

CROWDFUNDING HARDWARE STARTUPS IN GERMANY

Research in Progress

Tech, Robin P. G., Alexander von Humboldt Institute for Internet and Society, Berlin,
Germany, robin.tech@hiig.de

Abstract

The key question raised in this research in progress paper is whether the development stage of a (hardware) startup can give an indication of the crowdfunding type it decides to choose. Throughout the paper, I empirically investigate the German crowdfunding landscape and link it to startups in the hardware sector, picking up the proposed notion of an emergent hardware renaissance. To identify the potential points of contact between crowdfunds and startups, an evaluation of different startup stage models with regard to funding requirements is provided, as is an overview of currently used crowdfunding typologies. The example of two crowdfunding platforms (donation and non-monetary reward crowdfunding vs. equity-based crowdfunding) and their respective hardware projects and startups is used to highlight the potential of this research in progress.

Keywords: Crowdfunding, Startups, Hardware, Germany

1 Introduction

Originally motivated by Paul Graham's 'The Hardware Renaissance' (2012) and further spurred by Witheiler's 'The hardware revolution will be crowdfunded' (2013), I chose to consider the intersection of startups, crowdfunding, and hardware. This is particularly interesting since literature on innovation and startup funding has indeed grown to some sophistication regarding the timing of more classic sources of capital in a startup's life, such as bootstrapping, business angel funding, and venture capital (cf. e.g., Schwienbacher & Larralde, 2012; Metrick & Yasuda, 2011). Due to the novelty of crowdfunding, however, general research on this type of funding is just at the beginning stages and many papers are rather focused on specific elements of the phenomenon (e.g., Belleflamme et al., 2013; Agrawal et al. 2011) and / or exploratory in nature (e.g., Mollick, 2013). What is missing is a verification of the research on potential points of contact between crowdfunds and startups. It remains unclear when crowdfunding is used—primarily during the early seed stage for example or equally at some later point as well—and what types apply (cf. e.g., Collins & Pierrakis, 2012). Simply put, the research question that emerges is whether the development stage of a startup can give an indication of the crowdfunding type it decides to choose.

To further explore an answer to this question, I commenced an investigation of the German crowdfunding scene with a focus on hardware startups. Following desk research on platforms situated in German-speaking areas—Germany, Austria, Switzerland—, a categorization of the respectively used funding types is still in process, and transitions into a quantitative analysis and an in-depth case study-based assessment. The prime challenge of such an investigation is to select and adopt from the

miscellaneous definitions of the main terminologies of (1) hardware, (2) startup stages, and (3) crowdfunding, and to locate them in the research ecosystem.

2 Hardware

As pointed out above, there seems to be a partial focus shift of startup founders from software and digital services to hardware and physical products. For the purpose of this paper, I will consider all hardware in the very classic sense. This includes manufactured goods such as mechanical tools, electrical conductors, machine elements, and fully assembled physical systems (cf. Oxford Dictionary) as opposed to narrowly focusing on hardware that is currently en vogue (e.g., 3D printers, drones, or Arduinos).

3 Startups and Startup Stages

Concerning the definition of a startup, and possibly more importantly its development stages, a wide range of authors and respective research papers seem pivotal: Churchill and Lewis (1983) chose a rather organizational lens on firm development, did not explicitly distinguish between small businesses and startups, but nonetheless, prepared the ground for most startup and startup stages research. Bell & McNamara (1991) introduced iteration, feedback loops, and the search for a working business model.

Relating startup stages to startup financing, one finds a somewhat archetypical funding sequence, setting off with seed funding—inter alia through bootstrapping—to provide relatively small amounts of capital to get the entrepreneur or inventor started and to provide basic proof of concept. This is followed by an early stage or startup financing, usually provided by business angels, family offices, and to lesser extent early venture capital investors. The aim in this stage is to develop market-ready products and building the company. The expansion or growth stage is marked by heavily scaling production and marketing, requiring large amounts of capital usually provided by several venture capital funds. A series of financing rounds is common in this stage with investors switching from support roles to strategic ones. Later stage startups are marked by positive cash flows, profitability—or a high probability of it—, and more stable growth rates, leading to financing through internal capital, exits, or the stock market (Metrick & Yasuda, 2011:15).

