 50 years old		
Telecommunications alternative for disaffected segments		
Communication channel for the student community		
Advertising tools to benefit customers		
Urban mobility		
Technology allows for increased responsiveness to users		
Support for local producers	Inclusion	
Democratization of access to housing		
Access to products for poorer families with smaller budgets		
Advice and support for users to learn how to use the technology		
Technological development can be homologated anywhere in the world		
Decrease purchasing restrictions		
Fair Trade and synergy		
Democratization of the use of digital services to all users		
Democratization and massification of digital means of payment		
Inclusion of people over 50 in the labor market		
Increased female participation in the labor market		
Promotes a circular and social economy	Circular Economy	Environmental Impact
Environmental actions linked to product marketing		
Reduction of environmental impact on communities		
Environmentally-friendly solutions for human welfare		
Eco-certification and recycling for waste traceability		
Increased agricultural productivity using adequate lighting		
Reduction of toxic waste	Bio Innovation	
Scientific innovation for the AgroForestry sector		
Renewable energies		
FoodTech for sustainable mushroom-based food production		
Research, development, and commercialization of mushroom-based foodstuffs		
Reduction of health risks of processed foods		
Use of solar energy		
Clean energy		
Innovation in the biotechnology area	Ecology	
Cost savings on packaging and single-use plastics		
A Greentech intelligent lighting system that improves plant growth		
Environmentally friendly cleaning line		
Natural and harmless products		
Water-efficient solutions		
Carbon footprint reduction		
Environmental responsibility		
Reducing water consumption, land use, and greenhouse gas emissions		

(*continued*)

Table 1.
Content analysis

Codes	First order	Second order
Efficiency in the use of resources	Efficiency	Technology innovation
Reduction of complexity and costs		-
Efficiency in supply chain management		Business Model
Access to venture capital		
Software development to reach more customers		
Reduction of information asymmetries		
Reduction of intermediaries in transactions		
Centralization of information for stakeholder support	Optimization	
Reduction of paper use in operations		
The technology used to optimize processes		
Collaboration between entrepreneurs in the same industry		
Significant reductions in production cycles		
Reduction of logistics costs		
Reduction of transaction times through technology		
Differentiated alternatives based on quality	Quality	
Learning for continuous improvement		
quality and efficiency in product delivery		
Digitize processes in a secure way		
Market growth	Opportunity	
Technology development and new associated businesses		
Growing market because of the pandemic		
Technological development is comparable to anywhere in the world		
Science, internet of things, collaborative learning, and internet of things		
Innovation with lower costs than the competition		
Innovation and specialized research and development		

Table 1. **Source(s):** Author's own creation/work

campaigns due to the use of technologies associated with renewable energies, waste reduction and reduction of health risks, among other characteristics (see P10 and P23). The R&D efforts in ECF campaigns aim to continuously improve project efficiency, optimization and quality. Disruptive technologies like AI and machine learning automate processes to meet high standards in health, biotech, green tech and other sectors (see P2, P11, P14 and P27). In this value co-creation process, the role of investors is fundamental by providing financial resources, as well as sharing know-how (as a business angel investor) across the innovative process to meet sustainable outcomes and ensure the investment return. The ECF platform also facilitates open innovation processes involving the users' feedback about technological solutions, particularly the alignment with vulnerable groups or communities. This open innovation practice strategically facilitates resource optimization, tackles societal needs and co-creates value with users, quality, viability and sustainable investors' returns (Guerrero and Martínez-Chávez, 2020).

5.2 Process → what: ECF platforms as intermediaries

On average, our analyzed ECF campaign funding process requested at least six months. A long this time, the ECF campaign shares the initiatives' content that includes an initial 30% hidden sale of the capital to investors associated with technological developers (e.g. key partners or early adopters), the 70% remaining involves the rest of the registered investors (e.g. 27,000 registered users), and the legal considerations for all parties (investors, entrepreneurs, platforms). In this way, the ECF platforms act as an intermediary and space that connects

