Communication of Post-Release Plans in Crowdfunding Development Initiatives: A Signaling Perspective

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Abstract

Significant research explores how developers leverage crowdfunding to attract finance for releasing digital goods. However, researchers seldom study "post-release activities" that are crucial for maintaining and advancing those goods. This article elaborates on the challenging nature of post-release activities for crowdfunding initiatives, asking how developers communicate their post-release plans to effectively prepare backers for possible changes. Using a grounded approach that connects the longitudinal history of fundraising to development to post-release, I examine initiatives that achieved impressive fundraising and development results yet varied significantly in their post-release outcomes. While they consistently signaled post-release plans, the differences are the signals' costs, backers' reactions, and the post-release activities and outcomes. I present theoretical propositions that (1) developers benefit in the long run by combining high-cost signaling with engaging backers in follow-up conversations about post-release issues and (2) prospective backers can utilize developers' communication to identify their post-release signals. Unlike dominant research findings about signals' impacts on mobilizing resources during fundraising, the findings emphasize signals' post-release consequences for stakeholders. While different signaling approaches can enhance short-term performance, they also seed contrasting longer-term outcomes for developers, backers, and the industry. These findings advance knowledge on effective strategies for engaging society to build sustainable digital goods.

Keywords. Crowdfunding, software development, sustainable development, post-release, digital, communication, information sharing, entrepreneurship, case study, grounded theory

1. Introduction

Digital goods, such as search engines, online encyclopaedias, and mobile apps, are the backbone of today's businesses and society [1] (Lyytinen et al. 2016). Reward-based crowdfunding using social networking technologies has enabled developers, especially those with unconventional and outside-of-the box proposals, to finance their ideas for building digital goods (Lee and Sohn 2019). As developers create crowdfunding campaigns to promise digital goods in exchange for financial contributions, they receive support from thousands of globally distributed individuals (Lee and Sohn 2019). Because those individuals pre-order campaigns' rewards (James et al. 2021), they are also enthusiastic about contributing development ideas and insights (Barbosu and Gans 2022; Nucciarelli et al. 2017; Smith 2015). Since meeting financial goals in crowdfunding campaigns is impactful, extant research predominantly focuses on how developers create and perform in those campaigns (James et al. 2021; Siering et al. 2016; Zhou et al. 2018). A few studies also point to crowdfunded projects and their processes for releasing digital goods (Conboy et al. 2020; Gleasure et al. 2019; Gleasure and Feller 2016).

Surprisingly, researchers rarely discuss that developers must also engage in ongoing activities after the first official release to maintain and advance their digital goods. Such activities—called *post-release activities*—focus on fixing bugs, addressing security concerns, developing new features and functionalities, and attracting finance to enable those developments. Post-release activities are crucial because digital goods rely on maintenance and enhanced versions (Dong and Götz 2020; Harris et al. 2009; Xu and Brinkkemper 2007). Otherwise, outdated goods would not be able to adhere to the market's changing demands, and they can quickly become vulnerable to ransomware attacks, malware, and data breaches. Subsequently, those outcomes risk developers' track record, reputation, and future fundraising

[1] Throughout this article, *digital goods* refer to software-enabled products and services that are sold, delivered, and transferred in the digital form.

performance. Despite these critical outcomes for developers and end users, extant research pays little attention to post-release activities in crowdfunding development initiatives[2]. Any attempt to mend this gap can strengthen our understanding of the complex nature of post-release activities in those initiatives. Specifically, developers might have shared some aspects of their *post-release plans*[3] during fundraising. If they abandon those plans and embrace new opportunities after the official release, they likely face tension between their interests and backers' expectations. Although crowdfunding platforms seldom force developers into future contracts, backers can be disappointed and lose their trust in developers' fundraising calls. Since crowdfunding occurs in the public domain, unhappy backers share their experiences, harming developers' track records and initiatives. Without the crowd's support, developers would struggle to sustain their digital goods.

Against these backdrops, the present study argues that the complex nature of post-release activities could be handled if developers engage in meticulous communication to clarify some aspects of their post-release plans and prepare backers for possible changes. The study asks: *How can crowdfunding development initiatives communicate their post-release plans to prepare backers for possible changes and maintain their satisfaction?* Using a grounded theory approach, I examine two longitudinal cases in which the initiatives achieved impressive fundraising and development results yet varied significantly in their post-release activities and outcomes. The analysis explores the developers' communication of post-release issues (e.g., plans, activities, changes) and backers' reactions to the developers' communication. I leverage the findings and insights from extant research to articulate propositions for how crowdfunding development initiatives can communicate post-release plans to seed longer-term benefits for developers, backers, and the industry.

2 *Crowdfunding development initiatives* refer to projects that have been funded using crowdfunding platforms to release and reward backers with digital goods as their core promise.
3 *Post-release plans* refer to developers' intentions about how they will engage in post-release activities to maintain and deliver enhanced versions of their released goods.

2. Literature Review

2.1. Crowdfunding Development Initiatives

Venture capitalists, banks, and similar lenders generally finance ideas with a mainstream market focus (Brabham 2017; Smith 2015). This approach has left limited support for niche or high-risk ventures, i.e., those that require longer horizons to pay off or resonate with minorities and vulnerable groups (Lagna and Ravishankar 2021; Meliou et al. 2019). However, this gap has created an opportunity for "financing models" such as "crowdfunding." Crowdfunding platforms such as Indiegogo (2007) and Kickstarter (2009) diversify innovation by financing independent developers and including the crowd in creative processes (Mollick and Robb 2016; Stanko and Henard 2017). Furthermore, they enable backers to provide hands-on feedback, pinpoint market needs, highlight alternative applications, and comment on pricing approaches (Belleflamme et al. 2014; Brown et al. 2016; Gerber and Hui 2013; Macht and Weatherston 2014; Taylor and Joshi 2019).

Because developers need to attract sufficient funding to embrace those opportunities, dominant research focuses on various fundraising aspects (James et al. 2021; Siering et al. 2016; Zhou et al. 2018). More recently, researchers have highlighted the importance of development processes after successful fundraising campaigns (Conboy et al. 2020; Gleasure et al. 2019; Gleasure and Feller 2016; Lee and Sohn 2019). These studies emphasize the complex aspects of developing for distributed and diverse crowds of backers, each with small financial contributions yet legitimate stakes in the promised product and its development.

Nonetheless, even if crowdfunding development initiatives succeed and deliver their promise to the crowd, they are prone to unsustainable outcomes (Wessel et al. 2021). While developers might release the official version of their promise, digital goods thrive only if developers release ongoing updates and enhancements (Jenkin et al. 2019; Shatnawi and Li 2008). Post-release activities, however, are challenging and can produce complicated

outcomes. Development settings generally benefit from experienced developers' freedom to explore, choose, and implement effective post-release directions (Chen and Huang 2009; Edberg et al. 2012). However, crowd involvement limits developers' flexibility. For example, developers might need to change some aspects of their post-release plans. Nonetheless, the changes might concern backers whose early expectations encouraged them to invest in the initiative. Because crowdfunding is a public financing model, developers cannot neglect their relationships with backers as the end users of their digital goods. Furthermore, unhappy backers can share their experiences and harm developers' current and future initiatives (Conboy et al. 2020). This discussion implies that developers could benefit from communicating some aspects of their post-release plans to set expectations and prepare backers for possible changes. In order to find some insights into how such communication is possible, the following section reviews the literature on communication in crowdfunding settings.

2.2. Communication and Signaling in Crowdfunding Settings

Communication in crowdfunding is mainly explored through the *information asymmetry lens*—one party possesses more information than the other (De Crescenzo et al. 2021; Sewaid et al. 2021; Wang et al. 2021). Studies argue that individuals have incomplete information regarding developers' credibility, proposals' quality, and the rewards' value (Sewaid et al. 2021). The resulting asymmetry can lead to adverse consequences, such as reducing campaigns' fundraising performance, misleading the crowd, and disappointing backers (Levenshus et al. 2019). However, crowdfunding initiatives can alleviate or prevent those effects by sharing helpful information and demonstrating related behaviors. In doing so, they "signal" insights that enhance their crowdfunding performance.

First, *information sharing* requires a grounding from a campaign's preparation stage. Developers decide on campaign parameters and collect third-party endorsements (De Crescenzo et al. 2021; Sewaid et al. 2021; Wang et al. 2021). Subsequently, they reveal that

information to prospective backers during a fundraising campaign. If funded, developers continue to share information through progress updates and commenting on backers' questions and concerns. Sharing information sends signals that can influence crowdfunding performance. For example, a campaign video signals developers' preparedness, increasing crowd confidence and motivating their funding decisions (Wang et al. 2021). Information about developers' past experiences, skills, and social media connections signal developers' capital and their capacity to deliver their promise (Anglin et al. 2018; Clauss et al. 2020; Jiang et al. 2021). Signaling can also substitute for developers' limitations. Developers with little crowdfunding experience may share positive sentiments to reinforce the herd mentality and attract prospective backers (Jiang et al. 2021).

Second, *developers' behaviors* can be interpreted as *signals* influencing funding decisions (Anglin et al. 2018; Butticè et al. 2017; Courtney et al. 2016). Setting limits for valuable rewards can signal developers' confidence in the initiative (Yang et al. 2020). Other behaviors, such as posting frequent updates and attending to backers' questions, signal developers' commitment and capacity to deliver their promises (Kromidha and Robson 2016). Table 1 offers a summary of the key research findings. As shown, most studies highlight that communication in crowdfunding settings is critical given its *signaling effect* on fundraising performance.