Contemporary research on startups, of which Blank and his 'The Four Steps to the Epiphany' (2003) is the most well-known example, put the scalability of the business model, the product, and the search for the right market in the center of investigation. This notion links well to the concept of crowdfunding and Witheiler's observation "(w)hat crowdfunding does is enable product-market-fit experimentation in a category that has historically been deprived of it." (Witheiler, 2013)

It appears, however, as if solely focusing on the ability of crowdfunding to catalyze product-market-fit falls short. When one takes not only the seed stage but also subsequent development stages of the startup into consideration, crowdfunding might be of even greater leverage. For example, Collins & Pierrakis pointed out that "traditional sources of risk capital (...) have increasingly been moving their investment activity (...) into more developed companies" (2012:17) widening the existing 'funding gap'—particularly familiar to Continental European entrepreneurs (Mitranescu, 2013). Additionally, hints of an emerging post-seed funding gap are put forward (Sohl, 2013), reinforcing the notion of multiple and equally important points of contact between crowdfunding and startup stages.

For these reasons, a startup stage model was compiled that considers variant lenses and comprehends a detailed division of stages allowing for the identification of potential docking points for crowdfunding.

	Early stage			Growth stage	Later stage
Organization	Existence	Survival	Success, business model	Strategic planning, company building, processes	Merger, acquisition, IPO
Product	Concept	Prototyping, pivoting, testing core features	Development, establishing production	Scaling production, refinement	Diversification
Market	Discovery	Market calibration	First customers, demand creation	Penetration, heavy marketing	Diversification, internationalization
Funding	Seed	Startup		Series	IPO, exit, (internal)

Table 1 Startup stages for growth-oriented ventures. By author, partially based on Churchill & Lewis (1983); Jeng & Wells (2000); Blank (2003); Marmer et al. (2011).

4 Crowdfunding

Regarding the concept of crowdfunding, it appears generally accepted to locate its roots in the phenomenon of crowdsourcing (Belleflamme et al., 2013), while this term anon goes back to an article by Howe published in the 'Wired Magazine' in 2006. It describes a process of an entity engaging a crowd, nowadays mostly through the Internet, to complete tasks that were priorly done by the entity itself. The main goal is to advance more efficiently. Though this alone appears to be a mere modification of classic outsourcing, crowdsourcing—heavily catalyzed by technological advancements—goes further by obtaining feedback, ideas, content, and solutions from an elevated number of individuals at increasingly low or even no costs at all (Bayus, 2013; Howe, 2008; Howe, 2006).

Ensuing from the discussion in Kleemann et al. (2008), Belleflamme et al. (2013) put forward a definition that will be used because it ties in well with the hardware focus of this paper: "Crowdfunding involves an open call, mostly through the Internet, for the provision of financial resources either in form of donation or in exchange for the future product or some form of reward to support initiatives for specific purposes." (Belleflamme et al., 2013:8)

5 Crowdfunding Typologies

Using the crowd as an agglomeration of investors that provides funds for one's product or company gave rise to manifold types of platforms that have sprouted globally and use greatly differing modes of

crowdfunding—the latter often being sharply influenced by national regulation (cf. e.g., Griffin, 2012; Schwienbacher & Larralde, 2012).

Due to the consequent complexity, novelty, and quickly changing object of investigation of this research domain there is no generally accepted typology regarding crowdfunding. While Belleflamme et al. (2013) use three categories to classify crowdfunding models, others use up to five (e.g., Bradford, 2012), and particular to the German-speaking parts of Europe, the distinguishing terms crowdfunding and crowdfunding were popularized. Internationally recognizable and commonly used crowdfunding types, however, mostly fall in one of three contribution categories depicted in the first column of table 2 for orientation purposes.

Meta categorization	Hemer (2011)	Bradford (2012)	Collins & Pierrakis (2012)	Belleflamme et al. (2013)	German-speaking area categorization
Without reward	Donation	Donation	Donation	Donation	Crowdfunding
With non-monetary reward	Sponsoring	Product / service*	Pre-ordering**	Pre-ordering	
	Pre-ordering	Pre-ordering**			
With monetary reward	Lending	Lending	Lending	Profit-sharing	Crowdfunding
	Equity	Equity	Equity		

Table 2 Crowdfunding typologies. *Note: Bradford’s ‘reward’ category (2012:16) includes products and services that are of interest to the funder, but do not necessarily correspond to the product that is funded. **Note: ‘pre-purchase’ (Bradford, 2012:32; and Collins & Pierrakis, 2012:3) was renamed to ‘pre-ordering’ to maintain congruence within overview