potential investors and technological projects. The ECF platforms share exclusively the technological portfolio with the registered and potential investors. Then, the technological entrepreneurs and teams interact with investors through several rounds of investment. For the investors, the ECF platform facilitates the exchange of information and resources among the parties, therefore, the investors can follow the progress of the technological solutions. For technological projects, the ECF platform also allows gaining marketing benefits to attract new customers (Hörisch, 2015), or as a market test for new technological products, assessing whether the crowd is interested in what they offer (Pitschner and Pitschner-Finn, 2014; Lam and Law, 2016). Our findings suggest that ECF campaigns are successful when offering numerous advantages to entrepreneurs and investors associated with technological sustainability-oriented projects. It means that the entrepreneurs capture the interest of investors, reach the target investment amount, and the investor ensures the investment returns. It has been possible because the analyzed ECF platforms specify the investment that is needed to carry out each technological project during the crowd fundraising campaign. It is important for measuring the number of potential investors, the overfunding of the target amount and the achievement of the parties' goals (profitable technological solutions and societal impacts). Likewise, success is measured based on externalities, such as the continued enrollment of the parties in new technological solutions and fundraising processes to tackle societal and environmental challenges. It was observed in the trusted relationship between the entrepreneurs and the investors to co-create multiple technological initiatives within the ECF platform.

5.3 Output → why: tackling social and environmental challenges

Extant entrepreneurship studies have evidenced an increment in the sustainability orientation of technological initiatives that encompasses environmental, ethical and economic challenges (Vismara, 2019; Yáñez-Valdés and Guerrero, 2022; Ibáñez *et al.*, 2022). While the aim is to solve problems for individuals and communities, there is also an emphasis on self-reliance and an orientation toward implementation outcomes. During our coding process, we identified and classified impacts according to the objectives of the initiatives (see Table 1). Most environmental and social issues are cut across communities at the global level, which is a scenario that sets challenges and opportunities. It is, therefore, important that sustainable technological solutions be replicable to broaden their scope.

Regarding social impacts, social innovations do not occur in isolation; there are often spaces where the private sector, public sector and other groups work together. This raises the creation of communities based on interaction on digital platforms as a key objective of the projects (Yáñez-Valdés and Guerrero, 2023). Projects establish a collective and inclusive vision in their ECF campaigns by including the end-user of the product or service as a central part of the value proposition. The societal impacts associated with these innovative projects are mostly related to improving the quality of life of individuals and communities using disruptive technologies. Using disruptive technological tools allows sustainable innovations to generate better results in terms of efficiency and effectiveness. A good example was the COVID-19 pandemic, in which ECF campaigns actively focused on technological projects that provide innovative solutions to reduce the effects of distance restrictions, such as remote education, health, employment and other community needs. Our findings show that different ECF campaigns supported inclusive and community projects, including segregated and vulnerable groups with special needs. For example, while P3 proposes the creation of a community to provide training for older adults and facilitate their communication, P9 proposes the promotion of recruiting people over 50 years old who have greater difficulties finding employment, as well as support for women mothers needing part-time work. Likewise, we also identify different technological projects focused on health (P2, P14, P27), education (P7), community management (P13, P16) and financial solutions (P24, P28, P29, P31).

Regarding environmental impacts, environmental problems are increasingly confronted with sustainability orientation and business models. Thus, technological solutions related to operation are underpinned by a new interest in caring for nature and available resources. We identify three patterns. The first pattern is related to the social recognition of environmental challenges that have fostered the emergence of sustainable technological-based entrepreneurs and pro-sustainable investors (Gast *et al.*, 2017; Lam and Law, 2016; Yáñez-Valdés *et al.*, 2023). It has contributed to the emergence of ECF campaigns to encounter technological projects and pro-sustainable investors interested in providing solutions to mitigate environmental challenges (see P11, P19, P20, P21, P30, P33). Consequently, the second identified pattern is adopting a circular economy approach that includes a new production model based on taking, manufacturing, ringing and disposing of resources and goods that threaten natural ecosystems and affect human health and well-being (Stahel, 2016). We identify different initiatives in its search for technological alternatives to using sustainable resources by adopting a circular economy view, caring for the environment and reducing carbon footprints. Specifically, new sustainable business innovation models embodied compostable, recyclable products that minimize waste, increase the reuse of resources, improve renewal energy sources and close damage cycles in industrial ecosystems (see P11, P19, P20, P21, P30, P33). The third pattern is related to the emergence of unique biodegradable and harmless technologies that positively contribute to care for the environment. A new sustainable mindset and sensibilization among consumers, producers and investors have emerged to meet sustainable principles and increased demand for green products/services (Gast *et al.*, 2017). As a result, sustainable technological initiatives seek to minimize any negative impact on the environment and communities.