Table 1. Literature on Communication in Crowdfunding

Area	Details
Communication through sharing information	**Preparation for sharing information during the campaign:** Choosing campaign parameters, framing developers' knowledge, skills, and experiences, and receiving third-party endorsements (De Crescenzo et al. 2021; Sewaid et al. 2021; Wang et al. 2021). **Sharing information during the campaign:** updates, comments, and responses using different platforms to signal the campaign's promise and developers' capabilities (Crosetto and Regner 2018; De Crescenzo et al. 2021; Levenshus et al. 2019; Sewaid et al. 2021; Wang et al. 2021; Wolfe et al. 2021). **Sharing information during the crowdfunded project:** updates, progress reports, comments, and responses to the crowd to signal developers' commitment and sustain crowd support (Conboy et al. 2020; Gleasure et al. 2019; Gleasure and Feller 2016).
Communication through developers' behaviors	**Demonstrating behaviors that signal insights about a crowdfunding initiative:** Setting reward limits at the beginning of a campaign, i.e., price discounts, *signals the project's quality confidence* (Yang et al. 2020). Money saliency in project description *signals commercial orientation* (Chan et al. 2021; Kim et al. 2016).

	Persuasion rhetoric, using an appeasing language, *signals project proactiveness, forward-looking nature, and alertness to novel changes missed by others* (Battleson et al. 2016; Calic et al. 2021; Calic and Shevchenko 2020). **Demonstrating behaviors that signal insights about developers** Developers' advocacy for other crowdfunded projects *signals their community mindset and awareness of crowdfunding dynamics* (Kunz et al. 2017). During campaign crisis events, a conversation style based on offering compensation, apologizing, and taking responsibility *signals developers' credibility* (Cornelis et al. 2021). Frequent updates, replies, and two-sided conversations *signal developers' commitment to the project* (Jung et al. 2022; Kromidha and Robson 2016; Kunz et al. 2017; Ribeiro-Navarrete et al. 2021a; Xiao et al. 2021)

2.3. Communication and Signaling

Signaling Theory (Ross 1977) originates within evolutionary biology, where living things communicate observable signals to infer unobservable traits about potential mates, predators, or prey (Dawkins and Guilford 1991; Ross 1977). For a signal to work, there has to be some benefit to the recipient, or they ignore the signal (Dawkins and Guilford 1991; Rowell et al. 2006). Hence, signalers may evolve their signals over time to elicit the desired response in the recipient (Getty 1997). However, the problem with signaling begins when a signaler chooses to use the signaling system 'dishonestly' (Getty 1997; Stuart-Fox 2005). Signalers could, for example, use dishonest (or false) signals to communicate advantageous traits at lower costs than it would take to develop the actual trait (Candolin 2003; Dawkins and Guilford 1991). A classic example occurs when non-poisonous frogs mimic the colors and patterns of poisonous frogs. This approach is effective at deterring predators but evolutionarily cheaper than developing their poisons (Summers et al. 2015). Hence, researchers refer to the "handicap" principle, suggesting that stable systems benefit from increasing the cost of sending dishonest signals (Ohtsuki et al. 2009). Since people hesitate to send costly signals, this approach ensures the credibility of signals (Hauser, 1992).

Crowdfunding is an exciting but controversial context for signaling. Specifically, developers would like to use signals to enhance their fundraising performance. Given the public nature of crowdfunding, however, they are best to refrain from sending unreliable signals. Meanwhile, reliable signals can lead to mixed and complex consequences (Calic and Shevchenko 2020; Chan et al. 2020; Li et al. 2021; Wang et al. 2022). Communicating *price*

discounts, for example, enhances fundraising performance by signaling scarcity; however, highlighting depleted rewards demotivates subsequent contributions after the signal has worked (Yang et al. 2020). Similarly, disclosing detailed information about a product is practical, but it can invite critiques and backfire among backers (Kim et al. 2016). Such consequences indicate that even honest and credible signals might not always lead to positive outcomes. Hence, developers need to be cautious in sending signals. This caution is especially relevant to sending ***post-release signals***—content, activities, and behaviors that convey developers' post-release plans.

The reason is that post-release signals relate to longer-term issues that are often difficult to predict. On the one hand, they can help developers achieve desirable short-term outcomes (e.g., better fundraising). On the other hand, they can convey claims and promises that risk backers' satisfaction if developers' circumstances and post-release activities change. Hence, sending post-release signals can have significant repercussions and damage developers' reputations (***costly*** or ***high-cost signals***.) In contrast, ***low-cost signals*** covey limited claims and promises about post-release plans. Hence, if developers' circumstances and post-release activities change, they do not risk backers' satisfaction.

An example of high-cost and low-cost signals can be seen in the following scenario (Sewaid et al. 2021). Consider developers asking the crowd for a small amount of money to fund a product. Meanwhile, they announced a high post-release price for the final product to signal backers would be rewarded for their early support. If developers delivered a low-quality product, their product would be inferior to expectations. Subsequently, they would receive negative product reviews. If developers were to offer discounts to boost sales, they would deviate from the post-release price announced during the campaign, disappoint backers, and suffer reputational costs. In contrast, if developers do not make explicit promises about post-release prices, they would not risk developers' satisfaction and suffer from reputational costs.

Although this discussion suggests that developers can maintain backer satisfaction by communicating low-cost signals, backers in crowdfunding initiatives often feel a strong sense of ownership and value transparent communication (Gleasure et al. 2019; Zheng et al. 2018). This dilemma raises the puzzling *research question* that the present article seeks to unravel.

3. Research Method

I employed a case study design approach to examine longitudinal processes, as most appropriate given the limited literature on communicating post-release plans to the crowd (Langley 1999). As there are some insights about signals and their costs for elaborating on post-release plans (Jiang et al. 2021; Kunz et al. 2017; Sewaid et al. 2021), the analysis also benefits from reflecting on existing ideas (Gioia and Chittipeddi 1991; Gioia et al. 2013).

3.1. Empirical Cases

In 2013, crowdfunding's early examples of technology development success focused on producing products such as 3D Printing and smartwatches. However, The Next Web (TNW) published an industry report in December 2013 pointing to the emergence of crowdfunding cases for building software. The report pointed to Ghost[4] and Macaw[5] as exemplary initiatives that succeeded in *attracting funding* and *delivering their promise* within the schedule and expected quality guidelines. According to much of the existing literature, Ghost's and Macaw's backers and the industry should consider both initiatives a 'success.' However, their post-release dynamics and current status suggest different trajectories and opposite reactions among backers. Notably, Ghost backers remained positive and contributed to the developers' post-release activities. In contrast, Macaw backers and the broader user community raised critical concerns and lost their hopes for the software's future. Ghost and Macaw offer a *polar* case

[4] https://www.kickstarter.com/projects/johnonolan/ghost-just-a-blogging-platforml
[5] https://www.kickstarter.com/projects/macaw/macaw-the-code-savvy-web-design-tool

study couple involving characteristics that are extreme and unusual. In spite of their impressive fundraising and development performance (*similarities*), they concluded with contrasting post-release outcomes (*differences*). This characteristic helps compare the empirical insights toward combining literal and theoretical replication strategies (Eisenhardt et al. 2016).

3.2. Data Collection

Collecting data began by locating—for each case—the milestones of '*campaign launched*,' '*successfully raised funds*,' and '*product officially released'*. Using these milestones, I drafted timelines for each case. Subsequently, data collection progressed in three phases: (1) collecting data about the campaigns, (2) collecting data about the developments, and (3) collecting data about post-release (Table 2). Using the web-crawler Gooseeker, the data was collected and exported to NVivo 11.0.

Table 2. Data Collection Process

Phase 1: Collecting data about the **campaigns** (Ghost: May 2013, Macaw: October 2013).	**All the information available on Ghost and Macaw's Kickstarter pages before the development stage**. This information included: the details of funding, reward structures and conditions, Ghost's stretch goals, developers' updates and announcements, backers' comments and developers' responses, and community discussions.
Phase 2: Collecting data about the **developments** (Ghost: June-September 2013, Macaw: November 2013-March 2014).	**All the information available on Ghost and Macaw's Kickstarter pages before the official releases.** This information included: developers' progress updates, backers' messages posted in response to the updates, developers' responses and reactions to those messages, and community discussions.
Phase 3: Collecting data about **post-release** (Ghost: October 2013-May 2021, Macaw: April 2014-December 2018).	The initiatives had become public success stories, gaining the media's attention through news, online forum discussions, and press releases. Hence, the research explored several outlets posting about their post-release outcomes. The research used the Google API Explorer tool to extract such information. The process identified online articles on platforms such as Designer News, Webflow, Tech Church, Indie Hackers, Product Hunt, Digital Ink, Medium, and Forbes. The research also looked for the developers' post-release channels, updates, and reflections (Macaw/Ghost Twitter posts, Ghost.Org)

The three-phase process helped collect rich data and triangulate some aspects of the findings. I could, for example, delve into the developers' reports to observe if they revealed any thoughts about establishing a sustainable business model in their campaigns' early days. Subsequently, I could examine the emerging findings from various sources to find inspiration about similarities and discrepancies across the cases and their implications for the post-release outcomes. Hence, the study became guided by emerging ideas. These explorations resonated

with the grounded theory approach to guide data collection and analysis by emerging ideas (Eisenhardt and Graebner 2007). Table 3 summarizes the data overview.

