Investigating Transparency and Accountability of User Interfaces for Data Visualization: a Case Study on Crowdfunding

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Abstract. Crowdfunding is an innovative form of fund raising that enables individuals and businesses to leverage a large audience of potential supporters for financing their projects: disseminating the message to many potential contributors compensates for the smaller individual commitment. In the recent years, thanks to web-based platforms, crowdfunding received increasing attention and branched into several subtypes, such as, reward-based and equity-based initiatives, which enable supporters to pre-buy products or acquire company shares, respectively. Indeed, crowdfunding platforms have several advantages (e.g., reducing barriers to bottom up initiatives and democratizing access to high-return investments). Simultaneously, as governments are in their early stage of addressing the many risks and grey areas related to the dynamics of crowdfunding, the accountability of platforms has a crucial role. In this paper, we investigate the transparency of the User Interface (UI) of equity crowdfunding platforms and we discuss the implications in enabling users to make better informed decisions about their investments.

Keywords: Crowdfunding · Equity Crowdfunding · Reward-based Crowdfunding · Data Visualization · Visibility · Inferability · Heuristic Evaluation

1 Introduction

Crowdfunding is a recent form of fundraising that enables businesses to collect funds for a project by publishing it on an on-line platform and presenting it to an audience of potential supporters and early adopters who are willing to pledge to its future development [1]. Although the initial objective of crowdfunding websites was to help finance small, non-for-profit initiatives, in the last decade it raised a total of 34 billion US dollars worldwide [2], and it evolved into a more sophisticated and structured form of funding for new or established ventures. As a result, nowadays several businesses choose reward- or equity-based campaigns for crowdsourcing funds as alternatives to raising venture capital, and the industry is projected to grow to over 300 billion US dollars by 2025, according to recent statistics [3]. Reward-based crowdfunding typically consists in pre-selling the concept of a variety of initiatives, such as, physical products (e.g., apparel, devices), events and exhibitions, art projects, and

services, before they are actually implemented, so that the company can collect the necessary funds to start production. The rules, risks, and best practices of reward-based crowdfunding have been analyzed in several research studies: although most of the projects are successful stories, given the intangible nature of the promise of crowdfunding campaigns, numerous cases resulted in scams or projects that were never realized.

Conversely, in this paper, we focus on the role of User Interfaces (UIs) in crowdfunding platforms, and we detail aspects that have an impact on transparency and, consequently, affect end users. Specifically, we analyze the explicit and implicit dimensions of transparency and their implementation in terms of type of information and data visualization mechanisms currently available on crowdfunding platforms. Moreover, we evaluate the contribution of specific components of the UI in terms of helping users take better informed decisions. We compare the different types of information visualization offered by the most popular websites, and we identify the benefits and potential flaws of the key elements of the UI (e.g., funding goal, fundraising progress, interaction with the audience, investment timeline). Specifically, we consider equity crowdfunding [4], a new form of crowdsourced investment that enables businesses to collect funds by issuing shares of the company. Given its novelty, regulations are still under development and UI is not taken into consideration. Nevertheless, as the audience of equity crowdfunding platforms mainly consists of inexperienced individuals, this type of initiative involves higher risks. From our findings, we demonstrate that information design is a component of governance: User Interfaces have a significant role in providing users with transparent information, increasing their awareness about the risks associated with investments, and improving the effectiveness of crowdfunding platforms in demonstrating their accountability.

2 Accountability and Role of User Interface in Crowdfunding

Many aspects of digital crowdfunding have extensively been explored in the scientific literature [5], despite its introduction is relatively recent. However, the majority of research studies focused on economic aspects [6], factors that contribute to the success of campaigns (e.g., marketing and promotion) [7], and social dynamics, such as herding, that explain the behavior of investors and help understand follow-up investments [8]. Conversely, elements of the user experience that are related to the UI of crowdfunding platforms, such as, the type and quality of information presented to users, data visualization, and the specific components of the GUI, received less attention. This is mainly because most of the work regarded reward-based crowdfunding platforms (e.g., Kickstarter and Indiegogo), in which, similarly to an e-commerce website, information primarily involves a description of the project, a limited number of reward options, and timeline and delivery date. In this case, risks are mainly limited to delayed product receipt or to not receiving the reward at all (e.g., due to production issues or fraudulent campaigns).