6. Discussion

6.1 Proposed conceptual framework

Figure 2 shows our proposed conceptual framework as a result of our content analysis, findings and proposed propositions.

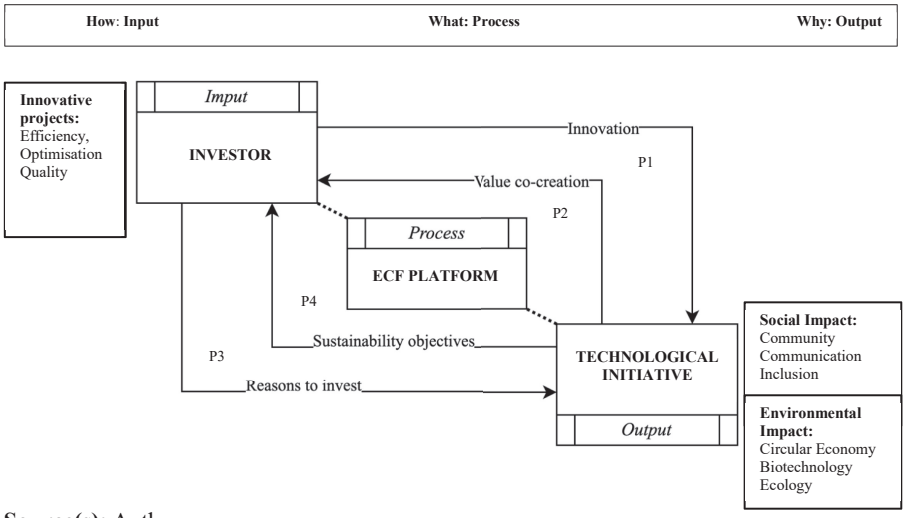


Figure 2.
ECF platforms and sustainable impacts > the encounter of investors and technological initiatives

Source(s): Authors

Our findings regarding proposition 1 reveal that investors are more willing to invest in ECF platforms if the technological projects offer sustainable solutions linked to disruptive technologies, as Calic and Mosakowski (2016) suggested. Over the last decades, global markets have faced technological disruptions with opportunities such as increased flexibility, reactivity and customization of products/services (Devezas *et al.*, 2017). The digital and sustainable approaches have transformed the view of the lifecycle, value creation, business models and impact generation (Loebbecke and Picot, 2015). Using disruptive technological advances as a central part of the value creation proposition represents signals of viability, legitimacy and profitability in each technological initiative (Calic and Mosakowski, 2016). Although several authors have suggested innovation as an outcome of ECF campaigns, new ECF outcomes have emerged by aligning technological solutions and societal challenges h (Zhang and Chen, 2019), whereas started a new conversation between entrepreneurs with technological solutions to tackle societal challenges and pro-sustainable investors interested in investing in technological, sustainable, profitable and impactful entrepreneurial initiatives.

Our findings concerning proposition 2 uncover that ECF campaigns can potentially increase the innovation performance and value of co-creating technological solutions. As suggested by Vismara (2019), the ECF information asymmetry regarding technological projects' capability to generate cash flow, income, and innovative performance positively influence any investor decision. Our analysis suggests that ECF projects potentially engage investors through a validated exchange of information and an open window for intervention with resources and know-how along the co-creation process of the technological solutions. Therefore, we observed a successful ECF platform strategy and timeline in generating each campaign, sharing information, launching technological initiatives, investing rounds and designing follow-up spaces. While some investors might have interests associated with a certain technological initiative, others seek to diversify their investment portfolio in co-created technological performance with strategic partners to guarantee a considerable innovation performance (Hornuf *et al.*, 2022; Stanko and Henard, 2017).