As the meta-typology merely represents the smallest common denominator of various classification systems and does not appear perfectly operationalizable for the purpose of this hardware-centric paper, I chose the classification system Bradford (2012) proposed. His model distinguishes between the different kinds of rewards given to investors, which play a key role in this paper’s investigation. Most notably, the highlighted distinction between crowd contributions made with the goal of receiving rewards for consumption (i.e., services or products) and monetary returns, rendering the contribution an investment, made it implementable. And since this paper’s focal point is hardware startups, the crowdfunding definition mentioned earlier complements Bradford’s system well, as it explicitly mentions products (a consumption item) as a form of reward (Belleflamme, 2013).

6 Examples of Crowdfunded Hardware Startups

In the following, I focus on crowdfunded hardware startups that successfully campaigned via two platforms that each allow distinct reward schemes and are based in Germany—namely ‘Startnext’ and ‘Innovestment’. It has to be noted that the crowdfunding mode of lending is not represented by either of the two platforms. Lending-based crowdfunding is—presumably due to legal constraints—developing rather slowly in Germany and offered by two comparatively small platforms only.

6.1 Startnext: donation and non-monetary reward crowdfunding

Founded in 2010 as a not-for-profit organization, 'Startnext' managed to arrive at more than 1,200 successful campaigns in 2013, exceeding a total of collected funds of 7.5 million Euros. The platform's success rate (i.e., campaigns surpassing a funding threshold) lies at roughly 50 percent and the sheer number of project backers—possibly attracted by the comparatively open access that does not necessarily require a login—renders it the most trafficked crowdfunding platform in the German-speaking area (www.faq.startnext.de, accessed 20131114 and own calculations, including all German crowdfunding platforms and regarding the number of visitors per month, the amount of initiated and successful campaigns, and the amount of capital collected). The crowdfunding modes allowed on this platform include donation, product / service, and pre-ordering.

When explicitly scanning Startnext's portfolio for hardware startups and projects, using the website's automatic filter categories of 'invention', 'design', and 'technology', the following statistics can be derived. A manual clearing of the list of projects, subsequently eliminating those entries that do not fit the hardware definition initially put forward, is work in progress.

	Invention	Technology	Design	Combined	Platform-wide
Number of campaigns	93	27	77	197	2,631
Number of successful campaigns	24	3	21	48	1,257
Intended funding (total)	959,423 €	354,880 €	365,046 €	1,679,349 €	15,730,912 €
Intended funding (average)	10,316 €	13,144 €	4,741 €	8,525 €	5,979 €
Actual funding (total)	346,316 €	53,542 €	146,255 €	546,113 €	7,558,857 €
Actual funding (average)	14,430 €	17,847 €	6,965 €	11,377 €	6,013 €
Funding success rate	36 %	15 %	40 %	33 %	48 %

Table 3 Startnext hardware campaigns. Table compiled by author. Data partially retrieved from www.startnext.de/projects.html?newLanguage=en#!alle/, last access: 20131201 and own calculations.

Though the preliminary sample most likely includes some projects that do not match the hardware definition, it should be noted how strongly the intended and actual funding averages differ between the three categories of 'invention', 'design', and 'technology' as well as compared to all of the platform's campaigns. The ensuing quantitative analysis will—given sufficiently large sample sizes—elaborate on these differences.

6.2 Innvestment: equity-based crowdfunding

‘Innvestment’ set its focus on technology startups and is in close collaboration with various German technical universities. Founded in 2011, the platform managed 37 campaigns out of which 25 were successful (i.e., surpassed a funding threshold), and agglomerated more than 2 million Euros, at an average of 3,150 Euros per investor. The equity investment that Innvestment offers is a mezzanine capital called silent partnership (‘Stille Beteiligung’) with control but no voting rights and is usually capped at a maximum of 100,000 Euros per investment round. (www.innvestment.de and www.innvestment.de/investors/stille_beteiligung.html, German, accessed 20131112)

The Innvestment sample presented below is much smaller than the one of ‘Startnext’ simply because of the difference of total campaigns hosted by the two platforms and was chosen on the basis of the hardware definition stipulated above. It consists of a nano-technology company that produces nano-particles in fluids with high purity, an LED producer and seller, a coffee capsule producer and merchant, an RFID-tracking system provider, a lighting system provider that offers lighting solutions working independently from power grids, and a company that developed a modular solar-energy system that allows for the flexible recombination of individual models. (www.innvestment.de/startups/profiles, German, accessed 20131112)

