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CROWDFUNDING CAMPAIGNS, OPEN SOURCE AND COMMUNITIES

The Relationships and Characteristics

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| Uppsats/Examensarbete: | Examensarbete i Medie- och kommunikationsvetenskap, 15 hp |
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Abstract

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Nyckelord: Crowdfunding, open source, communities, hackarkultur, teknomeritokrati, relation, kommunikation

Syfte: Studiens syfte är att studera de sociotekniska relationerna mellan communities och crowdfunding-kampanjer med open source-produkter.

Teori: Kärnan i teorin utgör teknomeritokratisk kultur samt hackarkultur. Teorier för datormedierad kommunikation, virtuella nätgemenskaper, social identitet och självbestämmande är basala för denna uppsats.

Metod: Uppsatsen har en kvalitativ ansats och består av 13 semi-strukturerade personliga intervjuer.

Material: Vetenskapliga artiklar, böcker och websidor har använts i denna uppsats för att underbygga delar av introduktionen, bakgrundskapet, teoriavsnittet och metodologin.

Resultat: *Gemensamma kännetecken.* Resultaten visar bland annat att open source crowdfunding-supportrar mest sannolikt stödjer projekt som består av hårdvara. När projektanordnare väljer att utveckla sina produkter med open source-nätgemenskapen som målgrupp, förväntas produkten att också vara open source och bli finansierad via crowdfunding. Projektorganisatorerna var försiktiga med att inte verka alltför "affärssamma", då de menade på att community-medlemmarna inte uppskattar alltför penga-medvetna entreprenörer.

Relation och påverkan. Nästan alla organisatörer visade på att de försökte engagera sig med communityn. Det var en ge-och-ta-relation, byggd på ömsesidighet och osjälviskhet. Organisatorerna lyssnade, svarade och ställde frågor, diskuterade och tog till sig feedback. I gengäld blev deras produkter finansierade, marknadsförda via word-of-mouth och förbättrade med hjälp av communityns framförda synpunkter.

Executive Summary

Crowdfunding campaigns are becoming increasingly popular and so does the number of individuals who manage to successfully fund their idea by appealing to specific target groups on a world-wide scale, bringing niche products to life. At the same time, a number of these crowdfunded projects are open source, meaning that anyone can potentially reproduce them themselves. In the current work, I investigate the relation between communities and crowdfunding campaigns of open source products. Specifically, I seek to discover what the characteristics of those campaigns are, as well as describe the relationship and the impact of the related communities to the campaigns.

The study begins by describing the context, the technical domain and key concepts of this research, such as open source, crowdfunding and licensing. This is done so to give the reader, regardless of scientific background, the ability to comprehend the later sections and seamlessly immerse themselves into the subject. The principles of open source are described along with the differences in what is being licensed when it comes to software and hardware. For example, it is mentioned that the key difference lies in the fact that copyright does not automatically apply to physical – functional – objects, unlike code. Additionally, I describe various open source business models that are traditionally encountered in industrial open source software.

Next, a bibliographic review is conducted in order to assemble a theoretical background on the topic. The academic foundations of this research, consist of previous studies on the hacker culture which is the typical target group of the crowdfunding campaigns with open source products. The so-called hacker culture is analyzed, along with theories on communities and computer mediated communication.

Due to lack of previous academic sources on the subject, empirical data was collected from 13 campaign organizers that involved products with open source elements. The data collection was mainly achieved through semi-structured interviews via video-calls. The interviewees were involved in both successful and unsuccessful campaigns and included big names in the field such as Arduino, who launched ESLOV on Kickstarter. The geographical distribution of the participants included individuals from 4 continents (N. America, Europe, Asia, Australia) and despite the various differences in both the nature of their campaigns as well as their role in them, common patterns were identified.

In particular, common characteristics among the campaigns included the reason behind choosing to crowdfund as the means to finance their product. Many of the interviewees agreed that it was their only viable option, considering the open source nature of their product. As for open source, many felt that the audience they were targeting expected the product or at least parts of it to be open. This led to the discovery of a broader norm, indicating that once the product applies to a community that is engaged with open source, then financing the product with crowdfunding is an eventuality. Subsequently, one can understand the significant role communities play in the whole undertaking of commercializing an idea, since they dictate both the state of its source but also the way forward onto mass production.

Furthermore, as to the relationship of the campaign organization with the community it was shown that generally the organizers try to embed themselves into the community and help. In return, not only they receive financial support, but also contributions to their products and a considerable marketing boost via word-of-mouth. Based on the collected data, releasing source code before the beginning of the campaign did not necessarily lead to the creation of a strong community and contributions.

Releasing the code after the end of the campaign proved to be the most popular tactic and this was primarily attributed to the product not being mature enough for a public release before or even during the campaign. Interestingly, cloning was not considered as a major disadvantage when crowdfunding open source products, while some strategies in order to avoid it were proposed. Moreover, it was pointed out that communities prefer to support crowdfunding campaigns that involve physical products.

The findings were able to verify parts of the literature and suggest a number of new angles. It would be beneficial to repeat this research with different campaign organizers to verify its results. More importantly, I see the value in attempting to investigate the various implications of crowdfunding open source products and the related communities from the viewpoint of the community members.

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Main Concepts

Below is a brief explanation of the words used in this thesis. They are presented in order to give the reader a better understanding of the subject. More in-depth explanations will be found in the *Introduction*, *Background* and the *Theory* section.

Hacker: Derives from a group of playful and enthusiastic computer programmers at the Massachusetts Institute of Technology in the 1960s and 1970s (Stallman, n.d.). In the thesis at hand, the word is used to refer to a skillful passionate programmer who overcomes technical problems by writing open source code for software and hardware products, typically on their spare time without payment.

OS: Stands here for Open Source. It is a programming code with a specific license, that allows it to be used, read, modified and shared by anyone.

Open Source License: Open source requires a license in order to regulate and permit the possibility to use, modify and share the source code innumerable times.

OSS: Open Source Software. The 'soft' part of a technological product, i.e. the programs and the code are open source.

F/OSS, F/LOSS: Stands for Free/Libre and Open Source Software. Is a term that is used for emphasizing that the open source is free as in 'libre', not as in 'free of charge'. Typically used by hacker activists such as Richard Stallman.

OSH: Open Source Hardware. The code behind the physical parts of a technological product that control the circuit board layout and its functions (e.g. circuit diagrams) are open source.

OSHWA: Open Source Hardware Association. A group that represents the OSH community. Their goal is to spread information about OSH to the masses and to help encourage development of OSH through activities like events for instance.

Closed-source: Opposite of open source, also called propriety software. The source code is not shared and the code cannot be bought, meaning it is only allowed to be modified by the company or individual that owns it.

Platform: Is here referring to a web page which allows people to get in touch with each other and communicate with one another.

Crowdfunding: A financing technique which allows individuals to invest, typically, small amounts of money, for the development of a specific project or company.

Backer: Synonym to *funder*. A person who finances a project on a crowdfunding platform.

Community: Is here referred to a group of people varying in size, who share the same interests and ideas around certain topics. They typically discuss, collaborate and share information online, on forums, through email, mailing lists, news articles, bulletin boards, blogs, social media like Facebook and chat rooms. But they also communicate through physical magazines, meetings and fairs.

1 Introduction

During the recent years, we have seen the rise of start-up companies as well as their contribution to the economy by creating job positions, enabling the youths to innovate and taking their ideas to the market (Seides, 2015 October 14). For any business, the importance of funding plays an essential role for a dynamic result. One way these ideas get investment to reach the market and influence market trends is via contemporary crowdfunding platforms - crowd raised contributions, which today reach far over 1.000 platforms (Drake, 2016 October 22), some of them being Kickstarter, Indiegogo, Crowd Supply and Patreon. According to Massolution's crowdfunding report, summed up in Marketwired (2015, March 31), the total global crowdfunds were over \$16.2 billion worldwide in 2014. The report further shows that the leading regions were N. America, Asia and Europe, and the crowdfunding models that had grown the most in percentage were the donation and the equity-based models (see section 2.5).

Many of these ideas are built around technology. One category that is particularly interesting, is of open source products – software and hardware codes that are publicly accessible online, typically for free. Lately, we have seen the merge of these two trends, open source and crowdfunding, often ending up in successful projects. Although there are crowdfunding platforms that are dedicated specifically for open source (bountysource.com, selfstarter.us, catarse.me, goteo.org just to name a few), the crowdfunding platform Kickstarter, followed by Indiegogo, is by far the biggest platform out there, taking on all kinds of technical and non-technical projects. It has had more than 120.000 successfully funded projects in total, with the number of successful technological services and gadgets reaching over 5.000 which is where the open source projects are involved (Kickstarter, n.d.).

Furthermore, open source has wildly expanded the last four years into a mainstream approach, on the international market as well as the Swedish market for businesses other than those that were originally associated with open source, shares Black Duck Software (2016, n.d.) and Lindström (2016, January 24). But why is open source interesting? Not least because it is a code that is shared for free, it is also cost effective, brings the sense of freedom and innovation to modify a product and generally leads to faster improvements in hardware and software. However, what is often accentuated, is the usefulness and significance of the open source community.

What ties the open source and crowdfunding together is the idea of social influence from a devoted crowd movement that supports the organizers and controls the outcome of a project. Social networking is, in this case, a fundamental component for both of them. Because of the networking attribute, the crowdfunding backers who support a project, typically help invest in it and market it through word of mouth among their friends and families on websites such as Facebook and Twitter. Likewise, the open source movement leads to companionship and inspire innovation within the communities to help promote active tasks.

Previous research in this area is mainly focused on what motivations people have for investing in a crowdfunding project (e.g. Gerber, Hui & Kou, 2012; Brabham, 2010) or what motivations they have for participating in an open source community (e.g. Budhathoki & Haythornthwaite, 2013; Lakhani & Wolf, 2003; Hars & Ou, 2001). Other research also sheds a light on what impact social media has on crowdfunding projects (e.g. Lu, Xie, Kong & Lu, 2014) or what role communities in general play in crowdfunding projects (e.g. Matheus, 2016; Bard, Brannström & Fahlberg, 2014). This study will aim to fill the gap of lacking interest in open source, by attempting to illustrate what characteristics an open source crowdfunding campaign has, what the communication process looks like between the campaign organizer's and the communities and what possible impact the communities have on an open source crowdfunding project.

2 Background

To have a better understanding of what open source is, how software and hardware are connected to it, what the open source community looks like, what crowdfunding means and what doing business with open source is like, this *Background*-section will introduce all elements relevant for explaining these aspects.

2.1 What Is Software and Hardware?

“Software” is an often-recurring word in today’s society, although it is oftentimes taken for granted and seldom explained. To put it simply, it is a code that tells the computer (a laptop or stationary computer, a smartphone or a smart TV) what to do, either to accomplish a function or create a content. Without a software, the computer would be impractical to use. Imagine a computer without a Web browser, word processing or a multimedia program. It would be nonfunctional.

While the software is the invisible part of a computer that allows it to perform complex tasks, hardware, on the contrary, is the computer’s physical parts that can be touched, such as a monitor, motherboard, memory (RAM), cable, keyboard, mouse, camera etc. Changing the code in the software and placing it in a hardware, makes the computer do a completely different task. But the hardware can also be changed to newer and stronger parts, which enable the end product to be even more complex than before.