Our findings concerning proposition 3 show that ECF investors are more willing to invest in ECF campaigns if the projects offer sustainable solutions linked to using disruptive technologies (Troise *et al.*, 2021; Vismara, 2019). The ECF platform is an optimal alternative for technological solutions that tackle societal challenges by attracting low-capital investors who consider tangible rewards and societal impactful in each investment. Our findings show that ECF investors who made decisions guided by cost-benefit interests are willing to invest in disruptive technological projects with a sustainable business orientation, as Hornuf *et al.* (2022) suggested. Our findings also showed the attractiveness to ECF's pro-social impactful investors of ECF proposals that combine innovative solutions, disruptive technologies and sustainable (social and environmental) objectives. Consequently, ECF campaigns promote a new circular economy and ecological outcomes (Ardito and Dangelico, 2018; Pujari, 2006; Fernando *et al.*, 2019; Lam and Law, 2016; Gafni *et al.*, 2021). Pro-social ECF technological initiatives promote the inclusion of vulnerable collectives and community engagement by offering solutions through digital spaces for improving health, education, employment, finances and communication. Pro-environmental ECF technological initiatives rethink value creation through new clean, natural, renewal and sustainable alternatives.

Our findings concerning proposition 4 confirm the intermediary role of ECF platforms in encountering sustainable-profitable technological solutions, impactful investors and new market segments. Our findings are consistent with previous studies that found that pro-sustainable-oriented ECF campaigns succeed more if they effectively communicate the nature (technological and sustainable orientation) and viability (expected innovation performance) of entrepreneurial projects to influence the investor's decisions (Gafni *et al.*, 2021). The ECF campaigns connect technological projects and new market segment clients (Hörisch, 2015). The ECF campaigns showcase the technological project, providing

information on feasibility and success rates to achieve funding objectives. It explains why guiding investors to invest in a sustainable technological initiative requires optimizing efficiency and quality (Presenza *et al.*, 2019).

6.2 Academic contributions

Our study contributes to the crowdfunding literature threefold.

First, our study theorizes new outcomes of ECF platforms related to the sustainable impacts of technological projects to tackle social and environmental challenges. It represents an initial step toward a more detailed study of the ECF platforms as an enabler for developing sustainable initiatives using disruptive technologies (Vismara, 2016, 2019). A pro-sustainable-oriented ECF technological-based entrepreneur represents a critical actor in society looking for an efficient and inclusive use of private-public resources to positively impact societal well-being and environmental care. It also highlights the inclusion orientation of ECF platforms and the convergence with multiple approaches (such as circular economy, open innovation business models, digital economy, digital social entrepreneurs and ecological models) where the central focus is the final user enrolled in a scenario of resource scarcity in line with the 2030 United Nations Agenda (Ardito and Dangelico, 2018).

Second, we expand the understanding of new intermediation roles of ECF platforms related to facilitating the co-creation process of sustainable and technological solutions. Previous studies explored the role of ECF platforms as a critical actor that exchanges information among entrepreneurs and investors (Cillo *et al.*, 2019a, b; Mochkabadi and Volkmann, 2020; Troise and Tani, 2020; Troise *et al.*, 2021). Our study uncovered the ECF co-creation space connecting entrepreneurs (who create disruptive technological solutions), investors (who act as business angels that provide financial resources, know-how and experience) and users (who offer constructive feedback regarding the efficiency, quality and required improvements of the products/services). Furthermore, we offered insights into the ECF-validating role with investors and target communities, extending the accumulated knowledge in corporate social responsibility literature (Boutillier, 2020; Battisti *et al.*, 2022; Cillo *et al.*, 2019a, b; Nirino *et al.*, 2022).

Third, we provide new insights into the use of disruptive technologies as a feature that legitimizes sustainable innovation business models and enables the success of ECF campaigns (see Callaghan, 2014; Jenik *et al.*, 2017). Moreover, the perception of quality and trust in ECF projects is achieved when disruptive technologies become the central focus of the co-creation process (among entrepreneurs, investors and users) and the sustainable value creation offering (tackling societal challenges) based on efficiency, optimization and quality of inputs and outputs. The ECF scenario increases investor confidence due to clear signals of viability, profitability and future sustainability of the technological initiative (Hervé and Schwienbacher, 2018). Consequently, incorporating technology, innovation and sustainability represents a successful combination in a technological initiative oriented to meet stakeholders' social and environmental objectives.