Table 3. Collected Data Overview

	Ghost	Macaw
Raised Funds	£196,362	$275,000
Backers	5,236	2,752
Fundraising	**April-May 2013**	**October-November 2013**
#Developers' Updates	6	3
#Comments	191	199
#FAQ	8	1
Development	**May-September 2013**	**November 2013-March 2014**
#Developers' Updates	9	17
#Comments	275	353
Post-Release	**October 2014-present**	**April 2014-December 2018**
#Developers' Updates	80	10
#Articles/Posts	35	21

3.3. Data Analysis

I used a grounded theory approach using recommendations by Gioia et al. (2013 to transition research from the empirical data to first-order codes to second-order themes and theoretical explanations. I progressed in three phases: (1) within-case analyses, (2) cross-case analysis, and (3) theory development. Table 4 details the analysis process; Table 5 offers an overview of the data structure.

Table 4. Data Analysis Process

1. Within-case analyses

a. ***Constructing a timeline of notable events for each case*:** This process involved (a) creating a contact summary sheet for each case, (b) reading the data, (c) doing memo writing to organize thoughts and understand the timeline of events, and (d) creating a longitudinal story of significant activities during each case.

b. ***Creating first-order codes:*** The researcher reviewed the data to identify *ideas* related to developers' post-release signals, backers/crowd responses, and post-release outcomes. The goal was to maintain analytic distinctions by constantly looking for similarities and differences among the ideas. Hence, the emerging ideas were compared with the previously identified ones across informants and sources. This process led to categorizing ideas as 84 *first-order codes.*

c. ***Creating second-order themes:*** The goal was to shift the analysis from *data-level expressions* to *researcher-centric elaborations*. As the researcher compared and clustered codes and their sources, the process led to synthesizing *first-order codes* into 16 *second-order themes*. Several codes, for example, suggested that, during the campaign, Ghost developers signaled their interest in creating a not-for-profit business foundation for sustaining Ghost. Those codes were categorized under the theme of *post-release business signals*. The analysis also noted that developers' signaling could be seen in their behaviors and rewards. Several codes, for example, suggested that Macaw developers focused on the official release and remained silent about collaboration opportunities, signaling their uncertainty or lack of interest in future collaboration with backers. These cases in which the developers remained silent or offered little expressions were categorized under the theme of the *post-release collaboration signals*.

2. Cross-case analysis aimed to form a comparative understanding of how Ghost and Macaw communicated post-release signals. It involved revisiting the data to understand how the developers' communication and signaling might have influenced post-release outcomes. It led to outlining differences in how the developers communicated post-release signals, how backers reacted to those signals, how the developers practiced post-release activities, and how the public reacted.

3. Theory development focused on (1) condensing second-order themes into theoretical dimensions; the research, for instance, categorized the second-order themes of *low-cost* and *high-cost signals* under the theoretical dimension of '*signaling costs,'* (2) identifying relationships among the dimensions/the underlying second-order themes, and (3) enhancing the empirical understanding with insights from extant research. This process generated six overarching dimensions (Table 4) and created propositions that elaborate the relationships between developers' communication of post-release signals, backers' responses to that communication, and post-release outcomes.

Table 5. Data Structure

Dimensions	Second-Order Themes	First-Order Codes	Evidence/Quotes
Post-release signals: developers' content, activities, and behaviors that convey their post-release plans in three areas: (1) how they will attract funding to sustain post-release activities (*business*), (2) how they will advance their digital goods' features and functionalities (*technical*), and (3) how they will engage with backers and the community after the official release (*collaboration*).	**Post-release business signals**	Intention to build a post-release foundation, intention to remain independent, developers' capability to build and sell high-quality software	*"Ghost will remain not for profit. We'll use 100% of the money to make Ghost better and pay people to work on it."*
	Post-release technical signals	Final outcomes an evolving product, stretch goals to be developed after the official release	*"We will launch the Open Ghost Marketplace within the next 12 months."*
	Post-release collaboration signals	Backers' sponsorship of future releases, backers' contribution to post-release platforms, backers' involvement in post-release development meetings, developers' community building activities	*"We're looking to hire/contract some work on some specific projects here, and we couldn't think of any better place to ask for any interested people than from our list of backers!"*
Signaling cost: the risks associated with sending a signal if developers engage in significantly different post-release activities— (1) signals that risk backers' satisfaction and developers' reputation (*high cost*), and (2) signals that do not risk backers' satisfaction and developers' reputation (*low cost*).	**High-cost signals**	Explicit post-release promises, reward structures promising post-release activities	*"Things Ghost Will Never Do: Sell You to Yahoo!".*
	Low-cost signals	Developers' consistent silence, developers' lack of clarification about backers' guesses	*"We don't have a public roadmap. Right now, we are staying pretty reactive to what we get based on feedback from the beta."*
Signal location: the outlets where post-release signals can be found: (1) *developers' updates and comment*s, (2) *developers' reward system for backers*, and (3) *developers' behaviors in elaborating on post-release plans.*	**Developers' shared updates and comments**	Progress updates discussing business plans, campaign information highlighting the campaign's core goals	Development updates on Kickstarter
	Developers' reward system for backers	Rewards promising future collaborations	Stretch goals promising additional features for post-release updates
	Developers' behaviors in relation to post-release issues	Developers' active engagement to illuminate post-release plans, developers' silence in response to backers' questions about post-release	Macaw's continued silence about post-release plans
Follow-up conversations: conversations that unfold after developers' communication of post-release plans: (1) *developer-backer conversations* and (2) *backer-backer conversations.*	**Developer-backer conversations**	Backers' challenging post-release plans, developers' elaborating on post-release plans, developers' highlighting backers' roles	*"I too am wary about Microsoft's involvement. What did they get in return for the money?"*
	Backer-backer conversations	Backers advocating for developers and their plans, backers' sharing opinions and concerns within the community	*"@Holden, come on man. I appreciate that the Ghost team have been working hard to make Ghost's shoulders firm and steady."*
Post-release activities: developers' activities after the first official release to maintain and deliver enhanced versions of their digital goods: (1) attracting funding to sustain post-release activities (*business*), (2) enhancing features and functionalities (*technical*), and (3) collaborating with backers, the public, and third-party developments (*community*).	**Post-release business activities**	Business independence, business sustainability, acquisition	*"Selling the company was a difficult decision. It became clear that we could do much more together than apart, so we got hitched."*
	Post-release technical activities	Changing technical plans, changing target user and core functionalities, rebranding software, discontinuing software	*"We have been moving to move up toward professional users who value power and flexibility over ease of signup."*
	Post-release community activities	Hosting weekly design meetings with the crowd for future developments, accepting plugins from third-party developers	*"[Weekly public development meetings] are a chance for everyone to get involved and have their say."*
Post-release outcomes: consequences emerging after the first official release: (1) backers' satisfaction with post-release activities (*backer post-release satisfaction*), (2) developers'	**Backer post-release satisfaction**	Backers' (dis)satisfaction with post-release quality, backers' challenging earlier communications, backers' (dis)satisfaction with the post-release direction	*"Shame, I'm a Kickstarter that bought Macaw to be Scarlet … It says on the site you'll have to pay again for this one. Really leaves a bad taste."*

capabilities resulting from post-release activities (*developers' capability building*), and (3) the impact of post-release activities on how the public perceives the promise of crowdfunding development initiatives (*public perceptions about crowdfunding development initiatives*).	**Developers' capability building**	Developers' looking for ways to fulfil their plans	*"We could create an open-source business that is healthy, sustainable, and profitable."*
	Public perceptions about crowdfunding development initiatives	Frustration with crowdfunded projects, power of the crowd for funding software	*"I totally get that it's annoying to put a tool into your daily workflow only to have it get acquired one day and fall out of existence. I'm tired of it as well."*

4. Empirical Findings

For each case, I provide an in-depth elaboration of (1) the developers' post-release signals during fundraising and development, (2) the follow-up conversations, and (2) the post-release activities and related outcomes. I conclude the findings with an empirical summary.

4.1. Case 1. Ghost

On April 28, 2013, a developer proposed **Ghost** on Kickstarter as "*an open-source blogging platform"*. Ghost promised to allow users to spend less time making their blogs work and more time writing their content. Based on a scheme ranging from £5 to £5,000 pledges, the campaign promised backers rewards such as *early access* to the first release, opportunities to provide *development feedback*, and *advertising possibilities* on the Ghost website. The 1-month initial fundraising goal was £25,000**.** However, the developers received £196,362 from 5,236 backers. Following a 4-month intense process, they released Ghost on September 20, 2013. Figure 1 illustrates the timeline.