2.2 Open Source Software

The term “open source software” (also called OSS, FOSS or FLOSS, ‘F’ standing for ‘free’ and ‘L’ standing for ‘libre’) means that a software’s programming code is publicly accessible and made possible to be modified, enhanced and redistributed by anyone anywhere either for free or with charge. A few examples of successful OSS are the web browser Mozilla Firefox and the computer system Linux.

The idea of open source software was used in the early computer days by programmers and developers to learn from each other and evolve faster. Back in the 1980s, the software freedom activist and programmer Richard Stallman founded the Free Software Foundation (FSF) who produced and promoted computer user freedom. The freedom to run any program, study it, change it and redistribute it (Weber, 2004:48). Around the same period, Stallman conducted a project called GNU, with the intent of creating an operating system completely out of free software. Stallman eventually compiled a *GNU Manifesto*, which consists of several rules involving free software. This came to lay the ground for today’s open source movements. Linux is one result of the GNU project intertwined with Linux Kernel (i.e. a core/operating system).

As commercialization was in high motion around 1995, Eric Raymond, an American software developer, came to publish the essay *The Cathedral and the Bazaar* (1999). This is a compendium based on an analysis of the creation process of Linux. It describes and analyzes the programming that occurred before software release (called the cathedral model) and moves on to the so-called bazaar model, where the code was developed over the Internet after it had been released, awaiting feedback from the public. This was given a significant amount of attention and lead to impact the computing field in such a way that the reputable web browser company Netscape Communication Corporation, ultimately turned one of their products into a publicly free software.

With the understanding that complete freedom in open source eventually could lead to an obstruction in code sharing, Stallman introduced the General Public License (GPL). In order to preserve the original idea of freedom mentioned earlier in this section, he implemented copyright law as a reference point (Weber, 2004). Overall there are 82 licenses (Open Source Initiative, n.d.), the GPL license included, whereas currently nine of them have active and strong communities.

An open source product is not merely simply public access to source code. There are particular guidelines to be followed in order to be identified as open source. Introduced by Bruce Perens, a computer programmer and advocate in the software movement, along with Eric Raymond, *The Open Source Definition* (Perens, 1999), is the first formally announced manifesto of open source. As an example, in the manifesto, the first requirement of open source, is its redistribution to be free and not necessitating any monetary compensation towards the original author.

2.3 Open Source Hardware

Similarly to OSS, the concept of Open Source Hardware (OSH) has emerged. In the beginning, OSH was focused on the domain of electronics and mechanical designs. Despite the ad-hoc and hobbyist process of sharing at the time, Stephen Wozniak, the co-founder of Apple claimed that the designs of Apple's first personal computers were freely circulated in order to enable others to incorporate them into their own systems, which in turn allowed Apple's engineers to receive an early validation and feedback their own product (Acosta, 2009:11). Since that era, influenced by the emergence of OSS, OSH's contemporary interpretation includes any physical artifact that is fundamentally based on source code being made publicly available under an open source license. For example, this expansion opened up the OSH domain to incorporate 3D printed objects and the fashion industry, among others.

Moreover, the Open Source Hardware Association (OSHW) defines OSH as hardware that has its design publicly available, permitting third parties to modify, redistribute and sell the design itself or physical derivatives of it, i.e. new hardware products (OSHW, n.d.). Additionally, in order to facilitate openness, it is suggested that the source of the hardware is available in a format that allows high modifiability and for easy-to-acquire components to be utilized in it. We can observe that the definition of OSH heavily draws its origins from the Open Source definition by Perens and Raymond, mentioned in the previous section.

It should be noted, that when referring to Open Source Hardware licensing, we refer to a physical object's source code and design schematics, not the license to the physical object itself. This is due to the fact that copyright legislation handles software differently from hardware and in particular, useful and functional objects are excluded from it. Such objects can be protected primarily through patenting which is usually a laborious process that costs and is not automatically applied upon creation of a physical object, unlike copyright on software and other forms of intellectual property. To put it simply, it is legal to arbitrarily reproduce an unpatented object as long as the copyright of the source files has not been infringed. This is the reason why the OSHWA does not suggest any specific license for hardware, instead, the association suggests the use of already existing OSS licenses and abiding by a process that satisfies the OSH requirements. That being said, a number of open source licenses, specific for hardware, have been in circulation, most notably the CERN Open Source Hardware license which is the hardware equivalent of GPL (Ayass & Serrano, 2012).

2.4 Open Source Communities

Due to the complexity of the open source community, this section begins with a simplified example of how the open source communities are composed and connected to one another.

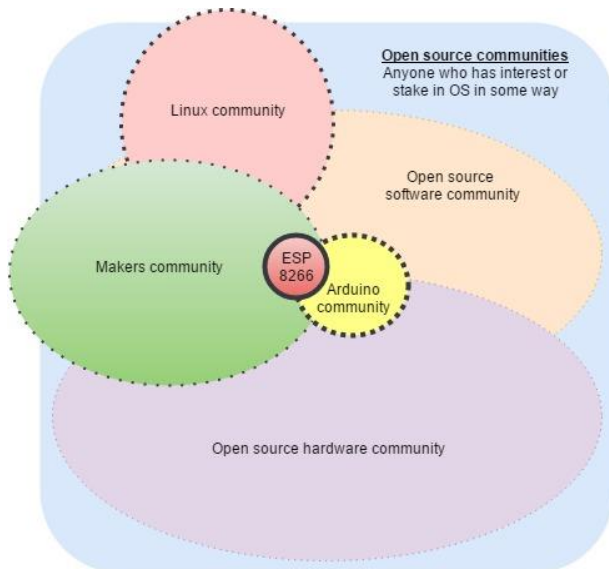


Figure 1 Open source communities

The diagram in figure 1, shows a blue section which illustrates the open source community as a whole. "Community" in this case, refers to a virtual space where people who share interests come together. This includes individuals who mainly have a technical *interest* in common, but some of these also *engage* in different kinds of projects by contributing with their knowledge in various ways (Open Source Initiative, n.d.). Within the blue box of open source community, two main categories divide it into two fields: open source software and hardware, both overlapping each other. People who work with either, tend to work with the other as well.

As further seen in the picture, there are factions consisting of people that are devoted to more specific fields within software, hardware or both.

Two examples of factions that have been chosen in the figure are the Linux community and the Makers community. These are both very known and broad communities that cover everything from private projects of individuals, to business companies that program or receive assistance online for their open source products. The Makers community is somewhat unconventional, as they also include individuals who have non-technical interests such as knitting or carpentry, but nevertheless, are considered "makers" (Maker Media, n.d.). Both the Linux community and Makers community have partial intentions outside of the open source community.

In addition to these, there are even more defined and specialized communities, as the illustration shows. The Arduino community is one example. They are specialized in creating, modifying and innovating small computers, commonly called microcontrollers. Continuing in this line, it leads us to increasingly smaller and distinct communities such as the ESP8266 which also is a microcontroller like Arduino, but specifically concerned with Wi-Fi.

To narrow this down further, the second figure (2) which can be found below, illustrates as previously mentioned, that the open source community is parted into two groups of people, the collaborative and the interested members. Not all members collaborate, due to lack of skill and interest for programming, but every member has some kind of interest in open source, even if it only means reading about open source projects (Wang, 2016). The members who collaborate, download programs such as Git and Apache Subversion (SVN), that allow them to store their codes, organize the code history and collaborate with one another. The projects can then be uploaded on websites like GitHub, GitLab and Bitbucket (see figure 1 & 2 in Attachment 1), where members have their own profiles with folders containing projects that they are involved in or have created, along with comment sections that facilitate communication among them.

Communication is on the other side of the open source spectrum, enabling the members to discuss progress, how to solve problems and develop projects (Guzzi, Bacchelli, Lanza, Pinzger & van Deursen, 2013:277). Apart from the comment sections on the mentioned websites, communication

also takes place through so-called mailing lists that send emails to a big crowd at once, forums, chat, fairs, newsgroups and physical or online magazines (e.g. "Linux Journal", "Linux User & Developer" and "Open Source For You") (see figure 3 in Attachment 1) (Open Source Initiative, n.d.).

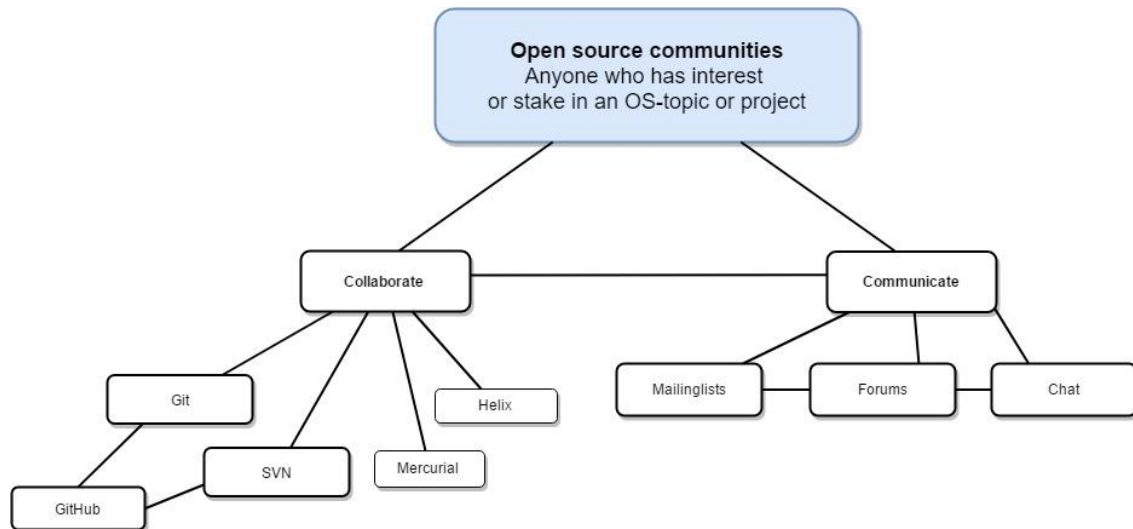


Figure 2 Open source communication

2.5 Crowdfunding

Obtaining finance for a start-up business or a product is often considered challenging. Usually, it requires a loan of some kind, search for investors, a participation of an innovation contest or applying of a grant. However, not having enough connections to investors or a loan big enough to cover all costs, online crowdfunding comes in handy. Online crowdfunding is an alternative way to raise money with the help of a large number of individuals from all over the world, who see potential in a product, project, social cause or service. The project can be anything from a physical product such as a smartphone case to a trip, book publishing, the start-up of a business, a concert or an expense (e.g. medical). The crowdfunding methods are typically based on donations, peer-to-peer or peer-to-business loans, rewards or equity, meaning that people who fund products automatically become co-owners. There are rare cases that consist of variations of these, for example alternatively of funding with money, the supporter can offer a product or service.

The rise of online crowdfunding begun back in 1997 when a British rock band was determined to gather money from their fans in order to afford a tour reunion. This inspired Brian Camelio, an American musician and composer to launch a reward-based crowdfunding website called ArtistShare in 2003. It was a website where musicians could seek donations from their fans to produce digital recordings.