6.3 Implications

Several implications emerge from our study. *For technological-based entrepreneurs*, our results provide interesting insights into how ECF platforms could provide effective access to investors and other financing opportunities to those experimenting with multiple obstacles or difficulties in the traditional financing channels. In this vein, ECF platforms boost innovation, entrepreneurship and sustainability, positively impacting employment, economic development and well-being. The ECF platforms also communicate effectively with strategic partners/investors regarding the innovative initiative, technological solutions, the team, financial needs and expectations, the expected sustainable impacts and an open window toward co-creation. *For pro-sustainable-oriented investors*, our results also provide

insights into how ECF platforms promote different portfolios of sustainable technological solutions. ECF platforms also stimulate co-creation along with the development of disruptive technologies by matching the objectives of potential investors and technological-based entrepreneurs. ECF platforms promote sustainable investment campaigns and increase social awareness and culture of sustainability through disruptive technological solutions.

6.4 Limitations and future research

Our study has several limitations. First, given the nature of our study, the analysis is limited to one ECF platform and 35 technological projects in the context of an emerging economy (Chile). A natural extension of this study is the analysis of multiple ECF platforms, ECF technological projects, ECF investors and final users across the globe. It will help us to empirically test our proposed conceptual framework, especially complementing perceptual with objective metrics to capture the inputs, the processes and the outcomes. It implies a representative sample and designing a mixed methodological approach to collect qualitative and quantitative data. Second, given our short data collection period, the analysis is limited to ECF data from 2020 to 2021 and may be influenced by the COVID-19 pandemic. It provides us with a "cross-section" or "static picture" of the analyzed ECF platforms and projects. However, any disruptive technological co-creation process demands a "dynamic" view to better understand the role of multiple actors (entrepreneurs, investors, users), inputs (resources, capabilities), co-creation process, outcomes (innovation performance, sustainable impacts) and other novel approaches. Third, given our sustainable impact orientation, we must contrast the target group (sustainable-oriented technological initiatives) and the control group (purely commercial-oriented technological initiatives). It should allow us to understand the success/failure of the ECF campaigns and investor-entrepreneur engagement. In addition, we could include new personal, project and partnership factors in our analysis. Likewise, our study also opens research opportunities by mixing multiple approaches (1) corporate social responsibility, (2) business (open) innovation models, (3) social (digital) entrepreneurship, (4) technology-based entrepreneurship, (5) business angels and corporate venture investors and (6) economic development.

7. Conclusion

The viability and development of sustainable projects depend on disruptive technologies. The ECF platform provides a space for investors and entrepreneurs to co-create sustainable and profitable technological solutions that address societal challenges. Our study proposed a conceptual model to understand how ECF campaigns attract investors to invest in technological initiatives with social and environmental value proposition impacts, as well as provides insights about the factors behind the ECF's successful encounter of disruptive technological initiatives and pro-sustainable-oriented investors. We hope this research encourages further debate and insights on the critical role of ECF platforms, as well as the contributions of tech-based entrepreneurs and investors towards a sustainable, circular and digital economy.

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(The Appendix follows overleaf)

Appendix

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P1	Property or real estate	An average property transaction in the country typically takes eight months, this project utilizes technology and access to capital markets to reduce sale times to just 10 days. After purchase, the property is renovated, warranted, and financed to provide the buyer with a product of excellent quality and a guarantee of excellent quality of life for the end user	1647.35	1647.35	0.00	51
P2	Health and MedTech	A science-based startup that develops and commercializes cancer detection solutions. Their patented product detects prostate cancer metastasis at diagnosis, allowing patients to access treatment	400.00	765.23	0.91	165
P3	Entertainment	It aims to connect people over 50 who may not have met otherwise, acting as a bridge	260.00	273.90	0.05	49
P4	Recruitment and advocacy	Customers can simplify the legal world with monthly subscriptions that offer unlimited legal services	150.00	228.90	0.53	79
P5	Marketing and advertising	It is a cashback platform that aims to bring sales to member brands and reward users. It offers solutions for both brands and users through a web platform that allows shops to advertise and offer money-back benefits to attract new customers. It earns a commission on each sale generated, which we share with the brands	616.05	616.05	0.00	60
P6	Food and beverage	A gastronomic hub that attracted local press attention, providing us with an important platform to showcase our innovative concept and experience. Its strategic location allows it to cover a 4 km radius in an area comprising of 4 communes with high demand for food delivery. Its kitchens are equipped to operate as plug-and-play establishments	700.00	740.00	0.06	153