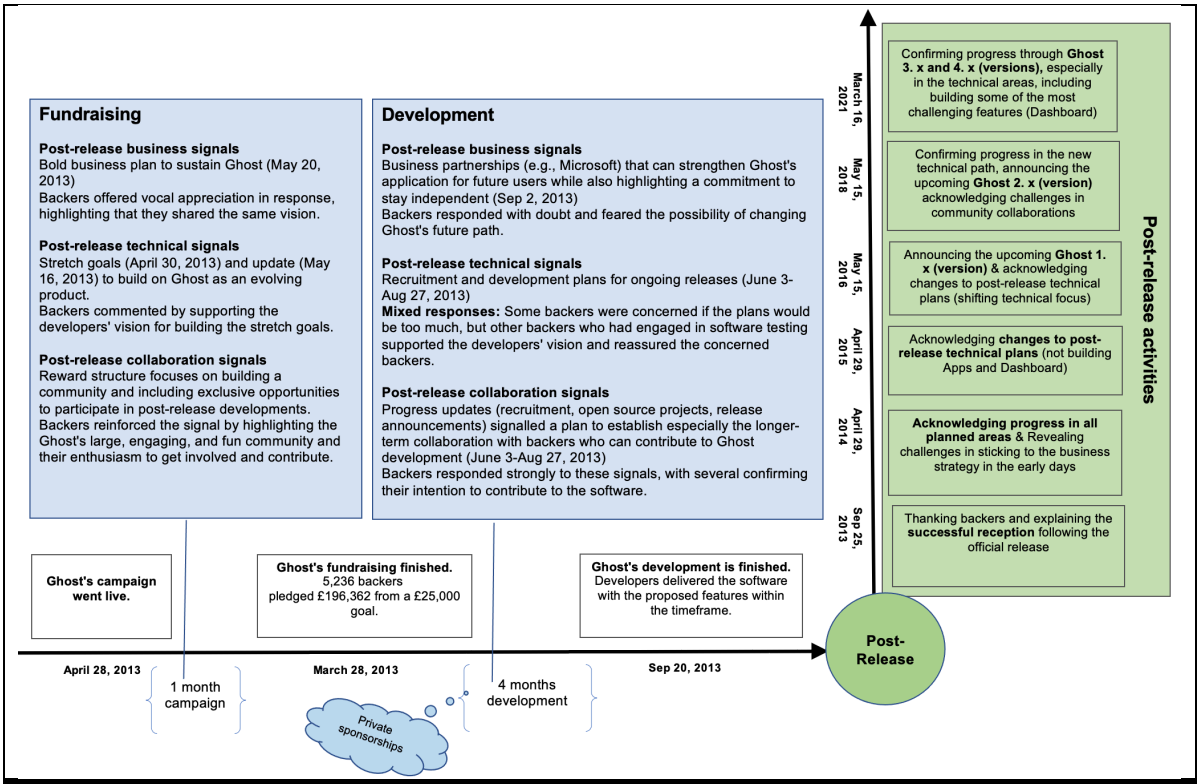

Figure 1. Ghost Timeline

4.1.1. Post-Release Signals during Ghost's Fundraising

Post-release business signals. On May 20, 2013, a week before the campaign ended, Ghost developers shared a bold update: "*Things Ghost Will Never Do: Sell You to Yahoo!*". The update explained that acquisitions by commercial companies pose data privacy threats to end users. The developers leveraged examples to establish a commitment to an independent business model: even though they plan to make money from the software, they have no plan to sell Ghost. This plan amounts to a *high-cost signal* to send the crowd, as any subsequent renege will be perceived as an intentional violation. Backers observed Ghost's high-cost signaling, considered it a sign of independence and transparency, and highlighted a shared vision, e.g., "*Exactly! Thanks for writing that so clearly; This is exactly why I put money towards Ghost."*

Post-release technical signals. The campaign exceeded the fundraising goals in 24 hours (120%). Subsequently, the developers shared an update to introduce *stretch goals* to attract more funding:

"If we hit £250,000, we will launch the Open Ghost Marketplace within the next 12 months. The Marketplace will give our users an incredibly easy place to go to find themes, plugins, and products built on top of Ghost, and our developers an amazing place to release their products."

The stretch goals, especially the Marketplace, signaled an ambitious timeline for post-release developments on specific dates. This plan was a *high-cost* signal. The developers did not only signal their explicit commitment to a sustainable post-release business plan, but they also exposed their technical knowledge to critique among backers. Toward the end of the campaign, the lead developer shared another update, referring to Ghost as an evolving technical product: "*Our technical specification is a living, breathing, evolving thing."* Whilst the update did not specify timelines, did not make firm promises, and the campaign did not reach the required level for creating the stretch goals (£196,362 out of £250,000), backers' follow-up conversations indicate that they still treated it as a sign of post-release commitment and technical intent. In the community section, a backer hoped that the developers would work toward some of the goals:

"While it's a shame we missed the stretch goal by some 20%, over one hundred and ninety thousand pounds is a fantastic outcome. Here's hoping this lets you realize some of the cool ideas."

Post-release collaboration signals. Ghost's reward structure included accessing the core promise (Ghost as a blogging platform) with a *minimum pledge* (£5, £10, £25). By lowering entry costs, the developers signaled they do not seek significant financial contributions. Instead, they intend to create a large backer community that would translate into end users. Indeed, 78% of Ghost backers (4,099 of 5,236) pledged at the entry levels (£25 and less). This emphasis on attracting large numbers of backers is a *high-cost signal*, as any change in post-release plans will likely alienate a more significant proportion of the market. Further conversations indicate that backers noticed the developers' signal based on the inference that Ghost is advancing toward a large and engaging community for people: "*You should have seen the Ghost community at the first meet-up. That was before any of us have even seen a running*

version of Ghost." Ghost's signaling encouraged backers to express their interest in making contributions, i.e., designing new plug-ins and advancing the open-source code: *"Can't wait to get it into my hands and hopefully design something to give back to the community!"*

Furthermore, Ghost created a reward structure in which some backers could remain integral to its post-release developments. First, backers who pledged £666 could directly collaborate with the developers after the official release. Second, backers who pledged £1000 could sponsor a future release. Such official plans represent a *high-cost signal* for post-release collaborations. If the developers failed to accomplish their plans, some engaged backers could become disruptive during significant changes. Moreover, any violation of the rewards would violate Kickstarter's conditions.

4.1.2. Post-Release Signals during Ghost's Development

Post-release business plans. Ghost frequently highlighted the importance of maintaining its compatibility with different technologies. Hence, the developers volunteered to share information about third-party businesses that might help achieve those goals. On September 2, 2013, the lead developer announced Microsoft's controversial partnership in an update:

"I'm incredibly proud to announce that last week Microsoft IE joined the Ghost Partner List. We've been talking to their great team about this, and their generous support is going to help give Ghost a bright and exciting future."

This update constituted a *high-cost signal*, as backers could argue that Ghost might reconcile Microsoft's business engagement with the espoused post-release plans. Backers reacted by sharing their concern about the possibility of being taken over:

"I too am wary about Microsoft's involvement. What did they get in return for the money? Unlike Ghost, Microsoft is a for-profit organization that is driven by profits first. They don't do anything out of the goodness of their hearts."

Ghost complemented high-cost signaling with conversations that engaged backers and provided arguments for the developers' decision making. Notably, the lead developer responded to the concerned backers by explaining that Microsoft would receive the rewards

promised in the Official Ghost Partner List reward. He also highlighted that partners would facilitate Ghost's application for more users:

"We e agreed to use Ghost across Microsoft devices and browsers during development (IE9 and later) to make sure that it works great for their users - Which we would have done anyway!

As the following comment shows, Ghost communication had positive outcomes and encouraged some backers to advocate for the partnership:

"@Holden, come on man. Have some faith in [Ghost]. We all benefit from getting to stand on the shoulders of giants, and I appreciate that the Ghost team have been working hard to make Ghost's shoulders firm and steady."

Post-release technical plans. During the campaign, the developers communicated an intention to establish The Ghost Foundation to oversee expenditures and facilitate any required trading. After the campaign, the developers shared an update on June 3, 2013, clarifying the technical role of the foundation in advancing Ghost, i.e., supporting and collaborating with the user community after the official release. The update announced that they were preparing The Ghost Foundation Website in parallel with the official release. This communication represents a *high-cost post-release signal*, as it lays out ambitious plans for building and maintaining a platform that enables community building, engagement, and collaborations. They wrote:

"We're also getting some other projects underway for The Ghost Foundation. The Ghost Website is the core platform that our entire community will call home and the infrastructure that will provide our hosted version of Ghost."

A month before the official release, on August 27, 2013, the developers shared a plan to release Ghost in September 2013. They ended by elaborating a list of upcoming features:

"We have big plans for much more than just a basic blogging platform. So here are the things that we're focusing on to bring you right after the first release: Plugins, The Dashboard, Multiple Users, and Content Tools."

If Ghost failed to accomplish those technical goals, the developers would suffer reputational costs, adversely affecting public views and future initiatives. Sharing detailed plans could also invite backers' critique and create tension. Indeed, backers reminded the developers of their original promise to maintain Ghost's simplicity, i.e., "*I'm hopeful the big plans for the future*

don't mean Ghost becoming something complicated. Like WordPress." Hence, by listing detailed plans for ongoing additions, Ghost sent a *high-cost signal* to the crowd. Nonetheless, the developers minimized complications as they had already invested in consulting backers. For example, they invited backers to participate in hands-on activities and conversations around quality assurance and beta testing. When the community raised technical doubts, those backers joined conversations and reassured others, i.e., *"I am using ghost since more than a full month now, and I can assure it's freaking great."*

Post-release collaboration signals. On June 3, 2013, the developers announced recruitment plans for building the Ghost Website. By highlighting their intention to recruit from the backer community, they signaled a plan to establish longer-term collaborations. As Ghost's development progressed, they shared updates to encourage backers with related skills to contribute after the official release. To demonstrate this invitation was more than a gesture, reinforcing a *high-cost signal,* they established multiple channels to maintain backers' ongoing contributions:

"It has been an honour and a pleasure to watch some of you hack on Ghost with your themes and modifications. If you're interested in helping out with the development of Ghost, we've set up various newsletters which we'll use specifically to get in touch with contributors!"

Toward the end of development, their post on August 27, 2013, reinforced a plan to open the final code to backers to submit contributions and requests via GitHub:

"You are getting the very first look at Ghost before anyone else. Once we're satisfied that we've been able to smooth out any initial issues, we'll then be opening our doors to the world and flicking the switch on the GitHub repository over to the public."