On the contrary, as equity crowdfunding platforms (e.g., Seedrs, Companisto, and Mamacrowd) are marketplaces for becoming shareholder of a company in exchange of an investment with potential future returns, there are many more variables and

additional pieces of information that need to be disclosed to the user, to make them fully aware of the risks and benefits of the operation. Moreover, currently, most equity crowdfunding platforms have a similar GUI and user journey compared to reward-based websites. However, especially considering the novelty of this form of platforms, there is the risk for non-expert users to assimilate two and, consequently, overlook the inherent risks associated with equity investments. Furthermore, as equity crowdfunding platforms target a diverse audience of stakeholders consisting of investment firms, professional investors and non-experts, it is even more important to make sure all the users have equal access to relevant information and that they can understand it.

Most studies about equity crowdfunding focused on implementation factors pertaining the organization of individual campaigns, such as, financial attractiveness of the business plan, communication and promotion strategy (e.g., updates and responsiveness to comments), and aspects related to founders' ability to use crowdfunding as a digital tool to successfully raise the target amount. Conversely, in this paper, we focus on the design of information, interface, and user experience in crowdfunding platforms, independently from the specific campaign information [9]. Although the design and implementation of user interface are often overlooked, they have a crucial role in increasing transparency and are a fundamental factor of accountability in equity crowdfunding platforms. In the next section, we highlight the best practices and identify areas that need to be improved. As governments recently started studying the complex dynamics of crowdfunding to introduce regulations that address assurance principles and standards, incorporating the concept of transparency in interface design could already contribute to improving the type and quality of information presented to users.

3 Transparency Analysis

In our preliminary analysis, we considered 7 European equity crowdfunding platforms (2 in Germany, 1 in the UK, and 4 in Italy), and we realized a heuristic evaluation of the transparency of their information. Although usability incorporates the concept of transparency, this aspect is inherently elusive and, thus, often overlooked. Therefore, in our study we refer to and adopt the model proposed by [10], which defines the semantic dimensions of transparency, that is, *visibility* and *inferability*, which are necessary and jointly sufficient conditions for there to be transparency. Moreover, [10] details the empirical parameters that can be utilized for measuring the quality of transparency: specifically, visibility represents the degree to which information is complete and findable, whereas inferability describes the extent to which information is disaggregated, verified and simplified. Furthermore, as previously discussed, transparency should be appropriate for the intended audience. To this end, we refer to [11], which differentiated between *indirect* transparency, that is, the level of understanding by experts, and *direct* transparency, which regards the degree to which it is intended to the wider public.

The structure of campaigns on an equity crowdfunding platform typically consists in the following details: (1) project description, which includes video, images and

text, that describe the business opportunity, the target market, the proposed solution and its advantages, the team, and the strategy; (2) financials disclose information, such as, amount currently raised, goal of the campaign, equity distribution; (3) updates inform potential investors about accomplishments and milestones achieved during and after the campaign, whereas comments help interested users interact with the team; (4) detailed list of investments promised and secured throughout the campaign. In addition, projects can include additional documentation, such as, investor's deck, business plan, and detailed financial projections, which typically are targeted at a more expert audience. Depending on the specific implementation, elements are arranged over different pages or incorporated in components of the GUI that helps condense and summarize information. Although most platforms include this type of information, they have different criteria in regard to visibility. Furthermore, the systems utilized for visualizing information demonstrate low inferability, which especially decreases indirect transparency.

None of the platforms analyzed in our study included whether the information presented in the project description page is verified and validated by a third-party stakeholder with domain expertise, which would increase direct transparency and, thus, promote trust among non-expert investors. Consequently, although information is visible, its inferability is limited, because it cannot be easily verified. In this regard, reward-based crowdfunding platforms are partnering with companies that analyze whether a project is credible and display a badge on their page, though there are no studies about the effectiveness of this system in terms of amount raised, successful product delivery, or improved trust. Moreover, crowdfunding platforms lack standardization: each campaign utilizes a different system for describing and visualizing data about the market, competition, timeline, funding allocation, and expected growth, which affect the simplification dimension of inferability. Having a single format for presenting similar data would enable users to compare information about different campaigns: although each project is unique, marketplaces should diminish fragmentation to support individuals in deciding about the best investment among the many opportunities advertised. Finally, information about the team is a key factor for determining the likelihood of success of a business. Unfortunately, 4 platforms display only the names of team members, whereas 3 websites provide links to founders' profiles on professional social networks (i.e., LinkedIn), which help infer their expertise.