Table A1.
ECF Projects

(*continued*)

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P7	Education	It is a platform for preschools that offers communication, management, and administration tools through a web platform and mobile app. The platform is customizable to meet the needs of each establishment, including private and state kindergartens, nursery schools, language schools, and after-school programs	150.00	195.00	0.30	75
P8	Entertainment	This platform simplifies event creation and management, saving time and costs. It's versatile, catering to teachers, personal trainers, banks, universities, and more. Over 6,000 customers use it to create, sell and live-stream physical, online, and hybrid events via their preferred platforms.	300.00	392.00	0.31	98
P9	Recruitment and advocacy	This platform uses machine learning to connect highly skilled women professionals with flexible job opportunities, including full-time with flexible scheduling, part-time and project-based work. Candidates only need to fill out their profile once, and organizations receive a shortlist of candidates within 48 hrs. Women candidates can participate in the platform and receive notifications for job matches, as well as access to the Proyecto community for employability content and webinars	165.00	212.00	0.28	71
P10	Food and beverage	This food tech platform aims to create change in the food industry by sustainably producing delicious mushroom-based products that are healthy, well-developed, and environmentally responsible. The entire production process is also environmentally sustainable, reducing intensive water consumption, land use and greenhouse gas emissions, making it suitable for all consumers	123.20	183.50	0.49	46

(*continued*)

Table A1.

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P11	Environment and GreenTech	This system combines LED technology with specific light spectra for plants, allowing users to adjust it remotely via a website and choose from a virtual library of light recipes	300.00	540.00	0.80	87
P12	eCommerce	This eCommerce platform connects local producers and consolidates their supply for fast delivery to users within 60 min. Orders are assembled within 5–10 min to ensure timely dispatch (Monday-Saturday)	100.00	119.50	0.20	19
P13	SaaS/PaaS	This platform digitizes community processes and enhances security, financial, and facility management. It integrates with building hardware for streamlined visitor check-in	150.00	200.00	0.33	33
P14	Biotech	This platform offers a diversified portfolio for investors and an acceleration program for biotech entrepreneurs. Each venture selected must meet our high standards to ensure success, global impact, and profitable market exit for all stakeholders	250.03	592.77	1.37	35
P15	Applications and games	This platform provides a complete and high-quality user experience for sports enthusiasts on iOS, Android and the web	300.00	450.00	0.50	61
P16	SaaS/PaaS	Entrepreneurs can digitize signature processes and document management from any device with Internet, at a more convenient cost. The mobile solution securely sends, signs, and approves documents anytime, anywhere. The technological development is homologated at the international level, under World Class standards, and integrated with the unique key of the Civil Registry. The company is certified in the Directorate of Labor for labor processes	127.95	227.39	0.78	8

Table A1. (*continued*)

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P17	Home and personal care	Is a line of ecological cleaning and personal care products, hypoallergenic, free of harmful chemicals for health and the environment, and not tested on animals and with the difference that they have patented microparticles that detoxify and protect against pollutants such as heavy metals	117.00	120.00	0.03	33
P18	Data and analytics	It is an online platform specialized in real estate investment, through which users can search, compare, analyze, select, invest and manage the real estate opportunities and assets that best fit their objectives	177.50	177.50	0.00	15
P19	Environment and GreenTech	It is a platform dedicated to providing cost-effective and proven water efficiency solutions to directly address water scarcity. Its technology is five years old and has been tested in all types of meadows, achieving savings of around 50% in water consumption	58.00	58.00	0.00	35
P20	Renewable energy and CleanTech	Solar energy is today the cheapest source of electricity production and Chile has the best radiation in the world. It built that model to develop solar energy on a distributed, decentralized scale, inviting each venture and person to generate their energy. It finances, installs and maintains solar photovoltaic projects for the self-consumption of electricity on a distributed scale	525.35	580.68	0.11	53
P21	Environment	It connects its offered services with any person or venture that has a specific or permanent need through a C2C platform (a marketplace of services) and a B2B platform (validated business lines)	130.00	140.73	0.08	41

(*continued*)

Table A1.