Many backers responded positively to Ghost's signals. For example, they confirmed their intention to contribute to the software, e.g., *"Great news! I can't wait to start coding some plugins."* If the developers introduced significant changes to these plans, they would disappoint enthusiastic backers who could be vocal about their negative experiences. The developers' emphasis on these areas, hence, served as a *high-cost signal*.

4.1.3. Ghost's Post-Release

Post-release business activities and outcomes. On September 19, 2013, Ghost shared a post on the Ghost.Org to mark the official release and the beginning of post-release activities:

"We've climbed an absolute mountain to get here, but this really is just the beginning. In a couple of weeks, once we've ironed some bugs, we'll be opening up Ghost to the public. The GitHub repository will go public, and everyone will be able to sign up for an account."

A month later, the developers released Ghost to the public. By early 2014, they announced rolling out access to a fully managed hosted service. The service, called Ghost (Pro), reinforced Ghost's post-release business plan to leverage the revenue from the service to maintain Ghost as an independent platform. For their second campaign anniversary in 2015, they highlighted that Ghost (Pro) has helped them build a sustainable business:

"Like the first iteration of Ghost was made possible by our users via Kickstarter—the future of Ghost is made possible by our users on Ghost (Pro). A very small number of paying users are making free, open-source publishing possible for millions of people."

Although Ghost pursued collaborations consistent with its earlier high-cost signals, the developers reported critical challenges. On May 2, 2016, they pointed to spending 15% of the Kickstarter funding on fees, dropped pledges, and taxes. While insufficient funding could push them to enter commercial relationships, their report elaborated on the steps they took to deliver the business promise, i.e., attracting private sponsorships.

Post-release technical activities and outcomes. In the first two years (2013, 2014), Ghost developers built on their post-release technical plan: creating features and functionalities to facilitate Ghost's usage for pleasurable writing. The public reacted by sharing positive thoughts on different community platforms:

*"I was **a backer** of it on Kickstarter and had to say I am very impressed with it. If you're looking for a sleek blogging platform, it is well worth checking out."*

*"I am **not a backer** of Ghost, but I do follow their development. It's a cool real "blog" since I do not really like the idea where WordPress gone from blog to CMS."*

Meanwhile, the developers gradually identified the need to change some aspects of their post-release technical plans. First, they published an update on April 29, 2015, admitting they had overpromised technical features. They explained difficulties in building some features (third-party integrations, dashboard), apologized for being too optimistic, and promised to improve their communication about technical plans. Second, for Ghost's third anniversary on May 2, 2016, they discussed how emerging solutions such as Medium had changed the personal blogging landscape. Hence, they elaborated on a technical shift to build Ghost for the professional market, i.e., newspapers and brand journalism:

"There isn't much of a "personal blogging" market anymore. Trends have moved on, and simple, beautiful platforms like Medium have come along to cater to individuals."

Subsequently, the update for Ghost's fifth anniversary on May 15, 2018, offered a lengthy discussion of "serving professional users" as a technical priority:

"The biggest takeaway after 5 years is that we have been moving, and will continue to move up market, toward professional users who value power and flexibility over ease of signup."

Such reports point to critical changes to Ghost's post-release technical plans. Nonetheless, backers' comments and community reviews do not suggest significant concerns. Instead, the data indicate that Ghost developers contributed to engaging and explanatory conversations about their post-release plans and activities. Similar to fundraising and development, their communication consistently guided people's understanding of Ghost's strength areas, possible challenges, and the need for changing plans. Indeed, the data suggests that after Ghost changed its technical roadmap, expert users wrote reviews to advocate for Ghost's strengths serving specific needs.

Post-release community activities and outcomes. After releasing Ghost, the developers pursued their post-release collaboration plans. Not only were the backers rewarded for their support (e.g., sponsoring releases), the developers leveraged the community for expanding collaborations. They held weekly meetings in the #Ghost channel on Freenode and framed

those meetings as "*a chance for everyone to get involved and have their say.*" On November 18, 2013, they created a blog for sharing meeting notes, updates, and ideas about how people can contribute:

"Squashing bugs can often be a good start point, and there are a number of open bugs in 0.4. Why not pick a pull request [for GitHub] and give it a thorough test? Not only is this a great way to learn our codebase and processes, but it's also enormously useful."

On April 29, 2014, their update noted that Ghost's open-source repository on GitHub features code commits from 125 globally distributed developers, making Ghost one of the most popular projects on GitHub. The developers created a few channels to receive community contributions, i.e., an '*open ideas page'* where people submit and vote on different ideas. Fast forward to today, community collaborations help Ghost retain its independence and pursue its technical ambitions. It is worth noting that Ghost faced community-related challenges. On May 15, 2018, the developers shared a report to explain the frustrating experience of engaging with the GitHub community, i.e., third-party developers voice ideas but do not invest time to advance Ghost. While those issues could encourage Ghost developers to limit their relationships with the open-source community, they did not close the doors of conversation and collaboration. Instead, they turned to the crowd to brainstorm about challenges and exchange opinions, i.e., they recorded a comprehensive podcast where they responded to questions and wrote about their experience with the community.

4.2. Case 2. Macaw

On October 2, 2013, two designers pitched **Macaw** on Kickstarter as a *"next-generation web design tool."* Unlike tools that require designers to write code, Macaw promised to enable people to draw and prototype their designs. Based on a scheme ranging from £10 to £149 pledges, the campaign promised rewards such as *early access* to the first release, *software licenses*, and *educational workshops*. Figure 2 illustrates the timeline.

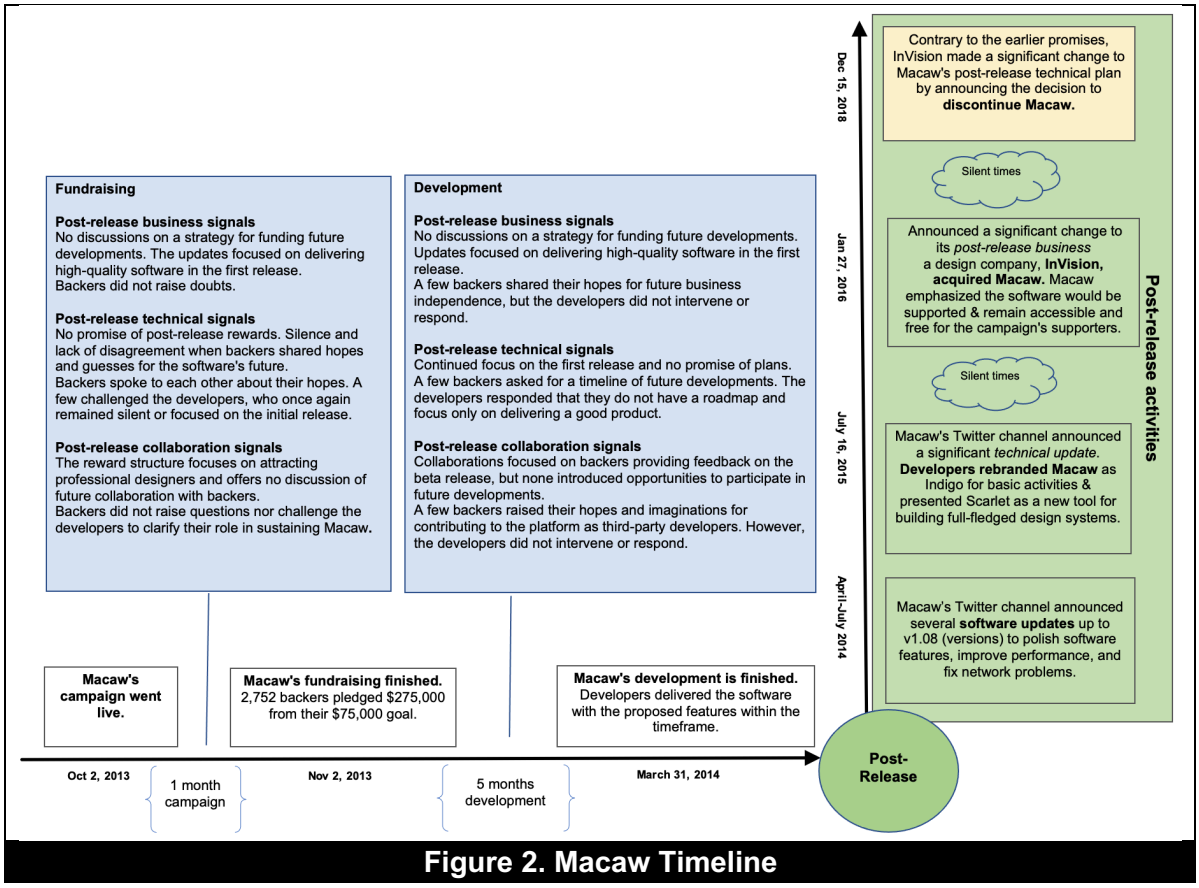

Figure 2. Macaw Timeline

4.2.1. Post-Release Signals during Macaw's Fundraising

Post-release business plans. Macaw developers kept the campaign's content concise and highlighted their goal to release a high-quality tool. Despite acknowledging some risks, the developers emphasized their capability to deliver Macaw:

"Macaw is a huge engineering challenge. However, we've been using design tools for nearly two decades. We've taught aspiring students how to use them, and we've published eBooks and articles exploring the same mechanics that we're now building. The Kickstarter funds will ensure that we can overcome the engineering challenges in a timely manner."

A strong emphasis on delivering high-quality software signaled Macaw's confidence in future sales and business continuity. As the developers did not discuss how they might sustain future releases, they did not create any obligations if they wished to pursue unexpected decisions. Hence, their silence about post-release business plans and an emphasis on building a high-quality release served as *low-cost signals*.