	Identoloc	Lumindo GmbH	Particular GmbH	Sonnenrepublik GmbH	Velibre GmbH	VeriSol GmbH	Combined	Platform-wide
Intended funding limit (total)	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €	600,000 €	3,700,000 €
Intended funding limit (average)	100,000 €							100,000 €
Actual funding (total)	54,000 €	95,000 €	100,000 €	100,000 €	88,000 €	55,660 €	492,660 €	2,115,919 €
Actual funding (average)	87,665 €							85,033 €
Funding success rate (against limit)	54 %	95 %	100 %	100 %	88 %	56 %	82 %	57 %
Average contribution per investor	2,454 €	2,568 €	4,000 €	4,167 €	4,631 €	2,420 €	3,284 €	3,250 €

Table 4 *Innvestment hardware campaigns. Table compiled by author. Data partially retrieved from www.innvestment.de/startups/profiles (German), last access: 20131201, Innvestment management, and own calculations.*

In this hardware sample, the preliminary findings in regard to intended and actual funding, success rates, or average contribution per investor do not—at least evidently—differ from the remainder of Innovestment's campaigns. Information on unsuccessful campaigns that did not reach the minimum funding threshold (i.e., did not receive any funding at all in the end) is not provided on the website, but could be obtained from the platform's management.

7 Discussion and Research Proposal

Attempting to answer the question of whether the development stage of a startup can give an indication of the crowdfunding type it decides to choose, remains the main purpose of my examination. A first exploration adverts to a relation between the two elements: as the donation and non-monetary reward platform mainly hosted very early stage hardware ideas and concepts; the equity-based crowdfunding platform managed campaigns of incorporated startups that required capital to bridge funding gaps before entering the growth stage.

Due to the current desk research-focused first step of my mixed methods approach (Mayring, 2002) and the small number of platforms and campaigns examined, no informed assessment can currently be made. For a second step, I thence plan to extend the attention to other platforms and to develop a common set of variables, thereby allowing for an elementary comparison, and the development of concrete and testable hypotheses (Raithel, 2008). The set currently under development will serve as a basis for a quantitative analysis of the individual platforms' campaigns. Data will be gathered through a semi-automated Microsoft Excel / VBA scraping of the respective websites. It remains to be seen whether all platforms feature a sufficient amount of campaigns from the hardware category—i.e. more than 15 (Friedrichs, 1999:146)—to allow for a meaningful statistical analysis. A third step consists of a multiple case study approach (Yin, 2003; Mayring, 2002) to illuminate the stakeholders' reason to choose (1) crowdfunding as a means to obtain capital, (2a) one particular platform, (2b) a startup to host, (2c) a startup to give capital to, and (3) use a certain crowdfunding type. I presume that (4) a quantitative analysis in combination with an in-depth study can or cannot support the notion of an idiosyncratic relationship between (hardware) startup stages and crowdfunding types, directly leading to follow-up research on comparable relationships between crowdfunding and other technology-driven startups—e.g. located in the domains of software, pharmaceutical, service, et cetera. The research proposal follows the exploratory and mixed methods path pursued by the majority of researchers in this field (e.g., Mollick, 2014; Belleflamme et al., 2013; Schwienbacher & Larralde, 2012).

8 Conclusion

When considering crowdsourcing and hardware in the same instance, one cannot abstain from the thought of bringing in the idea of open-source hardware and open-source practices in general. It would be most interesting to investigate if crowdfunding catalyzes the spread of open-source schemes—that originally emerged from the digital realm—to the physical and hardware world.

A motivating factor for startups to engage in crowdfunding that was identified early on was the notion of crowdfunding as a marketing instrument (e.g., Schwienbacher & Larralde, 2012). It could be interesting to keep this element in mind when examining the various types of crowdfunding, since they might differ in investor / user activation from a marketing perspective, as well as the startup stages, since marketing challenges change depending on the development stage (Belch et al., 2008; Meffert et al., 2011).

Given these additional perspectives and the preliminary results presented in this research in progress paper, the prospect of an elaborated overview of German-speaking crowdfunding hosts and an in-depth study of crowdfunded hardware startups in various development stages appears challenging, but also very promising. To encourage more academic research in this field, all scraped data as well as the agglomerated platform profiles will be made publicly available.

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