The platform Kickstarter and Crowd Supply, which I will concentrate on in this thesis, are reward-based platforms focusing on physical products and refrains from services and charities. These platforms utilize an all-or-nothing model, meaning that pledges will be returned to the backers unless the project reaches its funding goal. Actions that are taken in the process of creating and maintaining a campaign, apart from detailing a budget and finding inspiration, concerns creating an attractive page with treasured rewards, identifying ways to find backers and keeping them informed throughout the campaign. Due to the all-of-nothing model, these mentioned instructions, are emphasized on the crowdfunding websites to help facilitate the work of campaign organizers (e.g. Kickstarter, n.d.).

2.6 Doing Business Using Open Source

Traditional businesses have strategies that help them control their entire administration. These strategies help govern everything from the leadership and organization, to trade and finances. One of these strategies involves a scheme to specify company goals and generate tools to implement the goals. It displays possible approaches to the creation, delivery and commercialization of a company's value, typically through its products (Teece, 2010:173). This scheme is called a business model. A business model is, in short, a plan that describes the approach of how a business intends to make money from the products. It identifies who the costumers are, what products or services they require and how much these products and services are valued.

Open source is progressively used as a business strategy and prominently adopted to build businesses upon (Goldman & Gabriel, 2005:2-4). The specifics of how to be successful with such a business is emphasized by Sandeep Krishnamurthy (2003) who illustrates profit potential of open source products. Three business models will additionally be presented by Raymond (2000) that can be yielding for the revenue.

2.6.1 Profit Potential of Open Source Products

As with all products, open source products do not all have the same profit potential. But because of the free nature of open source products, compared to traditional services or products, the profit potential of an open source product tends to look slightly different than traditional ones. Krishnamurthy (2003:14-15) uses the term *stars* to state that these refer to high applicability products with the highest profit potential that some open source businesses are built around. Likewise, these open source businesses have the largest community support that works as a direct and indirect marketing tool. The star products are essentially made to be used on a wide range of operating systems, similar to traditional products that are made for a wide range of uses and people. *High-profile niches* have high product importance within the community in the way that they are very respected in their narrow field, but have a low costumer applicability since they are not heard of outside of the community. If these, however, get properly marketed, they have the potential to become profitable. Low applicability products, also called *low-profile niches*, have the intention to serve a small amount of crowd and do this effectively. Lastly, Krishnamurthy mentions the *mainstream utilities* which contribute with functions that are widely applicable to electronic devices and programs but cannot financially thrive as a standalone product.

2.6.2 Business Models for Open Source Software

To understand the business models of open source, one must understand that they go hand in hand with the open source communities. Dahlander and Magnusson (2006:127) suggests that the open source software business model chosen by a firm is closely related to the relations that the firm has to its communities. To have a sustainable business, the relationships to the communities are vital. They believe that being *part* of a community is more important than *managing* a community. The open source communities are said to facilitate the firm's endeavors by cutting costs, pace development and set trends. They also help reduce the production and development cost burden on the company (Krishnamurthy, 2003:2). However, they also point out that the firm's intentions to create revenue can come into conflict with the open source communities' norms and values around acceptable behaviors.

Possibly the most crucial decision involved in a business model with open source software is the terms under which the derived works can be distributed. According to Krishnamurthy (2003:5), one of the

greatest functions that the community has, is that it helps determine which type of license a product should have. The license that has the biggest influence on how business models are constructed, is the one called General Public License (GPL). The reason for this is that the GPL is a copyleft license, meaning that all the derived work, must be distributed under the same guidelines as the original code. On the other hand, a GPL license is considered to reduce the profit potential of companies, according to Krishnamurthy (2003:5).

While most existing open source business models are strictly fixated on being applicable for open source *software*, they become less useful when hardware is involved because it not only consists of code but also of physical objects that need manufacturing. Due to little or no research in this field, open source *hardware* business models will be left unrecognized in this thesis. Below, three open source software business models will be introduced by Raymond (2000).

The element of *Support Sellers*, also known as "give away the recipe, open a restaurant" (Raymond, 2001:136; 2000:20), is similar to the distributor model, but differs in the sense that it proposes more services to the client or end user (Weber, 2004:195; Hecker, 1999:49). It allows the code to be given away for free on the Internet, while simultaneously, for a cost, offering the service of packaging, branding and distribution of the product, training, consulting, custom development, as well as technical and setup support.

Brand Licensing, or "free the software, sell the brand" (Raymond, 2000:23) aims to sell the trademark to clients who wish to use it, in order to create derivative products. In other words, the open source code of a product remains free of charge, while the brand or trademark will be exclusive to the commercial company. Weber (2004:197) explains that the advantage is that the already branded product has value on the market in terms of clients, end users and quality. For example, a brand could imply that the product has been thoroughly quality controlled. Additionally, it instills confidence that the product shall have a long life-cycle and that high standard customer support will be available.

Lastly, Raymond (2000:20) also introduces *Loss Leaders*. It possesses and displays two different products at once. A free open source product is used for marketing purposes to attract attention from potential clients and end users, create a greater demand for upcoming commercial products, build the reputation of software sellers, improve the usability of the commercial product and help amplify the developer's community along the way. The "real" product, is then sold.

2.7 Previous Research

As mentioned in the *Introduction*, so far, there have been no studies found on the relationship between open source communities and crowdfunding campaigns with open source products. Instead, the past and current research, concerns motivations for participation, social media's impact on crowdfunding projects and the role of communities in crowdfunding campaigns in general.

Gerber, Hui and Kou (2012:1) has been looking at the motivations for posting and funding crowdfunding projects online. Their study shows that the participation-motivations among crowdfunding project creators depend on the idea of strengthening commitment to community members and their feedback. The backers on the other side found a connection in the common community because of shared interests. Extrinsic motivations also showed to exist among the creators, in the form of securing funding, while for the backers it was the usage and experience of the products that seemed to matter.

Hars and Ou (2001:25, 34-35) has made a study of the motivations of the community members in an open source community. They point out that the participation of an open source community falls, according to their study, into two categories: intrinsic motivation like altruism and identification with a community, and extrinsic motivation like direct compensation, anticipated returns and personal needs. Monetary rewards were shown to be no exception but were mainly important for open source programmer employees. Hobbyists and students, on the other hand, were more connected to the intrinsic motivations. Lakhani and Wolf (2003:2), in contrast to Hars and Ou, finds that the level of creativity a person feels when working on a project is the main motivation. What also drives people to join an open source project is personal needs, intellectual stimulation and the will to improve programming skills.

Motivations have also been studied concerning the online community and e-commerce website for T-shirts called Threadless. Brabham (2010:1139-1140) extracted the gratifications sought from participating in Threadless. He reveals that the members, apart from passing time and having fun, are driven by opportunities in the form of money-making, skill-developing and creating a career portfolio. Additionally, they had a strong devotion to the community and showed signs of addiction, according to Brabham. Brabham (2010:1139) calls the members "vibrant and obsessed" and goes to say that these traits are essential for a thriving crowdsourcing community. The reason for these addicted members, he explains, is because the development and production need this enthusiasm in order to fulfill quality standards, considering that they recognize themselves to be central influences in the business process, more than mere customers.

Further research, also sheds a light on what impact social media has on crowdfunding projects. One example is by Lu, Xie, Kong and Lu (2014:1) who have mapped principles that can have a positive effect on crowdfunding campaigns. They have observed that early promotional activities in a crowdfunding campaign are strongly connected to the outcome and show the benefit of using multiple platforms for promotion.

To end this section, we will look at the general impact that communities have been proven to have on crowdfunding projects. Two studies, conducted by Bard, Brännström and Fahlberg (2014), and Matheus (2016) have reached different conclusions. The former research highlights the importance of recognizing the communities as more than just financiers. Their role rather appears to be that of a devoted networking group that share ideas and information. A model was created by Bard, Brännström and Fahlberg (2014:35) showing three levels of community commitment, which they named *sponsors*, *active audience* and *inactive audience*. The sponsors were shown to have the biggest involvement, while the active audience helped to promote the project and inactive audience simply consisting of people being aware of the project, but not spreading the word. Ultimately, Matheus (2016:54) suggests that the success rate of a crowdfunding platform is driven by how much creators back others, lessons learned from creating projects and the level of connection with the backers/funders.

3 Theoretical Framework

The following section presents theoretical frameworks and tools that set the ground for the methodology and the results. Theories and concepts used here are relevant for this thesis, in order to explain and create hypothesis around the topic of open source crowdfunding and the role of the communities.

3.1 Computer-Mediated Communication

Since the early ages of computers in the 1960s, computer-mediated communication (CMC) has been relevant, because the rise of it has given face-to-face (FtF) interaction a different meaning (Thompson, 2001:107-109). It has created new forms of social connection and allowed us to adapt our behaviors accordingly. The concept of time and space has shifted and been separated from one another. Jones (1995:2) calls this new social formation a *cybersociety* where people's hopes and expectations for the community is based on assumptions that users make about the connection to each other. These assumptions are essentially tied to our natural tendency for contact, cohabitation and communication.

CMC is in constant change. Various principles and practices concerning computer network structures have come to co-exist, enabling the interactivity, usability and collaboration among online users, businesses and individuals alike (Ryan, 2012:1-3; Jones, 1995:3).

Traditionally, Reid (1991) suggests that CMC consists of three main systems which are email, text chat and news. However, through the years, it has also come to involve other media forms like forums, bulletin board systems, text-messaging, video and voice chat (Thurlow, Lengel & Tomic, 2004:262). CMC consists of a diverse set of categories. Differentiating factors include the utilized technology or the "softer" aspects, such as their purpose of communication as well as the representative usage groups. The way people communicate in various settings (professional, social and educational), varies depending on the elements mentioned above.

As the paragraph above exhibits, CMC can be viewed as an umbrella term for various types of perspectives on communication that fall under this same category. CMC is typically used to look at how people utilize computers for interacting with one another and how they form impressions and maintain relationships (Walther, 1996). Walther (1996:17) has developed the theory of hyper-personal interaction, in which he defines this interaction as, in many ways, superior to FtF, because of the power it gives the sender for developing and editing self-presentation as well as idealization and reciprocation (Walther, 1996:28). He portrays it as often being more desirable and productive than FtF. An example is impersonal interaction which, Walther adds (1996:17), is common in task oriented groups because the communication evolves around the task at hand and makes the work more effective when irrelevant personal information is being dismissed. While Walther typically compares the online interaction in contrast to offline, other researchers in more recent studies, view CMC as a part of everyday life, where Internet is used routinely, alongside to daily communication and behaviors (see e.g. Wellman & Haythornthwaite, 2002 for further reading).

3.2 Techno-Meritocratic and Hacker Culture

In the two following sections below, the culture of meritocracy and hackers will be based on Castells (2002) writings, which is also further elaborated by other researchers.

3.2.1 The Techno-Meritocratic Culture

The Oxford dictionary (Scott, 2015) explains 'meritocracy' as a social system ruled by intellect along with talent, rather than wealth and birth. Status is achieved through ability and effort rather than class and gender. The technological factor in the meritocratic culture can be explained that the more individuals contribute to the scientific and technological development, the more highly esteemed they will be. Subsequently, in a techno-meritocratic culture, they enjoy higher influence in the decision-making process, related to the subjects or projects they have been involved in, Castells explains (2002:49-51). Sen (2000:8) splits meritocracy into two main sections, where *incentives* are regulated by actions that do good, and rewards that lead to better results through actions. The second way is through *action propriety* that explains how actions can be judged by their appropriate behavior, rather than the results.