Post-release technical plans. Although the developers offered a range of rewards, none were linked to post-release plans. Hence, they did not create technical obligations for which they could later be challenged. In contrast, they could benefit from the market feedback to—if necessary—embrace unexpected post-release directions. Despite their silence, some backers expressed an interest in Macaw's future.

For example, the developers created a stretch goal on October 10, 2013, promising backers to build an attractive feature (Remote Viewing). That update generated interest among some backers, imagining features and offering ideas for future developments. Without the developers' proactive disclosure of post-release plans, those backers wrote to each other on the crowdfunding platform. As a result of their one-sided conversations (backer-backer), they shaped perceptions about Macaw's future. Since the developers remained silent, those perceptions could be plausible. Indeed, backers ended their conversations with optimistic speculations about Macaw after the official release. In summary, the developers' silence about post-release technical plans and their lack of disagreement with backers served as *low-cost signals*. Meanwhile, some backers asked Macaw to clarify their signals. A backer commented:

"What really would be awesome would be if you integrated a timeline feature into Macaw, such as where different elements could be manipulated on the timeline with corresponding CSS elements."

Another backer pointed to the funds raised, asking the team to leverage the surplus toward creating a comprehensive product:

"Holding back on features and functionalities for your backers is not right. Profiteering by leveraging the already 2 times over funds to develop functionalities that you hold back from backers so that you may sell the full functionality program in a retail version is even worse."

Although the developers did not provide specific details, they reasserted their goal to leverage the funds to make a high-quality release:

*"Building a product of this complexity is no easy task, and the Kickstarter funds *will* be used to help ensure we have a nice solid app for you all."*

While backers could leverage those conversations to ask the developers to be more transparent about their post-release plans, most backers defended Macaw's focus on the official release.

Post-release collaboration plans. Macaw's reward structure required backers to pledge at least $99 to gain early access to the software. This amount was considerably higher than the minimum pledge required by Ghost. By increasing entry costs, Macaw signaled a focus on attracting enthusiastic backers. While this approach decreased the number of prospective backers, it pushed people to contribute at higher levels. Indeed, only 332 of Macaw's 2,752 backers (12%) made pledges below $99. This strategy confirms Macaw's ability to raise more funds than Ghost ($275,929 versus £196,362) from half the number of Ghost backers (2,752 versus 5,236). To promote Macaw, the reward structure included an attractive and exclusive t-shirt component for anyone who pledged US$ 30 or more. However, the t-shirt was only shipped to the US-based backers. Even though they had a reward scheme called "international early birds", they did not include this component in that scheme, leading to comments such as:

"Too bad there were only 125 'international' early bird pledges without the t-shirt you can't get outside of the US, but 300 early bird pledges with a t-shirt only shipped to the US that are still not sold out a week later."

The developers' choices to *localize* and *control the community size* signal a strategy of pursuing relationships with selective backers. Given Macaw's ambition to build a tool for professional designers, backers ultimately did not mind these choices. A smaller and more localized community implies that breaking expectations could alienate fewer and less globally distributed long-term users, serving as *low-cost signals*.

Finally, unlike Ghost, Macaw did not elaborate on opportunities to collaborate with backers after the official release. Instead, their strong emphasis on delivering a high-quality product masked the need for future collaborations. Macaw's silence about post-release collaborations served as a *low-cost signal*, as there was no explicit misrepresentation of plans by the developers for which they could later be questioned.

4.2.2. Post-Release Signals in Macaw's Development

Post-release business plans. The developers maintained a brief and concise communication style. Unlike Ghost, the progress updates often consisted of a few standard paragraphs describing the new additions. Other than that, the developers did not initiate discussions about how they would fund ongoing releases. Overall, then, backers' comments, too, focused on the official release. Only a few backers expressed their hopes for Macaw's post-release independence:

"Whatever you do, I hope you retain your autonomy and agility when MACAW turns out successful, and the big players come knocking on the door."

"I agree. I hope they would remain autonomous! When big companies come knocking, you know you have something big yourself. In some cases, holding out is best".

Once again, those conversations were not reciprocated as the developers did not intervene to correct backers' perceptions. The silence did not create obligations for the developers to engage in specific activities after the official release. As the silence signaled that those perceptions did not require correction, backers did not challenge the lack of explicit confirmation. In summary, the developers continued the application of *low-cost signals*.

Post-release technical plans: Macaw consistently communicated a product-based language throughout development. Right after the crowdfunding campaign on November 1, 2013, the developers announced: *"We're going to do everything in our power to deliver the very best product for you all."* On rare occasions, backers asked for high-level clarifications. The developers reoriented the focus on the official release and highlighted that they did not have a public roadmap. One example of an exchange is as follows:

"Is there any way to see which features and fixes are coming up in the future? Like a roadmap or bug list, maybe? I'd love to know more about what's coming when :)".

"Thanks! We don't have a public roadmap. Right now, we are staying pretty reactive to what we get based on feedback from the beta."

This communication signaled that the developers' plans could match backers' expectations without committing to details. In other words, the developers did not spoil backers' excitement about Macaw. Meanwhile, they had the flexibility to change, postpone, or halt future works with little effort or reputation damage. This signaling amounts to sending a *low-cost* signal.

Post-release collaboration plans. The developers asked backers for summative feedback on beta versions, i.e., identifying bugs. They also received feedback from backers to make Macaw more inclusive for people using different platforms. Backers responded positively to how the developers integrated their feedback:

"I'm happy to have backed your projects and appreciate you guys being so down to earth and personable. The cross-platform is a great idea and very much appreciated. I can hardly wait to try it all out!"

The developers released a trial version on January 7, 2014. Backers were impressed by the speed covering many functionalities. A few days before the final release, on March 27, 2014, they confirmed plans and acknowledged backers' contributions:

"We received an incredible amount of feedback during our beta. It was humbling, motivating, and tremendously helpful in guiding the product's direction. It's your feedback that led us to rework major parts of the application to deliver the best possible experience for our version 1 release. "

The updates signaled that the developers are keen to learn from backers to ensure the software's immediate stability. However, they were silent about continued collaborations. There were also no established means for backers to remain engaged. Faced with the silence, some backers made assumptions about their role in building Macaw's future:

"As a developer/contractor, Great product and attention to detail. Just want to throw in my $0.02 with a request for plugin support - My gears are turning, so I've already got a few ideas!"

The conversations were not reciprocated, as the developers did not intervene to correct those assumptions. The lack of clarification did not create obligations to collaborate with backers in any specific manner, serving as a *low-cost signal*.

4.2.3. Macaw's Post-Release

Post-release business activities and outcomes. The developers announced the official release in their final Kickstarter update on March 31, 2014. Since the sales could fund future releases, backers did not raise questions about post-release business plans. The developers implemented a few releases in 2014 using the remaining funding. A year later, on January 27, 2016, the lead developer shared a Twitter post announcing that a design company (InVision) had acquired Macaw. They framed the major acquisition as an *"opportunity to increase our impact on the industry we love"* and a means of "*rolling our innovations into their already incredible offerings."* On the same day, the lead developer shared a story on Medium highlighting the strategic benefits and promising backers to remain in touch:

"We didn't follow glamorized start-up path. We stayed independent. Selling the company was a difficult decision. It became clear that we could do much more together than apart, so we got hitched. This new chapter comes with a heavy heart but sure enthusiasm. But I promise you to have not heard the last of us."

Nonetheless, people continued approaching Macaw on Twitter, enquiring about the software's future (e.g., *Will the old Macaw app still work? Or is it discontinued?*). The developers emphasized that Macaw would remain accessible and free of charge to backers, e.g., "*We aren't killing Macaw! Users will have continued access to the product.*" Still, the unexpected acquisition created controversy. The comment below demonstrates how a backer raised a moral issue and questioned Macaw's lack of communication:

"Let's assume that I personally hate InVision, and these guys sold an application, which was created with my money, to a company that I hate. They never explained that they'd sell their app to a bigger company if they fail."

Post-release technical activities and outcomes. From April to July 2014, Macaw's Twitter channel announced several updates to polish features, improve performance, and fix network problems. However, those updates were built on Macaw's promise to release high-quality working software. From August 2014 to May 2015, the developers did not announce additional updates. On June 16, 2015, their Twitter channel announced a significant technical update: (1)

rebranding the original Macaw as "*Macaw Indigo*" for prototyping and mock-ups, and (2) presenting "*Macaw Scarlet*" as a live environment for building full-fledged design systems.

Macaw's earlier low-cost signaling about post-release technical plans could not inhibit them from pursuing such significant changes. However, the change still received a mixed reception. While new users were excited to try the new addition (Scarlet), some backers wondered why they should pay for Scarlet, given it was a rebranding of the original software:

"People will tend to feel betrayed. Post-release was utterly unfair to everyone who paid a good amount of money to see this come to life. The team promised a product and delivered a version and then moved to build a product that they promised at the first place."

Some backers speculated that the developers would soon abandon additional updates and sell Macaw. This speculation was accurate when Macaw announced the acquisition news in January 2016. As the developers did not announce more updates, the public expressed disappointment about the lack of communication, i.e., "*I backed a software I believed in, and all I got was a lousy limited subscription."* At this point, some supportive backers also began to express frustration with the common destiny of crowdfunding development initiatives:

"*It's annoying to put a tool into your daily workflow only to have it get acquired one day and fall out of existence. I'm tired of it as well."*

In December 2018, contrary to their earlier promise to continue supporting Macaw, InVision made a final public announcement on their site to discontinue Macaw:

"We discontinued development of Macaw shortly after the acquisition while still providing help to existing users. We have decided that it is in our customers' best interests to cease support of Macaw so we can focus on development our current InVision features and those that are coming in the future."