As for transparency of financial information, several factors render it the most critical aspect among all components. Indeed, this is due to the inherent complexity of investment dynamics. Nevertheless, numerous pieces of information are not visible on most platforms. As an example, only one website shows the difference between promised and committed investment: as raising equity on average involves higher amounts compared to other forms of crowdfunding, users promise a sum that they can commit (i.e., actually pay or transfer) by the end of the campaign. However, as there is no obligation for the investor to fulfil their promise, there often is a discrepancy between the amount promised by users and the funds eventually collected at the end of the fund-raising round. While this ambiguity helps demonstrate traction and attract follow-up investments, it might lead to inflating promised amounts and, consequently, affect the success predictability of a campaign based on the amount raised at any given time, and ultimately, decrease the level of trust in the platform. Furthermore, in-

formation visibility issues include the relationship between share rights and minimum amount invested: several crowdfunding platforms enable defining different types of shares and assigning them based on the minimum contribution. While direct and indirect transparency are compromised by the lack of visibility of this information, the concern is even greater in terms of inferability, as many non-expert individuals participate in investments. Also, most websites lack transparency in regard to the amount co-invested or raised by founders independently from the platform and assimilate it to the promised or committed amounts, creating further ambiguity in this regard. Many equity crowdfunding campaigns follow the pattern of traditional crowdfunding campaigns, in which the initial commitment is a driver for attracting subsequent investments. As a result, founders typically already secure investment from different sources (e.g., friends and family or professional investors) before or in parallel to launching the campaign. Such investments might involve conditions that are negotiated independently from the platform and might result in different rights compared to users who buy equity on the crowdfunding website. Specifying the amount already secured and the conditions negotiated with the investors would help understand the ratio between founders' ability to raise funds and the effectiveness of the crowdfunding platform, in addition to increasing users' awareness about the convenience of the investment opportunity and the overall structure of the deal. Increasing the visibility and inferability of this type of information is crucial for improving even indirect transparency.

Most platforms include tools for posting updates and comments, which can be utilized to ask for additional information that was not mentioned in the initial package, to clarify specific aspects and, indirectly, to infer the responsiveness and commitment of the team. Also, this component helps dynamically modify and complete the information presented in the other sections based on the feedback received by users.

Finally, platforms lack visibility and inferability of information about investors who contributed to the campaign. In reward-based crowdfunding, who else backs the campaign and the type of reward they choose are not relevant to the supporters and proponents of the campaign: the only concern that matters is that the project is successfully funded. Conversely, as the supporters of an equity crowdfunding campaign will share ownership and responsibilities, their identity should be important to the founders and to other supporters; furthermore, the type and number of shares owned by backers can result in different representation and, thus, have an influential weight in strategic decisions, determine company success and, ultimately, valuation. To this end, 3 of the 7 crowdfunding platforms implement a unique numeric identifier associated with users, so that the investment, equity stake, and portfolio of each investor can be disclosed while preserving their anonymity. Although all platforms examined in our evaluation show the number of supporters, none displays information about the type of shares and their distribution among investors, making it difficult to infer the structure of company shareholders as a result of the campaign.

In addition to the type and quality of information, persistence is relevant for both new users and returning investors. In this regard, platforms have different strategies: 2 websites maintain all the information visible after the end of the campaign, whereas the others remove some or most of the data as soon as the campaign ends, which makes it difficult to compare current investment opportunities with previous campaigns.

4 Conclusion and Future Work

Crowdfunding websites, especially promoting equity-based campaigns, are a novel type of online marketplaces that enables individuals and businesses to raise funds to initiate and develop their projects. Although most campaigns successfully deliver their promise, equity crowdfunding involves several additional risks compared to reward-based campaigns, especially for non-expert investors. Consequently, governments are in the early stages of developing recommendations. Nevertheless, given the current lack of regulations, companies implement what seems to work best in their platforms. In this paper, we highlighted the importance of transparency in User Interfaces, we discussed its implications in terms of risk awareness and information assurance. Specifically, our heuristic evaluation of the main components of the Graphical User Interface focused on transparency, that is, quality and type of information, as well as its visibility and inferability, and did not take into consideration other dimensions of usability. We suggested the implementation of UI elements that should be recommended as mandatory to provide users with information and make them aware of the risks and benefits of investing in a project, so they can make better informed decisions. In our future work, we will expand our study by designing an experiment that will evaluate whether introducing the elements suggested in this paper actually increases transparency and improves awareness of both experts and non-experts.

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