In his book "The Internet Galaxy", Castells (2002:50-51) lines up six elements that characterize the techno-meritocratic culture: (1) *technical inventions are valued highest*, (2) *the invention's relevance and rank is determined based on the contribution (as a whole) to the domain*, (3) *the invention's relevance is determined through peer-review by the community members*, (4) *delegation of tasks and projects are made by authorities that control resources within the community*, (5) *respect and rank is gained through following formal and informal rules and sharing all resources*, and finally the last and one of the most important elements is portrayed as (6) *open communication and shared improvements*. This commitment to meritocracy is something that, according to Coleman (2013:122) only has grown stronger among the open source hackers through the years. Coleman (2013:121) also stresses, just like Castells, that the value of the source code is not privatized in any manner and that "*this value is fed back and circulated among peers, thereby contributing to an endowed and growing pool of resources through which other hackers can constantly engage in their asymptotic process of self-cultivation*". Coleman (2013:120) further adds that, although community members, like hackers, see each other as peers, there is an elitism among them due to the meritocracy that encourages individual skill and respectful competition between peers. This infinite process of self-development mentioned in the quote above is one way that the hackers try to minimize the elitism (Coleman, 2013:121).

Meritocracy features are seen to be present in contemporary open source communities as well. As an example, O'Mahony and Ferraro (2007:22) highlights, that for open source programmers to create exceptional innovations, meritocracy is in fact needed as a governance system in the communities. By awarding the programmers for their contributions, with higher status or more responsibility, deeper needs are being met that their physical environments possibly might not provide for them. O'Mahony and Ferraro's study of an open source community also shows that the technological contributions alone did not work as a merit factor. What also played a significant role was the management and administration of the project, especially as it matured. Likewise, studies on the community of Apache Software Foundation, where open source projects, such as their reputable web server Apache, shows a direct link between meritocracy and higher achievements among the programmers (Roberts, Hann & Slaughter, 2006). The co-founder of the Apache server, Roy T. Fielding (1999:43), clearly states that the higher number of work done leads to more freedom and opportunities for the members involved. Fielding underlines that although there are groups who help create collaborations within the community, it is ultimately the individual who, apart from writing code and supporting the end users, motivate themselves into being more creative for their own personal goals, and not to satisfy the group.

3.2.2 The Hacker Culture

When rules and values are adopted from the meritocratic as well as from the so-called business culture, to create a framework for autonomous technical projects, *the hacker culture* is established (Castells, 2002:48, 51-62). This culture contains of a group of intelligent people who use their programming and networking skills in a creative and playful manner to invent software products by exploring possibilities for evolution (Stallman, n.d.). These products are essentially defined by their independent nature from executive institutions. Coleman (2013:93) describes hackers as people who value cleverness, ingenuity, wit and humor. Furthermore, she points out that ethical aspects that matter within the hacker culture are individuality, meritocracy, independence as well as interdependence. This leads the hackers into a paradox of individualism and collectivism, due to the collective aspect of projects where the hackers need to ask each other for help (Coleman, 2013:94).

The open source movement plays a substantial role in explaining the organizational and ethical attributes of the hacker culture, considering it is one of the main subcultures of the hacker community. These attributes are according to Castells (2002:50) performance, technological excellence, peer review, a common need for sharing and open communication. Raymond (2003) shares this point of view, while also explaining how the hacker culture does not consist of leaders, but of prominent and experienced senior members who review new projects. Comprehensively, he signifies what all hackers have in common: problem-solving, creating, freedom through sharing and openness, as well as reciprocity and altruism. Similarly, Levy (2001:40-49) points out six elements that define the hacker ethics. He maps them as *access to computers, all information should be free, promote decentralization by mistrusting bureaucracy, hackers should be judged by their hacking and not criteria such as degree or age, you can create art and beauty on a computer, and lastly, they have the belief that computers can change your life for the better by giving it focus and enriching it*. The modern days have delivered a cultural trend inspired by the old hacker culture, that emphasizes creative and innovative needs in the technological field of individuals of all ages, simultaneously turning the consumers and end users into creators. As the founder of the Maker movement, Dougherty (2012) suggests the movement is accentuating the same traits that exist in the hacker culture. That is passion, enthusiasm with an ambition to be playful while building hardware and software, but in a more connected way than before. Aside of online communities, activities like Maker Faires and workshops like Makerspaces (also called hackerspace) bring people together.

3.3 Virtual Communities

The term *virtual community* that was coined by Howard Rheingold (1993:6, 15) in the early 1990s, it involved free, informal, self-governing and lateral communication (Castells, 2002:65).

'Communities' are, as indicated in the *Background* section, a complex term. Throughout the years, communities have been examined from different perspectives by researchers, gradually following the path of media development. Initially, communities were tied to local time and space, such as wildlife groups and neighborhoods that shared common goals and interests. Eventually, when virtual communities emerged, Rheingold (1993:3) started to participate in a community called the WELL, where he came to experience the convergence and transformation of time and space and led to the creation of new forms of social interaction. He describes the community through comparison to physical communities, where people talk to each other, receives support from one another and fall in love in the same way (Rheingold (1993:5).

A shift was then made, from the physical idea to an imagined place where researchers like Turkle (1995) and Thompson (2001) focus on the transformation of physical time and space, and how it has

created a new type of symbolic trade and expression in the context of mediated interaction. Anderson (2006) proposed back in 1986, a theory of *imagined communities* where he draws examples from physical nations. Anderson explains that, although most members of a nation will not meet FtF, they still have a sense of shared values and connection to one another. The affinity of one another is mentally stored, resulting in an honest non-hierarchical partnership (Anderson, 2006:6-7).

Despite that communities have all the common traits mentioned earlier in this section by Rheingold, communities are different from one another depending on what features they offer (Resnik, Konstan, Chen & Kraut, 2012:233). In social media communities, like Facebook, the users share digital objects and conversations, while in open source communities, production of products and projects are central and the communication evolves around the making of these. Shared values and interests are what pervades the communities and results in mutual relationships and unselfish acts of kindness to one another. Findings by Li, Browne & Wetherbe (2006:131-133) as well as Wu, Chen & Chung (2010:1026, 1030-1031) show that the more values the members of a community share such as goals, appropriate behavior and policies, the stronger the competence, commitment and altruism is among the members. The relationship commitment between the members is fundamentally defined by a trust which, through the previously mentioned elements, strengthens the group's consistency and cohesion. For the members to also trust in each other's talents, virtues and the mentioned predictability, ultimately results in a higher level of satisfaction among the members and constitutes an open communication and enhances "belongingness". The community thus becomes a coherent platform that enables homogeneous interpretation among like-minded people. Coleman (2013:124,140-141) mentions how it is an ongoing process for hackers in an open source community to integrate themselves, comprehend and set the social norms as well as gain trust in one another. She calls this process an *ethical enculturation* where they need to knowledge that spans across the social and technical spectrum.

This view is further elaborated in "A Networked Self" by Malcolm R. Parks (2011:108-109) who expresses that apart from homogeneous behaviors, interpersonal relationships and bonds need be the foundation of the community for it to thrive. This leads to a *knowledge community* or *network of practice*, traditionally called a *community of practice*. These communities describe big groups or networks of people online, that may or may not know each other or meet FtF. They share common goals and purposes and use communication to fulfill these goals (Borg, 2003:398; Wasko & Faraj, 2005:37). What distinguishes a community of practice from others, is that members are believed to actively choose whether to be part of the community, communicate and share knowledge. I propose that this type of community shares many similarities with open source communities, considering that they are also self-organized by people who volunteer to keep the communities active. Wasko, Teigland and Faraj (2009:254) finally add that knowledge is contributed by the members through individual skills, resources and willing for higher reputation. These aspects when accumulated in sufficient amounts, are responsible for the generation and longevity of a knowledge-sharing community.

3.4 Social Identity and Self-Categorization Theory

"In order to build a development community, you need to attract people, interest them in what you are doing, and keep them happy about the amount of work they are doing. Technical sizzle will go a long way towards accomplishing this, but it is far from the whole story. The personality you project matters, too."

This quote by Eric Raymond in *The Cathedral and the Bazaar* (1999:38) shows that personality is an important aspect of a prosperous community. To further broaden this perspective, the theory of social identity will here be introduced. Social identity illustrates how and why a person identifies themselves as different group members. According to a central aspect of this theory, it is the *requirement*,

willingness and *motivation* of people to be part of a group, in other words, to categorize themselves, that allows the group to exist in the first place (Billig, 1995:66). Every group teaches people how to think, feel and behave. The belonging of a group, such as a painters group, handball team, school class or an online community and the interpersonal communication that occurs, gives people a sense of social identity. The adaptation of this is an emotional bond that leads to the construction and preservation of a person's self-image and self-esteem.

Deaux offers a more broad perspective when he indicates that the social identities are the characteristics such as norms, values and behaviors a person acquires from the group that he or she represents (1993:5-6). The identity part in 'social identity' is explained as a personal identity that is being defined by the group, while the social part is influenced by the personal identity. The social part contains of categories such as age and sex, while the identity part refers to *personal meanings* and *experiences*. As an example, for any role a person takes on, such as being a woman, mother, sister and a nurse, the social identity of these roles are all intertwined and connected. Even though they are fused in one another, Deaux claims that individuals still freely choose which categories they want to be salient and which personal meanings to attach to the categories.

4 Purpose and Research Questions

The purpose of this research is to investigate the socio-technical aspects encountered in crowdfunding campaigns of open source products from the perspective of the campaign organizers.

- RQ1: What are the characteristics of a crowdfunding campaign of open source products?

Here I highlight what the advantages and disadvantages are for open source campaigns and what business aspects are taken into consideration.

- RQ2: How can the relationship and communication between the campaign organizers and the community be described?

This question presents the tools used to communicate with the communities and investigates what the relationship or collaboration is, between the organizers and the community.

- RQ3: What is the impact of the community on an open source crowdfunding campaign according to the organizers perspective?

By combining the answers to the previous research questions as well as data from the interviews regarding the feedback or contributions the campaigns got from the community, I will here be analyzing what impact the community has on the campaign and/or the organizers.

5 Methodology

In this section, we examine which methods were chosen along with the motives behind the choice, how the field was approached and participants recruited. Further, there will also be an illustration of how the methods were implemented with ethical aspects taken into consideration. Lastly, this section contains experiences obtained from the applied methods, as well as an explanation of how the data was transcribed and analyzed.

5.1 Selecting Interview as A Method

Before the gathering of data, an attempt was made to settle the theoretical framework, but due to little information about this field of study, abduction was finally applied. This method suggests that pattern around this topic is found in the data as well as through the previous research and theoretical framework (Alvesson & Sköldbberg, 2008:54-57).

Based on the research questions at hand, qualitative research method was finally chosen (Kvale & Brinkmann, 2014:174). Qualitative methods allow ambiguous data, by making room for the subject's viewpoint and primarily leading to a more in-depth description of characteristics, settings and practices that otherwise would not emerge with quantitative methods. The goal is to acquire a better understanding of other people, capture their experiences by recognizing how they think and feel (Kvale & Brinkmann, 2014:15).

The purpose of conducting interviews is to establish a connection to the field and subject, and through this, extract knowledge and understanding (Aspers, 2011:139; Kvale & Brinkmann, 2014:34).