Post-release community activities and outcomes. During Macaw's development, a few backers expressed their interest in helping advance Macaw. However, the developers did not promise post-release collaboration plans. Building on the same signal, in their last Kickstarter update on March 31, 2014, the developers highlighted that they would not respond to post-release comments on Kickstarter. Instead, they asked backers to get in touch via one-to-one

support email. To update backers with public post-release activities, they turned to Twitter. This communication implied that backers would access the same communication channel as new users. While Twitter enabled some interactions with the public, the scale of discussions could no longer be extensive. Furthermore, the developers hardly announced updates from August 2014 to May 2015, and the tweet announcing the acquisition was their last tweet.

4.3. Empirical Summary

Table 6 offers an empirical summary of the cases.

Table 6. Data Analysis Process

	Ghost	Macaw
Post-release signals	During fundraising and development, **explicit commitments** (Ghost) versus **no explicit** commitments (Macaw) to (1) how they will attract funding to sustain post-release activities (*business*), (2) how they will advance their digital goods' features and functionalities (*technical*), and (3) how they will engage with backers and the community after the official release (*collaboration*).	
Signaling cost	**High-cost** (Ghost) versus **low-cost** (Macaw) signals risked/did not risk backers' satisfaction and developers' reputation.	
Signaling location	Updates, reports, comments, reward structure, and developers' behaviors (**engaging** (Ghost) versus **silence** (Macaw)).	
Follow-up conversations	Ghost's high-cost signaling created concerns and encouraged many follow-up conversations. In response, the developers initiated and engaged backers in **follow-up conversations** about future opportunities and possible challenges using a transparent, detailed, explanatory communication approach. Backers appreciated the developers' communication. At times, they raised questions and doubts. Ghost continued to respond with transparent, detailed, and explanatory communication. Through those conversations, **the developers highlighted their commitments and guided backers by elaborating on possible challenges.**	Macaw's backers did not observe and fully understand the developers' low-cost signaling. Without the developers' clarification, backers engaged in self-made guesses and assumptions about Macaw's future. Overall, then, the developers and backers had **no significant conversations about post-release plans.**
Post-release activities	Ghost faced financial and community-related challenges. However, the developers **stretched to remain committed to some of their earlier business & collaboration plans.** The developers also made **core changes to Ghost's post-release technical plans**. However, they elaborated on the changes in a similar conversational style, i.e., explanatory & transparent. Such conversations—throughout fundraising, development, and post release—provided rich content and guided people's understanding of Ghost's strengths, possible challenges, and essential changing plans.	The developers had the **liberty to make core changes, most notably business acquisition by a design company**. This change delegated the business into an unknown field, and no community was involved in collaborating and contributing to help advance Macaw over time.
Post-release outcomes	Due to their stretching, Ghost developers built **new networking capabilities**, i.e., they could limit post-release collaboration activities upon facing community-related challenges, yet they followed their earlier communication approach by turning to the crowd and illuminating the challenges for better brainstorming and idea generation. Given their communication approach, changing some aspects of Ghost's post-release plans did not lead to critical concerns, and **backers continued to raise positive feedback.** Ghost remains a trustworthy and **promising example of crowdfunding for open-source development**.	Macaw's low-cost signaling meant they did not need to stretch to remain committed to any specific post-release plans. Hence, after the official release, there was **no need to develop additional capabilities** to achieve a specific vision. Backers raised significant concerns and expressed their dissatisfaction with Macaw without revealing conversations about post-release. Several backers expressed frustration and **questioned the promise of crowdfunding for building professional tools.**

5. Theoretical Propositions

Ghost and Macaw backers did not judge the crowdfunding initiative based solely on the developers' impressive fundraising or development results. Instead, they demonstrated concern and enthusiasm about how the software progressed over time. While Ghost backers contributed

to the platform's ongoing releases, Macaw backers participated in conversations about the consequences of the software rebranding and InVision's acquisition. These findings indicate that post-release outcomes are central to backers' long-term satisfaction with a crowdfunding development initiative, challenging much of the existing literature on fundraising success (James et al. 2021; Siering et al. 2016; Zhou et al. 2018). I leverage the comparative findings and extant research to formulate theoretical propositions on how crowdfunding development initiatives can communicate post-release plans to seed longer-term benefits for developers, backers, and the industry.

5.1. Post-Release Signals & Location

Ghost and Macaw cases imply that developers share content and demonstrate behaviors that signal their post-release plans. While the content shared through campaign information, progress updates, and online comments send explicit signals, behaviors such as their willingness to respond to backers' questions about post-release activities send implicit signals. For example, Ghost's engaging approach to responding to backers' questions signaled a commitment and intention to post-release plans. In contrast, Macaw developers' silence and lack of disagreement with backers' comments and preferences signaled their uncertainty and openness to embrace opportunities that might not be consistent with backers' expectations.

Throughout fundraising, developers' communication signals if they (1) plan to earn capital and fund post-release developments (*business*), (2) have a roadmap or a list of technical ideas for advancing their digital goods (*technical*), and (3) intend to collaborate with backers, users, and the larger community after the official release (*collaboration*). Throughout development processes, developers' communication signals if they have (1) made progress in their plans toward funding post-release advancements (*business*), (2) created a roadmap for post-release activities (*technical*), and (3) planned to expand and deepen engagement with backers, users, and the larger community after the official release (*collaboration*). This

discussion leads to the first proposition:

Proposition 1. *Crowdfunding development initiatives share content and demonstrate behaviors that signal their post-release business, technical, and collaboration plans.*

Furthermore, the findings highlight that reward structures are insightful outlets for signaling their post-release technical and collaboration plans. Rewards such as stretch goals planned for the post-release stage commit developers to advance their work through future releases. Similarly, rewards that promise backers to participate in future releases signify developers' intention to remain connected to the crowd and sustain their digital good. Also, reward structures prioritizing attracting large numbers of backers and featuring equal incentives for globally distributed backers signal developers' enthusiasm to expand their initiative's boundaries. Given the high costs of scaling up a crowdfunding initiative, those reward structures are more likely to commit developers to maintain positive relationships with the crowd. We note the prime examples of these signals in Ghost's reward structure as the developers chose to provide access to Ghost with a minimum pledge and offered stretch goals based on post-release additions and collaborations. In contrast, Macaw developers required backers to contribute much more to access Macaw. Also, they did not define any rewards based on post-release additions and collaborations, confirming the finding that they never engaged in considerable technical advancements and community collaborations beyond the official release. This discussion leads to the second proposition:

Proposition 2. *Reward structures, where crowdfunding development initiatives can discuss opportunities for post-release additions and collaborations and reflect developers' community-building interests, are critical outlets for signaling post-release technical and community plans.*

5.2. Post-Release Signals and Costs

As signals can influence backers' motivation to invest in a crowdfunding initiative, most literature explores how developers leverage signals for better fundraising outcomes (Courtney et al. 2016; Kromidha and Robson 2016; Kunz et al. 2017). What is less understood is the

longer-term impacts of signals. As discussed earlier, some signals attract and encourage the crowd to invest. However, their application proves costly later. Offering detailed information about post-release plans is attractive to backers (Kim et al. 2016). However, there is a risk of committing to plans and constraints in good faith, later discovering that developers need more flexibility to deal with changing contexts and requirements (Harris, Collins, & Hevner, 2009). Similarly, announcing plans to include backers in post-release activities is ideal for enhancing fundraising performance. However, enthusiastic backers become disruptive if developers' plans change later. By creating high expectations that developers might not be able to hold onto, costly post-release signals might raise tension and lead to challenging relationships between developers and backers. Understandably, these situations encourage developers to prefer low-cost signals that do not discourage the crowd from supporting their campaign or challenge developers with high expectations (Sewaid et al. 2021). Nonetheless, the typical signaling logic might not hold here, given the very public nature of crowdfunding and backers' established sense of ownership (Gleasure et al. 2019; Zheng et al. 2018).

Returning to the cases, high-cost signaling can still benefit developers. The reason is that developers can use costly signals to create an outlet for the emergence of *follow-up conversations* that engage backers to participate in discussions about post-release issues. Such conversations help developers establish rapport and guide backers' understanding of post-release plans. By creating alignment between backers' expectations and developers' post-release vision, developers can go a long way in maintaining backers' satisfaction after the official release. Specifically, if backers see developers' efforts to embrace available opportunities, they are more likely to consider them signs of developers' commitment to sustaining their digital goods. By appreciating developers' commitment and transparency (Gerber and Hui, 2013), backers will likely go the extra mile to support the initiative beyond the official release (Taylor and Joshi 2019). Similarly, developers' reasoning in those

conversations can provide richer content and explanations, encouraging backers to advocate for developers' post-release plans. Such supports are desirable as online communities often struggle with creating sufficient psychological proximity and dedication to enable effective member participation (Kuem et al. 2020). Collectively, if developers introduce inevitable post-release changes, backers are more likely to understand and be prepared for possible changes.