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P22	Content and information	It looks for products or services to add value from innovation, from intrapreneurs within the organization to external entrepreneurs and SMEs who receive advice and online tools to improve their proposals. It has generated a ranked list of the best solutions, an assessment of the capabilities and tools of the teams that are key to creating real value for your venture or industry	250.00	284.66	0.14	90
P23	Food and beverage	It creates a unique service in supermarkets with the highest standards of quality and customer service, taking care of every point of contact we have with the consumer	368.80	446.67	0.21	68
P24	Finance, FinTech, and means of payment	It is a platform to support digital entrepreneurship through the means of payment, the difference is that we will do our best to make the ventures sell more, as well as learn everything necessary for their growth	40.00	60.00	0.50	56
P25	Telecommunications	It delivers a Smart Mobile service, with a unique value proposition that allows users dissatisfied with the current mobile offering to access a flexible consumption model, with no strings attached and no plans	101.44	276.43	1.73	70
P26	Data and analytics	It is based on "Cloud" technology for the inspection and control of the progress of works, through augmented reality and timely, accurate and accessible information for all agents involved in the development of each construction project	65.05	65.05	0.00	16
P27	Health and MedTech	It is a technology venture that, through the development of software solutions, is dedicated to improving people's access to services, allowing them to manage their time	40.00	46.00	0.15	44

Table A1. (*continued*)

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P28	Finance, FinTech, and means of payment	It allows users, through our web platform, to buy Bitcoin via bank transfer directly, without having to place purchase orders or complex offshore money transfer systems	40.00	42.37	0.06	26
P29	Finance, FinTech, and means of payment	It has developed a collaborative materials and spare parts catalog in the cloud, with the following features: (1) Common and universal language and (2) Collaborating with ventures in the same industry	150.00	151.54	0.01	37
P30	Environment and GreenTech	Its value proposition is the creation of highly effective, natural, and environmentally friendly solutions for human and animal welfare using the properties of products, carrying out research, development, and innovation together with specialized research centers	90.00	90.00	0.00	83
P31	Finance, FinTech, and means of payment	It uses KP to create a payment button on their website, request payment by e-mail, share a link on Facebook, or many other ways to generate an offer that can be paid KP. The user who wants to pay with KP, declares the RUT with which he will pay and makes a transfer to complete the payment. KP is waiting for the combination (RUT, amount) of the transaction to be charged and when it arrives, instantly notifies the merchant and the payer	200.00	246.80	0.23	72
P32	Entertainment	It delivers an innovative model that allows fans to simply invest in their favorite bands and share the risk of the show, earning returns according to the number of tickets sold. This solution allows production ventures to leverage their risk and share the profits of the business	248.17	248.17	0.00	62

(*continued*)

Table A1.

Project	Industry	Description	Target amount $CLP (million)	Total Raised $CLP (million)	Over-funding	Investors
P33	Environment and GreenTech	It is an innovative and sustainable design, we detect problems with products that pollute, improve them, and design solutions that work and leave no environmental footprint. It has started with cutlery, plates, and various disposable products made of wood, palm leaves, and 100% compostable materials (biodegradable in less than 1 year) oriented to the food industry, which is one of the most polluting in terms of plastic waste. It is already working on solutions for other industries using a patented technology	266.00	361.02	0.36	34
P34	Food and beverage	It seeks to establish a wholesale relationship with manufacturers of basic consumer products - such as detergent, rice and oil, among others - by buying products in bulk (not packaged) to save considerably on packaging costs, without lowering product quality	90.00	90.10	0.00	55
P35	Entertainment	It is a collaborative e-commerce selling custom clothing and accessories. The designs are created by our community of thousands of designers. Anyone can upload a design and every time it sells, the creator earns a commission	60.00	84.00	0.40	67

Table A1. **Source(s):** Author's own creation/work

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