The semi-structured method that I chose, is described by Aspers (2011:143) as a method based on a few predetermined questions, closely connected to the theories. This technique allows me to suggest further follow-up questions, leading to a dialogue through the question-answer approach. As the open source communities and the crowdfunding campaigns are elements that greatly shift, depending on factors such as the people involved and the methods used to communicate, it leaves me with limited facts to base predetermined questions on. Structured interviews require just that, predetermined questions and answers, while the thematically open interviews are too open-ended. This is the reason why the semi-structured interview is the chosen method for this thesis.

5.2 Selecting Participants

The selection process is the conscious act of seeking and choosing participants to help answer the research questions (Larsson, 2010:61). It is significant to adopt a random selection method. Choosing participants representative of the target group as a whole is ideal for balancing the results (Esaiaasson, Gilljam, Oscarsson, Towns Wängnerud, 2017:171).

Striving to find a group of crowdfunding campaign organizers that would represent all open source campaign organizers, my search naturally started on the Internet. Knowing that there is an abundance of crowdfunding platforms, three of them were used to simplify my search for crowdfunding organizers with open source products: Indiegogo, Kickstarter and Crowd Supply. Whether the campaigns were active or completed, successful or unsuccessful, very technical or less technical did not matter as it was diverse results I was after. It also had no importance if they were created by individuals or already established businesses, since it presumably only could show a bigger diversity

of the relationship to the open source communities. Ultimately, my two main criteria were products that were open source and crowdfunded ideally on the platforms previously mentioned. I was also aiming to gather an equal amount of male and female organizers, but due to lack of female organizers, I ended up with one.

To begin with, the ideal organizer would be from Gothenburg or Sweden for me to obtain a local point of view. Meeting FtF for interviews could also allow me to create a friendlier atmosphere and have a deeper connection to the participants (Larsson, 2010:65-66). Shortly after seeing that there were not enough Swedish campaign organizers to contact, the scope was immediately broadened to involve organizers worldwide. Any project that clearly mentioned on the campaign page that they were using open source, was approached.

Throughout the whole thesis, a total amount of 53 campaign organizers were contacted through email, Facebook, the contact-form on the crowdfunding platforms and the contact-form on their own websites. In total 20 people answered, whereof 14 agreed to participate, 4 answered No because they had a lack of time and 2 of them were interested but never got back to me to set up a Skype session. One of the campaign organizers who agreed to participate wanted to answer the questions through email. The questions were sent, but the answers were never delivered back to me.

Ultimately, I executed interviews with a total of 13 open source crowdfunding campaign organizers from Finland, England, Italy, Germany, France, Switzerland, India, Australia and USA. 12 interviews were made through Skype and one through email. The participants consisted of 12 males, and one woman, between the ages 25-45.

5.3 Preparing and Conducting the Interviews

The semi-structured method that I chose, required several interview questions to be composed prior to the interviews. An interview guide was formulated with specific themes acquired from the research questions, previous research and the theory (Aspers, 2011:143; Esaiasson et al., 2017:273; Larsson, 2010:64). The guide, consisting of 20 questions (see Attachment 2 & 3). After the experience of the first two interviews, a few of the questions were merged and slightly modified to better fit the topic and easier lead to discussion. I kept in mind that Esaiasson et al. (2017:274) said, “*the interviewees must at all times feel motivated to tell about their experiences*”. Larsson (2010:58) also points out that the first interview is never the same as the last because I gain more knowledge and get a better understanding for every interview that passes. The questions were adjusted, more of less during every interview, to better fit the participant’s situation and business. The reason for this is because some campaign organizers worked alone (e.g. Paperino and MicroPython) while others worked in teams (e.g. Bare Conductive), others were a well-known business from before (Arduino) and some questions were simply not applicable due to getting a negative answer, early in the interview.

Knowing that the participants were situated worldwide, I had to apply online interviews instead of FtF. Punch (2014:151) suggests that audio recordings are best fitted for more open-ended questions like the semi-structured I had chosen, rather than highly structured with pre-coded responses. Because I previously have had an adequate experience with using Skype, it was the preferred platform for interviewing the participants. The recording of the interviews was with a smartphone.

Larsson (2010:73) suggests that an openness and trust need to be established between the interviewer and the participant for obtaining high-quality data and for better understanding the participant. Based on this, I tried to build a relationship with each one of them, starting with the email exchange, all the way through the interviews, by being friendly, laughing with them and in some cases, briefly compare

our experiences. Lastly, aside of this, another aspect that can have an impact on the interview, is the influence of the researcher (Larsson, 2010:74). I asked one question at a time and allowed them to fully finish their sentences before I moved on to the next question. The interview guide also aimed to be neutral with as little assumptions as possible. To add to the above, there was one participant who did not have the time for a Skype interview, so instead, the questions were sent and answered through email. This separates me further from the participant because no chance was given me to build a relationship with him. The answers were also more summarized and somewhat lacking depth, which resulted in little opportunity to investigate the answers much further. To facilitate this, I asked the participant to allow email exchanges, in the case of questions that might arise during the analysis process.

5.4 Transcribing the Material

After the interviews, it was essential to transcribe the gathered material. How strict the transcription should be, depends on what the analyzed text will be used for and what type of analysis method is chosen (Aspers, 2011:156). According to Linell (1994, cited in Wibeck, 2010:93-97), there are three types of transcription methods, depending on the level of detail desired. The third level was applied which is the less literal one, retailing simply the principal content of the interviews. Wibeck (2010:97-98) further proposes an alternative method for interviews, that is based only on written notes from the interviews.

5.4.1 Ethical Aspects

When doing interviews, it is important to follow certain laws and regulations. Ethics is the philosophy of what is wrong, right and virtuous in different situations. In Sweden, the ethics of a research are regulated by the Privacy Protection Law (Sveriges Riksdag, SFS 1998:204) and the Ethics Review Board (Sveriges Riksdag, SFS 2003:460), that exist to protect individuals' personal integrity as well as to respect the human dignity. Before, during and after a social study has been made, there are four fundamental demands that must be followed when doing a research according to the Swedish Research Council (Vetenskapsrådet, n.d.: 7-14): (1) *informing the participants about the purpose of the study*, (2) *informing about the optional participation and getting the participants consent*, (3) *confidentiality of data and cherishing the participant's privacy* and lastly, (4) *gathered data is solely allowed to be used for research purposes*. Because of these demands, the ethical aspects play a substantial role in the methodology, specifically for interviews where often private and sensitive information is shared.

In the 53 emails that I sent out, I introduced myself, briefed about the study, its purpose and the method used. I was then waiting for the participant's response and approval, in order to continue the research. This was based on three common guidelines which are expressed by Kvale and Brinkmann (2014:107-110) in addition to Dalen (2015:25-28), who speak about the importance of briefing the participant about the study, acquiring his/her consent and maintaining confidentiality. Ultimately, all the participants ended up approving the names to be published.

5.5 Validity and Reliability

A research needs to be established through trustworthy, consistent, relevant and valid grounds in all aspects, including thesis literature and the gathered data from the interviews (Ekström & Larsson, 2010:14). To reinforce my results and conclusions made from them, validity and reliability are two requirements. *Validity*, also called *measurement validity* (Punch, 2014:239), simply means how well the assessment of what was said to be studied was measured, while *reliability* has to do with whether

future studies will attain the same results as I did. The reliability concerns the honesty in the participant's answers or whether they change their answers, as well as negligence made by the researcher such as unreadable notes, misunderstandings during the coding process or interview due to tiredness as well as incorrect sources used throughout the study (Ekström & Larsson, 2010:15; Kvale & Brinkmann, 2014:295).

Validity is a broad concept that encompasses many aspects of assessment. The one that will be mentioned here is the measurement validity. It is consistently affected by the deduction that exists between my subjective perspective, consisting of presumptions and preconceptions, and the concept I aim to measure (Punch, 2014:239). Since the purpose of this thesis was to study the possible relationship between the open source campaigns and the open source communities, it is important to accentuate that this study was conducted only from the campaign organizer's perspective, leaving the community member's experiences and comprehensions out of the picture. This naturally lowers the validity of the study, because it gives us one point of view of the relationship that is studied. Likewise, not all existing campaign organizers were contacted, due to lack of time, a great need of effort, the degree of difficulty and perhaps even impossibility.

Elements such as personal affiliations to the field and emotional closeness to the subjects are said to impact the experiences and interpretation of a study. To this study, I neither have a strong emotional bond or personal involvement that can influence the results. But being too different from the participants mentally can also lower the reliability. For me and the participants not to be too estranged, a video call was preferred during the Skype interviews. As long as the participants felt comfortable showing themselves, and their Internet connection was stable, using video would help me to better get to know the participants and observe their facial expressions and body language.

Other details that mattered for this study, were preconceptions and theories used, since they also posed a threat to the interpretation process, generally resulting in predetermined follow-up questions (Dalen, 2015:16; Aspers, 2011:140). Minimizing the chances for this was rather difficult since I had already written down some theories, on which I had based my interview guide on. The preconception, Dalen (2015:17) clarifies, could not be bypassed, but an alternative strategy is introduced: the researcher is advised to be aware of his/her own preconception, which is something that I tried to keep in mind during the interviews. Being aware of my preconception allowed me to have a sensitivity present and generated an interrelation between the preconception and the theories already chosen.

Furthermore, Aspers (2011:141) makes a remark on the exercise of power that usually occurs during an interview. The dialogue is typically controlled by the interviewer, with questions or topics due to a predetermined agenda, generating a limited field of study, originating from the researcher's point of view. Just like the preconception, the unbalanced power is unyielding, but I attempted to facilitate this through reading various previous research and asking follow-up questions so that I may obtain a broader understanding of the field and the participant's life-world. Kvale and Brinkmann (2014:170) and Aspers (2011:155) mention that encouraging the participant is vital for creating a comfortable environment in which feelings and thoughts openly can be shared. Introducing the topic, being clear about what type of information is required, being myself, paying attention as a researcher and showing interest for the participant's answers, were a few ideas proposed by Aspers. All of these propositions, I tried applying during the interviews so to aim for the ideal environment.

Additionally, to maintain a high reliability during the Skype interviews, I always made sure that the sound was clear when recorded and double-checked a second time when the interviews finished. However, during one of the interviews (e.g. with LimiFrog), the network connection was not very stable, resulting in some sound disappearing from time to time. To be sure I heard correctly, I would either ask what he meant or let him know that I could not hear him so he could repeat himself. What is

harder to control are reliability threats like speech accents. It is worth mentioning that the language can work as a barrier if any of the participants, for example, do not have English as native language, have strong accents, or if I am perceived to have one, which can affect my understanding of the participant's answers, or the participant's way of answering my questions.

5.6 Introduction to the Participants and Products

All the products and participants involved in this thesis are introduced in Appendix A. Brief information, mainly about the products is given, to provide a better understanding of what they are and how they work.

It was often the case that the same organizer had run more than one campaign for the same product (i.e. different versions of it) or simply a different product that worked as a complement to the original one. Such is the case with Espruino, MicroPython, UDOO, Kano and Mooltipass where the line between the different versions and products was not always fine. Therefore, it requires the freedom to discuss all the relevant campaigns at once in the results. It is also worthy to mention that Crowd Supply was used for Paperino and snapVCC, Republic.ca was used for RaceYa and the rest of them were posted on Kickstarter. All but Republic.ca are donation-based models, while Republic.ca is equity-based.