Ghost developers regularly shared information, signaled commitment, and explicitly associated their communication with longer-term activities while highlighting unknowns. Their progress updates included comprehensive accounts of post-release plans, such as shaping The Ghost Foundation's not-for-profit operation, detailed post-release technical plans, collaboration plans with backers, and entering partnerships with commercial companies. Ghost's application of costly signals offered an opportunity to engage in another set of conversations with backers and convincingly elaborate on their thought processes. As backers observed developers' efforts, they were more understanding and prepared to accept the changes that unfolded during the post-release stage rather than being disappointed with them. In contrast, Macaw developers focused on signaling their general commitment to make reliable software (official release) and maintaining a smaller community. Macaw's signaling was safe and protected the developers from subsequent critiques. However, it left backers to speculate on the future of the software and infer post-release plans. In the absence of effective conversations, backers did not have a clear picture of the developers' plans, and instead, they were driven by self-made assumptions. When the backers were not corrected, they assumed their speculations were accurate. The resulting misalignment meant that backers did not take steps to engage in further conversations to challenge Macaw developers about post-release plans or anticipate potential changes. Understandably, backers were surprised and disappointed by how Macaw's development unfolded and eventually halted. This discussion leads to the third proposition:

Proposition 3. *Crowdfunding development initiatives that complement high-cost post-release signals with engaging backers in follow-up conversations about post-release issues are more likely to prepare backers for essential changes to post-release plans and maintain backers' satisfaction after the official release.*

Developers are conscious of the consequences and costs of signaling post-release plans in crowdfunding initiatives. Hence, they are more likely to engage in advanced thinking and strategic planning about how they might learn to leverage available resources, i.e., crowd energy, toward achieving their plans. Furthermore, they are more likely to stretch their capabilities to remain resilient to their challenges. This argument relates to the literature on how adversity encourages breaking boundaries and resourcefulness (Sonenshein 2014; Williams et al. 2021). We can see contrasting examples of these arguments in the cases. Macaw developers were not particularly locked to build capabilities to maintain the software beyond selling it to a design company. In contrast, Ghost's significant promise to remain independent and a not-for-profit platform pushed the developers to practice new fundraising skills (e.g., additional fundraising through new networks) instead of looking for more accessible acquisition alternatives. This discussion leads to the fourth proposition:

Proposition 4. *Crowdfunding development initiatives that complement high-cost post-release signals with engaging backers in follow-up conversations about post-release issues are more likely to build new capabilities to fulfill those plans.*

Unlike extant research's focus on how a crowdfunding initiative's outcomes influence its backers and developers, the empirical cases here imply that those outcomes do not contribute to a single specific story.

On the one hand, those initiatives that have successfully delivered their promises over extended periods (such as those observed in Ghost) exemplify stories of resilience, reminding the public of what crowdfunding success could mean for independent developers and the crowd community. On the other hand, those developers that have failed to sustain backers' satisfaction after the official release (like the situation observed in Macaw) cool public interests. They do so by creating an overall impression that crowdfunding might provide a false promise of long-

term community and collaboration. Such disillusionment was evident in much of the discussion around Macaw. Backers who had supported Macaw even after the acquisition eventually expressed their frustration and lamented other crowdfunding development initiatives characterized by similar frustrations. Thus, we can argue that backers' satisfaction with post-release activities contributes to a larger narrative around how the public perceives the promise of crowdfunding for building digital goods. This insight has important implications for the much-needed trust in the crowdfunding and development industry (Wehnert et al. 2019). Hence, the final proposition indicates:

Proposition 5. *Backers' satisfaction with a crowdfunding development initiative after the official release contributes to public perceptions about the overall promise of crowdfunding for building digital goods.*

6. Discussion

6.1. Contributions to Research and Practice on Crowdfunding Development Initiatives

This study builds on the contemporary role of "crowdfunding" in enabling developers with innovative ideas to create digital goods with active user communities (Gleasure et al. 2019; Lee and Sohn 2019). Instead of pursuing the dominant research focus on how developers succeed in raising funds, this article concurs with recent discussions suggesting that "post-release activities" are crucial to maintaining developers' outcomes beyond the official release (Wessel et al. 2021). It, however, reorients those discussions by highlighting the challenging nature of being supported by a large crowd and that effective post-release activities are insufficient to maintain backers' satisfaction. As a foundational step, the study argues that developers need to plan how they can use "communication" to prepare backers for possible changes to their post-release plans. Using a grounded approach that connects the longitudinal history of fundraising to development to post-release, the study explores the developers' communication for post-release issues across two polar cases. It builds on the comparative

analysis and extant research to present theoretical propositions for how crowdfunding development initiatives can effectively communicate their post-release plans.

The propositions alert developers about the importance of post-release outcomes for satisfying their backers, creating a better reputation to succeed in future initiatives, and contributing to positive perceptions about the potential of crowdfunding for boosting development works. Further, they elaborate that developers can seed longer-term benefits for themselves, backers, and the industry by combining "high-cost signaling" with engaging backers in "follow-up conversations" about post-release issues. These insights advance our understanding of effective strategies for developing digital goods for the crowd—an area that has only recently received attention in the literature (Gleasure and Feller 2016; Lee and Sohn 2019).

Furthermore, these insights respond to recent calls to examine how to engage society—and not only the development workforce—in building information and software technologies (Sarker et al. 2019). Specifically, developers and backers can appreciate the constructive role the crowd can play in supporting initiatives. As discussed earlier, developers signal their post-release plans in their (1) *shared content* (e.g., campaign information, updates), (2) *reward choices* (e.g., minimum pledges, stretch goals, collaboration possibilities), and (3) *behavioral patterns* (e.g., engagement versus silence about post-release issues). Instead of making self-made guesses and assumptions about developers' post-release plans, prospective backers should pay attention to developers' communication through these areas to tease out important post-release signals (business, technical, collaboration) and if developers choose high-cost or low-cost signaling. During fundraising, prospective backers are perfectly positioned to encourage developers to articulate their plans. Their encouragement contributes to constructive dialogues and a promising trend where developers are better prepared to stretch and strive for sustainable outcomes.

6.2. Contributions to Research and Practice on Communication and Signaling

Because signals influence people's motivation to invest in business initiatives, most literature explores how developers leverage signals for better fundraising outcomes (Courtney et al. 2016; Kromidha and Robson 2016; Kunz et al. 2017). This study elaborates that the dominant focus on signals' application for achieving short-term outcomes (here, fundraising) is problematic and that signals' longer-term consequences must be considered. In doing so, the article discusses the consequences of sending high-cost versus low-cost post-release signals. Although researchers indicate that disclosing development risks informs backers and balances expectations (Kim et al. 2022), sending costly post-release signals embedded in developers' explicit communication can invite critiques and backfire among prospective backers. Not only can fundraising suffer, but developers could also have less flexibility to embrace emerging opportunities after the official release. Any changes can unsettle backers and potentially lead to tension. Such outcomes can cause additional distrust and harm if developers have significantly used their established social media presence (Wolfe et al. 2021) and respected third-party foundations have broadcasted their support and endorsement (De Crescenzo et al. 2021). While these outcomes can make a case for applying low-cost signals, this study elaborates that high-cost post-release signals are beneficial if they create an outlet for further conversations, engaging backers, and elaborating on developers' capabilities and thought processes. Such communication not only stretches developers' potential to strive toward fulfilling a post-release vision, but it also creates rapport with backers, enables them to observe developers' efforts, and prepares them for possible post-release changing paths.

Beyond post-release issues, these findings contribute to broader paradigms on communication and signaling for mobilizing resources and attracting prospective financial providers (Alsos and Ljunggren 2017; Davidson and Poor 2016; Levenshus et al. 2019; Vanacker et al. 2020; Wang et al. 2021). While different communication approaches can

enhance short-term performance, the empirical cases suggest contrasting longer-term outcomes for various stakeholders. Consider the case of developers choosing a considerably short duration for their campaign to signal the call's urgency and emphasize their confidence in attracting funding. Such choice, however, means that the public has had little exposure to the initiative, inhibiting the possibility of evaluating the idea and challenging developers to clarify post-release plans. Similarly, developers may define exciting but not feasible stretch goals to attract the crowd to overfund the initiative. However, a successful outcome for a crowdfunding campaign might mask being the root of overpromising, causing post-release challenges and conflict.

7. Concluding Remarks

This research offers a theoretical perspective that explains why and how crowdfunding development initiatives and their prospective backers should care about post-release plans. The signaling perspective offered in this study elaborates that both low-cost and high-cost signaling help achieve successful fundraising and development outcomes but seed contrasting longer-term outcomes for developers, backers, and the industry. Building on the results, the study recommends that developers combine high-cost signaling with engaging backers in follow-up conversations about post-release issues. Furthermore, the study advises that prospective backers pay attention to developers' post-release signals and encourage them to clarify their plans. Together, developers and backers can create richer conversations and a stronger foundation for achieving better post-release outcomes and maintaining the much-needed trust in the industry. I hope the theoretical and practical contributions will encourage additional inquiry into the longitudinal dynamics of crowdfunding to address some of the societies' most critical needs for digital goods.

There are several opportunities to build on this research. The findings elaborated on the impact of post-release outcomes and public attitudes toward the promise of funding

development ideas. It is helpful to elaborate further on public opinion about the promise of crowdfunding development ideas, if and how those perceptions are changing, and how the industry and individual developers respond to support and maintain trust in the industry. Researchers can also expand on these insights by studying other forms of crowdfunding—crowdlending—where developers and the crowd need to engage in intensive, trustworthy financial and behavioral exchanges (Ribeiro-Navarrete et al. 2021b). Finally, this study explored the cases' fundraising, development, and post-release stages. Future research can build on the findings by paying attention to the history of campaigns. Specifically, the campaigns studied here had a history of preparing the crowd a few months before running the campaigns. Researchers can explore crowdfunding initiatives before fundraising to explore how developers prepare the crowd to invest before releasing their call, the post-release signals they use, and how those signals can have implications for advancing the propositions.

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