The participants that were interviewed, had three main job descriptions surrounding the campaigns: founders, developers or campaign managers. As seen in figure (3), 6 of the participants oversaw everything, combining all these job descriptions, while 3 of them were solely campaign managers (Arduino, UDOO, Mooltipass), 2 others were campaign managers and co-developers (USB Armory and Kano), 1 was simultaneously the founder and co-developer (RuuviTag) and 1 the founder and campaign manager (RaceYa).

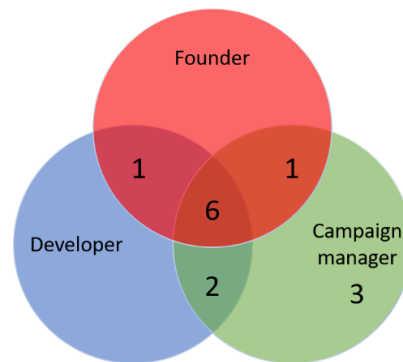
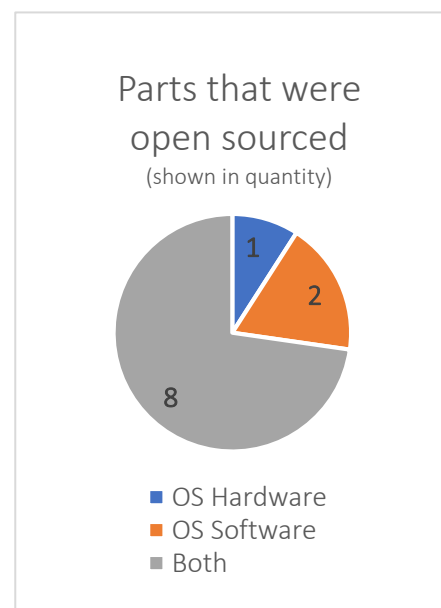


Figure 3 Roles during the campaigns (shown in quantity)

All campaigns also differed in terms of the usage and release of open source software code and open source hardware code. The figure to the right shows that most of the products shared both software and hardware code, while 1 product only shared open source hardware (snapVCC) and 2 of them open source software (LimiFrog and Kano). RaceYa and ESLOV are not included in the diagram, because the hardware and software are not open sourced yet, but will be in the near future.

Lastly, there were in total 11 successful campaigns, 1 was still ongoing when the interview was conducted (Paperino) and 1 was canceled (ESLOV).



6 Results

What follows here will be the empirical data gathered from the interviews. This section will commence with outlining the first research question by presenting the advantages and disadvantages of crowdfunding open source products before it will move on to describing the outlook on crowdfunding as a business method for open source products. The second research question will be approached by looking at what involvement the organizers had with the communities and lastly, the third research question will be examined by looking at the open source impact on the promotion of products and the possible feedback on the products given by the communities.

6.1 Advantages and Disadvantages of Open Source in Crowdfunding

A set of questions was asked to elicit advantages and disadvantages of open source in crowdfunding, however, many of the received answers regarded exclusively open source or crowdfunding and not their combination. In the following section, I will try to present and analyze the ones that are combining both domains. What will be mentioned here, is the advantage of contributing back to the community, marketing through the platform, getting funded by the communities and creating a dedicated community. The disadvantages will introduce the threat of cloning and a revenue dilemma.

6.1.1 Contribute Back to the Community

A common pattern among the *advantages* that was encountered, concerned the direct and indirect intention of contributing back to the community.

“Pretty much all the software that I’ve done that’s been reasonably popular, has been pirated. [...] So, then you start thinking, you know, if it’s gonna get copied and distributed anyway, you might as well let the people who are really interested in it, actually get to grips with it and make it better, rather than just copying it. [...] There’s definitely this feeling that I want to be someone who contributes back because I’m rather taking huge advantage of other people’s work”. – Gordon, Espruino

In the spirit of the hacker culture that was described by Coleman (2013:121) in section 3.2.1, the importance of sharing or circulating the value of the code is done by giving credit to one another, as expressed in Gordon’s quote above. Gordon who previously had a few closed sourced products had frequently encountered the uncompromising force of piracy. As a result, he embraced open source, in order to have Espruino, Espruino Pico and Puck.js working as a source of inspiration and innovation for the individuals who were dedicated to his products. Many of the other participants shared his opinion. They believed that nothing is gained by keeping it closed source, considering that people who want to copy a product can do it either how. Arduino rather embraced copying, because this means their products are desired and coveted and the name Arduino is spread. This, however, is not an element specifically for crowdfunding open source products.

Lauri added, *“Always sharing has been one of the goals and creating things without thinking business, money and revenue first”*. Others believed that with an open sourced product, they could keep their open source tradition alive, by guaranteeing transparency for the right audience. Similarly, Mathew explained that they also wanted to contribute back to the open source community at large, but specifically to the Raspberry Pi-community, since this is what they had used for their product.

“We wanted to make sure that any work that we did was pushed back into the community. Particularly around the Raspberry Pi itself, because it’s sold so many, it’s still quite a niche product. Commercial development is very thin on the ground for it.” – Mathew, Kano

Andrea (UDOO) exhibited a market awareness with the example of another Kickstarter-campaign called LattePanda, which used Windows, a closed source product. Because of this, several people criticized LattePanda’s decision of close source. Giving, mainly the Makers community, what they ask for, was a common trait among the participant’s answers.

“I think people, especially in the Maker community, they don’t like closed sourced products. So, even from a marketing perspective, I think people are more interested in open source products.” – Mahesh, snapVCC

Mahesh further explained how he had learned designing electronics with the help of Adafruit’s and Sparkfun’s open source hardware products. As a thankful gesture, he released the hardware design of snapVCC, in order to give back to the open source community.

For Arduino, there is no other way than to share with the community, because it is based on the open source values and ethics that its founder, Massimo Banzi possesses.

“[...] The main Massimo Banzi idea was that people wouldn’t have to ask, to wait. So, if I do something that can be useful for the world, also just for one person, why close it? Why not share the knowledge? So, [...] all the different parts [hardware and software] was, are and will be open source.” – Andrea, ESLOV

The widespread wave of interest in open source in society at large was what led Bare Conductive to adopt it, thinking that it would allow them to give something unique to their community. However, their community proved to behave in a distinctive way. The majority of Bare Conductive’s community were shown to be simple people who prefer using working code and hardware to initiate a project, rather than sophisticated programmers who want to modify it.

6.1.2 Good Marketing Platform for Open Source Products

Another notable *advantage* regarded the buzz that crowdfunding created which, along with the concept of open source, was considered to be a good marketing tool. As the quote below states, many of the participants accentuated that both being open source and using crowdfunding, was a way of showing the target groups, that they were not being used by a corporate trying to make money out of them.

“I think that the reason the Kickstarter was successful was because the code was open source, or it was going to be open source. So, that’s why people were willing to give up money for it. [...] It’s not like it’s a commercial company behind it that’s making money. [...] And people realized that it’s cool for open source to get funded.” – Damien, MicroPython

“I think people do get a bit more publicity. [...] Especially the hobby ones would probably [...] not want to feature you if you do not open because they feel that you’re basically cashing in on the people and you are using them for advertising.” – Gordon, Espruino

Being open source also allowed for more people to help advertise, due to its inclusive and engaging characteristics. People had a lot of feedback to give and many ideas to share. Damien considered people to be more *generous* with open source software and would, therefore, offer support more easily. He also added that people expected software to be free, which was an opinion that he shared with several other participants. Therefore, a technique that was used by some, was to only share parts of the code and releasing the entire code after the campaign. This way the product was kept compelling and engaged more people.

“I kind of pitched it as telling people that if they did contribute, then they would get access to the code, everyone would get access. I mean, if the campaign wasn’t a success, they wouldn’t have seen any of the code. So, it kind of drove them to contribute so that code would be open source.”

Freeing the code was, therefore, an easier way to reach to more people. The crowdfunding as a method simultaneously worked as an advertising tool that helped reach these people.

“You get the message out there of what you’re doing and you use the crowdfunding as sort of advertising to get people to help contribute as well, in terms of ongoing contributions through collaboration of the software.” – Damien, MicroPython

Just as being open source helped to market software, Mahesh believed that being open source also helped market his hardware design. Open source is believed by some, to awaken an altruism among people who facilitate the marketing process.

“More people are likely to pass the word if it’s open source. So really, open source has an edge. [...] You get the goodwill from the people.” – Mahesh, snapVCC

For the security product Mooltipass, it mattered tremendously to be open source, because being open source worked as an advantage among national agencies that could see through the building process of the product which made the product and the people behind it seem more reliable.

Keeping in mind that Makers were believed to want free or very cheap products, some of the participants clearly stated that there was a difference between who the end-customers were and who the funders were in the crowdfunding campaigns.

“I can tell you that the bigger number of products that you sell is to industries or to the educational field, not to Makers. Even if Makers are the only ones that will fund your Kickstarter-campaign.” – Andrea, UDOO

Ultimately, Matt shared general positive sides of crowdfunding campaigns and summed it up by saying that, *“They are great ways to bring a product to life, create a lot of buzz around it and develop a really dedicated community. [...] You can start really small and get really big”*. The community was in fact, the third most common positive outcome of crowdfunding and will be further illustrated down below.

6.1.3 Alternative Way of Getting Funded

Getting investors or banks to fund the products was hard. Many of the participants, claimed that the promise of delivering a product was not always easy to keep. Crowdfunding seemed to be about trust; trusting that someone would create and produce a product in the future. As Mahesh described it, *“Crowdfunding is about a promise and you have to deliver around that promise in a very short time.”* Ultimately, public institutions cannot “trust” in the same way that individuals can.

In Mooltipass’ case, everything was open sourced and existed online prior to the campaign, with no patents and ultimately no competitive advantage, since anybody could copy the project and create one themselves. For this reason, crowdfunding played a vital role for them. Lauri added that they did not have any certifications, which led them to choose to crowdfund since there was no other simple way to complete the product.

Some investors were considered to be afraid of open source, because of the competitiveness that exists, mainly through the feasibility of copying open source products.

“When you look at MakerBot. MakerBot was an open source project. They built a product and they tried to build an entire company around selling MakerBots. But because they were entirely open source, other people came along, iterated on their product and did it better than they did. They had a

little bit trouble to keep up and it was a little bit hard for them to convince people that it was OK to be a hardware for-profit company while at the same time having their technology free-floating in the world.” – Abigail, RaceYa

Also, looking for venture capital was hard, because the open source factor was not appealing to these funders. These venture capitalists typically tend to prefer funding non-open sourced products due to possible risks that open source poses on the market. This seemed to be closely related to what Abigail explained above.

“If you are trying to form a company, especially if you are looking for VC-funding based on your product, then a lot of VC: s fund intellectual property, and it’s not in line with open source. There is definitely a problem there.” – Mahesh, snapVCC

On the other hand, hardware is typically expensive. It was hard to find investors who could pay a lot of money, so crowdfunding was somewhere in-between the “big angels” and the small investors.

The same way that individuals had to trust that a product would be delivered on time, the campaign organizers had to believe that individuals were willing to give money to support projects that interested them. Even if ESLOV was originally an EU-project, it was yet not a finished product to be sold to the masses, since it was intended to be used in schools. Because Arduino did not have enough people who could carry the work of developing the software side further for this project, it required a lot of money. Getting help from the community was a given fact.

6.1.4 Developing a Dedicated Community Around the Product

This section covers the third and last pattern seen among the advantages of crowdfunding open source products, which was the rise of a dedicated community surrounding the product.

*“Maybe the one benefit of an open source product is, you can get an extremely dedicated community very early on. So, the people who are Kickstarter-backers, we really love them and we really care about them and they have given us so much good feedback. That has been a really powerful, kind of, function for us. And I can imagine that if you have an open source product that is very technical, you might be able to recruit people who help you to develop the product, which I can definitely believe.”
– Matt, The Touch Board*

The community’s role is, as we have seen in the previous section, the one of early adopters who find an interest in the open source products and help to advertise, but also, like Matt explains, has the function of a sounding board where ideas can be discussed, tested and judged in numerous ways. This support system helps improve the products and is often time-saving for the creators. This is something that will be discussed further below in section 6.5.1.

The dedicated community emerged for most, in the beginning of the campaign process and seemed to have a significant impact on the outcome of the campaigns.

“What we were not aware of, was the network-effect that happens in the beginning. So, we were on a few websites about Kickstarter-projects, and that seemed to bring more people and more exposure and we really gained a lot of acceleration, just from that.” – Matt, The Touch Board

This spike network-effect was the sudden and temporary interest that projects typically get at the beginning of their cycle, observed by Gordon and www.kicktraq.com. Regarding the first campaign of Espruino, the inclination of backers and visitors on the campaign page was slightly smaller due to only word-of-mouth advertisement. Conversely, what was seen in his two last campaigns with Espruino Pico and Puck.js, the peak reached somewhat higher, which he clarifies is because he had an established open source community at the time, who helped him with funding as well as to spread the

word to others. However, a community was not an easy task for some. They explained it takes a lot of time and effort to create one and eventually for it to mature.

“You’re using Kickstarter, not only to get the money but also to raise awareness and to start building a community... [...] Really trying to build a community around it. Because with open source software, the only way it can survive is people using and contributing to it every day, so, it’s really gotta be a thriving community.” – Damien, MicroPython

Damien signified that, apart from sharing the code, building a thriving community around the product was the second ingredient for a successful open source software campaign. Other organizers like Abigail and Mathew, explained they used the already existing open source community to network and eventually build their own resourceful and passionate crowd.

“One of the nice things about open source is the huge community that is constantly improving the product, writing for the product and thinking about the product. So, you essentially get a huge researching development department that is doing it out of love and passion and not out of the money that you as a start-up don’t have.” – Abigail, RaceYa

Abigail further stressed how important the equity-based crowdfunding platform was for the project, since people who invest through these type of platforms, end up owning the shares of the company at hand.

Lauri and his team were not able to see the positive effects of crowdfunding an open source product until after the campaign, when the community around their product blossomed and people started to contribute, by building on RuuviTag’s code and creating their own projects. However, not everyone managed to create a community. Robert experienced that it was hard for him to find a dedicated community because his product was a niche with a limited audience.

6.1.5 The Threat of Copycats

The threat of a product’s hardware or software being cloned and sold by someone else was one of the main concerns among the participants, but as we will see, this was also viewed positively by some.

Even if cloning can occur in any situation for non-open source products as well, Matt experienced that open source has made cloning of hardware products much easier, which tremendously has slowed down the development of, particularly open source hardware products.

Andrea (UDOO) expressed his own opinion about cloning, saying that the best way of avoiding it, is to not be entirely open source. He refers to the bigger amount of Raspberry Pi’s sold, comparing to Arduinos, to stress his argument, since Raspberry Pi’s hardware design is closed sourced. He believed that releasing the product with dual licensing, like Qt, would allow people to see the code, use it and share it, but in order to modify it and create a derivative product, the creator of the code would have to be paid.

Not releasing the code until the end of the campaign, was something that many of the participants claimed to do, so to minimize the risk of being beaten to the market. One of the Touch Board’s earlier versions was released before the end of the campaign and it managed to be copied. This made Bare Conductive keep the final product closed sourced until they had fulfilled everyone’s orders (see section 6.5.1 for more about code releasing).

Another downside to cloning that was mentioned by few of the participants, was the connection between cloning and loss of profit. Xavier explained however how small quantities of a product are expensive to create and therefore, cloning does not pose a direct threat, because ultimately, producing

hardware and software and getting a high number of products manufactured, automatically lowers the price and more people end up buying them.

Apart from the example above, other positive attitudes around cloning were accentuated. Mahesh believed that the passion and interest of the community created around the product helped to promote it and speed up the campaign and production process, which ultimately can help beat the copycats to the market. Like Mahesh, Andrea (USB Armory) pointed out that the importance of a dedicated community helps to keep the product working smoothly and remaining bug-free. The community was commonly believed to invest in the success of the project. With the help of a blog post written by Crowd Supply's Director of Campaign Communications (Lifton, 2017), Andrea further highlighted that an established market dominance with the product can be a great benefit. He explained how, even if all the schematics and layout of the hardware are exposed, there is more to the product development and its sources, which essentially makes the risks minimal compared to the benefits.

With open source products being easy to clone, Arduino decided to embrace it. Like a few of the other organizers, Arduino's values seemed to live in the brand name instead of the product.

"We are aware of it. We encourage the copying. We spread the word and we give all the things you need to create your own project. [...] The only thing we try to work against is the use of the name, the brand. Because behind the Arduino brand, there is a lot of people, a lot of work, a lot of tests, a lot of things that a Chinese company that takes the project and makes just a bunch of hardware pieces – it's not the same." – Andrea, ESLOV

On the other hand, it was generally considered acceptable according to these participants, if the product was copied and another name was used. This way, *credit* is given to them and the respect is restored. The success of a project, according to some, often leads to cloning. For this reason, it is better to be open source, rather than closed.

"Toys are a funny business because it's very secretive, but people steal from each other all the time, so, I thought, let's just embrace the stealing. You can't even call it stealing at that point. And to be honest, you know, any product that you can make is going to be copied as soon as you make it, if you're successful. [...] So, trying to lock everything down super hard is a little bit of a waste of time." – Abigail, RaceYa

6.1.6 Revenue Dilemma for Software

Even if crowdfunding can be a helpful tool to gather money for an open source product, based on the participant's answers, having *software* funded by individuals through crowdfunding can be difficult. The main reason for this is that some of the participants typically believed Makers prefer free or very cheap products, making it hard to profit.

In order for software to be profitable, a license would be required to keep the code partly closed sourced.

"It means that you can't charge money for the code, which means that you've totally lost the revenue stream. So, if you want to make money from selling software, it's not good to make it open source." – Damien, MicroPython

Since open source software is expected to be free, it can also be made successful through complementary consultancy, Gordon mentioned. At the same time, companies can use what he makes since he is open source and undercut him on price because they are not the ones spending the time on writing the software.

Another example given was that profit could be made from selling hardware, which in turn would keep the software alive. A quote and further explanation can be found in the section of *Business aspects*, 6.3.3.

6.2 Business Aspects

This section will cover what their business goals were and how the campaign organizers related to open source business models presented to them.

6.2.1 Creating a Business Perspective

The biggest reason for crowdfunding appeared to be the possibility to measure the popularity of the product on the market. 200 simple prototypes of Kano-kits, were originally sold through Kano's website prior to the campaign. To further see if the crowds had, as Mathew put it, "an appetite" for the product, they ran a campaign on Kickstarter because they considered it to have the right kind of audience consisting of early adopters.

Xavier could see beforehand, in FabLabs (small workshops for building personal technology) and Hackerspaces, that the prototype and the idea of LimiFrog attracted attention. But it was not enough feedback, leading to the execution of a campaign. Paperino the same purpose. With no knowledge of what the market looked like, how much money would be needed and what the business goal was, he decided to find this out with the help of a campaign.

Apart from testing the market, most participants did not have a clear goal when they started the campaign. There was no clear line between creating and crowdfunding the product for fun, versus creating it for the purpose of hopefully positioning the product or business on the market. A business perspective proved to surface as soon as the campaign started for most. Eventually, their goal became to position their product on the market if proven to be coveted.

"Kickstarter-campaign is creating a business. If you don't already have a business, you will have one at the end of the Kickstarter-campaign." – Matt, *The Touch Board*

From a business perspective, six of the participants aimed to establish a line of products through mass-production, reach out to a big market and to grow a business. According to Matt, Bare Conductive's implicit goal was to use crowdfunding as a way to drive attention to the rest of their products, which resulted in higher sales numbers on the rest of the products and helped their company to grow. Now they set sail to invent more interesting and good products that can ultimately "fund themselves". ESLOV was also planned to be mass-marketed, while the profit would be used for hiring people to work on the software development.

The campaign was believed for some to work as a springboard for reaching out to the crowd at large and to help fund the manufacturing of the hardware. This was the case for Kano, whose mission they haven't accomplished yet.

"We wanted it to help us make the first batch and fund all subsequent batches of computers. And we really want, and still, do, bring this to the masses. On Kickstarter, we were still speaking to a niche, you know very tech-literate typically males in the western world and we wanted to bring this to a family in Africa, a school in India, a university in China." – Mathew, *Kano*

For both Paperino and LimiFrog, the goal remained to use the products as a test to verify the interest on the market. The experiences learned during crowdfunding, would lead to valuable feedback, and

possibly, if very successful, would sell as many products as possible and perhaps even create a business around it.

6.2.2 Relation to Open Source Business Models

To begin with, only three of the participants were a company before the campaign: Bare Conductive behind the Touch Board, Inverse Path behind the USB Armory and Arduino behind ESLOV. The rest of them were either working alone or in smaller teams (like Ruuvi and Kano). UDOO, on the other hand, is a product created in the cooperation between teams from two companies.

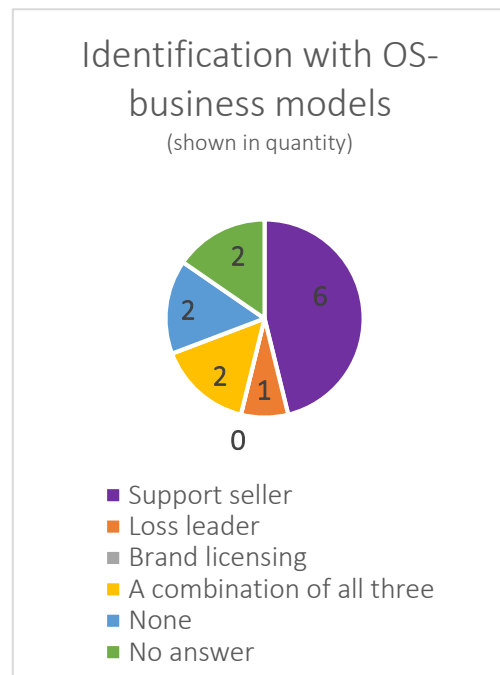
During the interviews, I had one question with predetermined answers for the participants to consider and compare themselves with (see Q9 and Q11 in Attachment 2 & 3). Surprisingly, none of the participants showed any prior awareness of open source business models. However, when choosing a model, six of the participants mainly leaned towards the first option, the *support seller*. A better example of the identification they made, is seen in the pie-chart “Identification with OS-business models”.

Andrea (ESLOV) explains that Arduino gives the code for free, sell boards, while simultaneously offer services in form of support to all their customers and community members.

Apart from selling the Touch Board and their closed sourced conductive paint, Bare Conductive still could relate better to the first model, since they offer support on the side in forms of tutorials and an active community that is willing to help one another.

Gordon was aiming for the brand licensing model – to be able to sell the software and charge people a licensing fee to put the software on their board. However, since software seemed to be harder to make money from, comparing to hardware, it unintentionally pushed him towards the support sellers model.

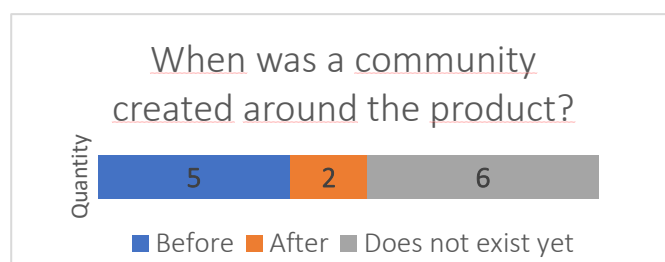
Damien’s explanation was very similar. Software alone cannot survive, but in company with hardware, they become a sellable duo. It is a clear observation, that many of the participants shared the experiencing of hardware alone being easier to build a business upon.



6.3 Community Creation and Personal Involvement

What could be observed in the results was that no community around the product emerged during the campaign. Instead, 5 communities emerged before the campaign launch and 2 after the campaign ended.

Ultimately, as seen in the diagram to the right, for 6 of the products, a community was never created. The community



around RaceYa is one of them. It is being built at the moment. Xavier explained that, although a community had not been built, he still had one-on-one communication through email and Twitter mainly, with people asking for advice and asking questions about LimiFrog. He added that maybe one of the reasons for this, was because he did not do enough work.

Robert's ongoing campaign for Paperino does not have a community either, but he is trying to make the community grow because he feels like he underestimated the promotion side for his niche-product.

6.3.1 Personal Involvement Prior to the Campaign

One of the communities that were created before the campaign was Lauri's, the creator of RuuviTag. He founded his own website around 7 years ago which eventually also was used to help promote RuuviTag and allow a platform for discussion. As he called them, the "early bird hackers", knew about him and that some Ruuvi-product was going to be published on Kickstarter. These ended up backing RuuviTag and allowing the product to reach its goal the first few hours.

When looking at the personal involvement of in open source communities prior to the campaigns, we could see that seven of the participants somehow contributed. The involvement encompassed contributions in the form of answering questions in forums, publishing source codes, making modifications and sharing content. Mahesh wrote a book on Python and had his own blog where he posted Python-projects. A few others also had personal blogs. Matt was more involved, comparing to his other team members. His contributions, however, were exclusively forum posts and helping people with projects, due to little skillset at the time in Arduino to be able to create something himself.

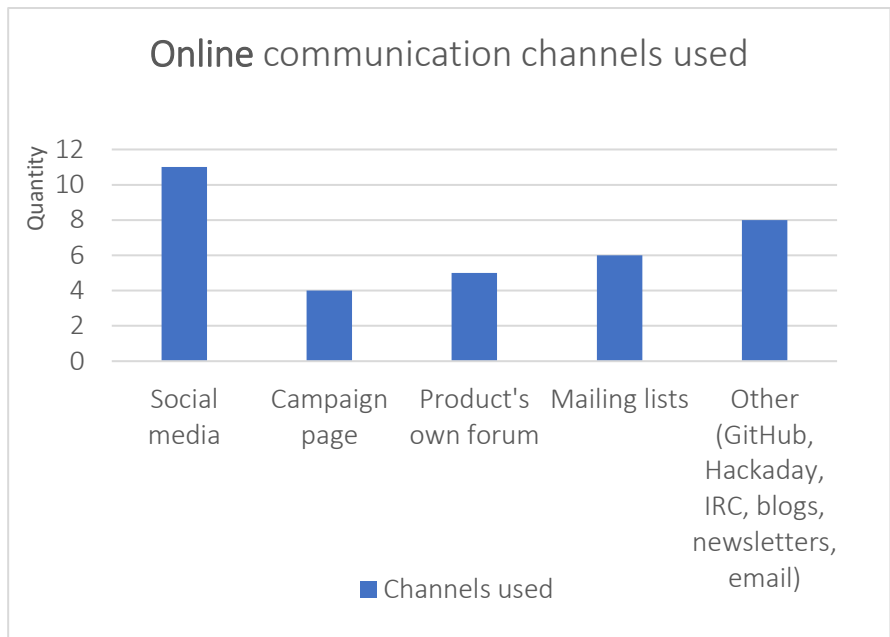
"I think it's very hard to separate my professional role at Bare Conductive from my personal role in those communities, but yes definitely [I have a relationship with them]. I certainly have a lot of friends in that." – Matt, The Touch Board

Other campaign organizers and teams, consisted of people who had previously both worked in technological companies. The team members from Kano, had previously worked in companies with more closed sourced products like Broadcom and open source like Red Hat, that has an extensive open source community.

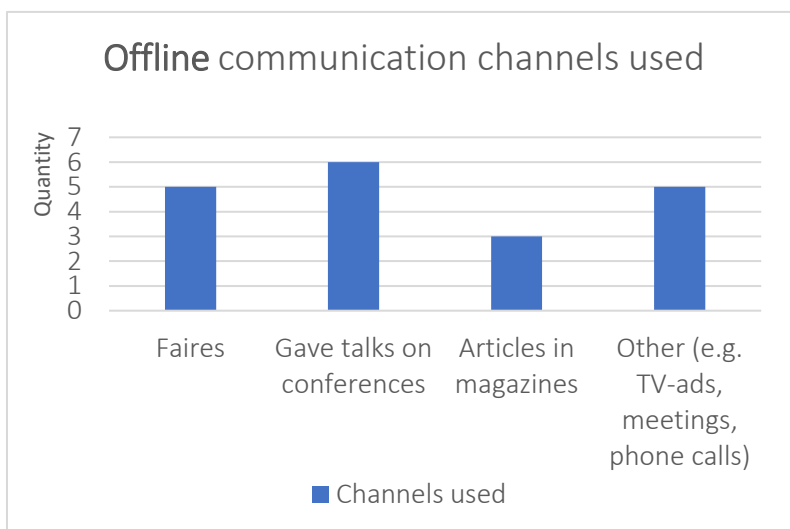
6.4 Engagement and Communication with the Communities

At least eight of the products targeted the Maker community. However, one of the organizers found it hard to involve this community, because non-popular products were easily disregarded. Big names like Arduino and Raspberry Pi had attracted more Makers. Other reasons for finding it difficult to attract the Maker community, was because their products were considered expensive.

It might not come as a surprise that online communication channels were used for all 13 products, considering that the campaign platforms were virtual. The most popular communication channel was social media where Twitter and Facebook took the lead. It was common among some of the participants to have separate channels for communicating with their members, depending on how technical or non-technical they were. Less technical information, news and “hacks” about



Mooltipass were mainly posted on social media, while more technical discussions, news and details were limited to Google groups, IRC, Hackaday and a newsletter. Matt also shared that they had two different newsletters; one that was sent to everyone and was mainly targeting the less technical people, and one that was for their “professional” crowd.



Offline channels were also very popular channels to spread the word through and engage the targeted crowds. 12 participants used offline channels. Six of them had given one or several talks on conferences and five had taken part in Maker Faires. Damien, for example, had given talks on Python and Raspberry Pi conferences as well as at Maker Days and universities during “engineering days”. For some, one channel seemed more important than the other.

“For example, for the ESLOV-project we also let the people try the modules during the Maker Faire in Rome last October. We had a lot of good feedback, so we are encouraged to continue. That’s why when you see the people interacting with your software face-to-face, it’s really important.” – Andrea, ESLOV

Gordon had eventually started setting up a stall during the fairs, but he experienced a different outcome than the one Andrea depicted. The Maker Faires did not show as much interest as Gordon thought because many children would end up playing with the boards while his actual target group would be too distracted to pay attention to his product. Conferences seemed to be a better choice for him, where people with more free time, interest and focus would attend. The chances to start discussions with them during conferences were higher and more intense. He liked the whole idea of meeting someone who is using his product.

However, even if offline communication channels seemed popular, due to the good relationships it could lead to, essentially many of the participants agreed that offline channels were very time consuming and might not even be worth spending time on, specifically during a crowdfunding campaign, which usually lasts about a month.

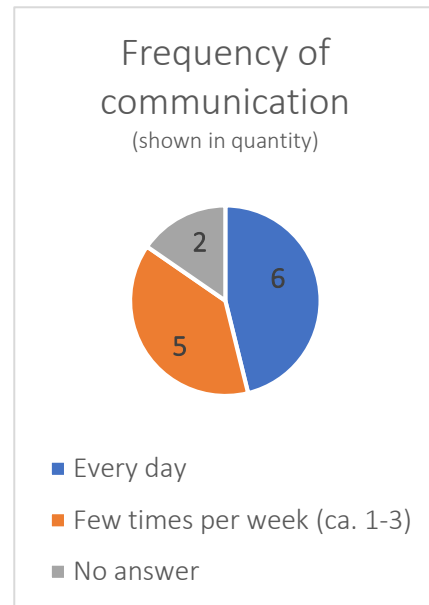
6.4.1 Communication Frequency

The figure to the right shows that the frequency of communicating with the communities during the campaigns was done mostly every day. Participants who connected this often, explained that the communication during the campaigns was the most important part, considering that it only lasted for 30 days and the time needed to be used wisely.

“If I invite you to my house for a big party and I tell you a week before ‘Wow this is gonna be a crazy party, there’s gonna be music and food, it’s gonna be really fun’... While you are there, I have to be there too. Talk with you and have fun, and it shouldn’t be fake. I should enjoy it cause it’s a party. But as a host, you can’t stop. You have to keep making sure everyone is happy and everything is going well.” – Matt, The Touch Board

Some of the participants connected with the members and target groups a few times per week, mainly due to little questions asked by the members, lack of time or feeling content with the chosen frequency. Mathew said that the deeper into the campaign they got, the more established the business became, with the reality of building a product taking over. Eventually, the harder it was to keep up with their communities. At times, the team behind Kano would go silent.

“And it’s amazing because the community is such an emotive group. They will push at YOU if they are not happy or if you do something that they don’t agree with. They are a phenomenal force. They are a force for change. And that’s also a force for good. They have kicked me in my backside regularly to get things done. And it’s important that we have that there. It reminds us every day that there is a group out there who needs our attention.” – Mathew, Kano



6.4.2 Shared Attitudes and Close Connection

Most participants proved to be nurturers when it came to their communities. The people behind Kano and ESLOV, both saw their communities as family members who constantly needed to be fostered.

“I actually refer to them as our family. I’ve always done that because I feel that every single person that supported us along the way, they gave the kind of belief, the hope, you know, just like a family member would, and they are so...pivotal to our success over the years. Any title but family wouldn’t be suitable.” – Mathew, Kano

When being contacted by community members, Bare Conductive typically tried to have specific people from the team answering specific people from the community, that reflected their mindsets and saw the question or problem from the community member’s perspective. This approach was considered important to facilitate the shared views and attitudes among the members because the community members seemed to think that they were speaking just to them.

Because the majority of the campaign organizers did not tap exclusively into the open source crowd, they managed to gather a diverse set of people in their communities. Damien explained how the discussions in the MicroPython community is getting broader in the sense that younger people and beginners with wider interests, hopped on board.

Feeling like they were linked to their communities, was another aspect that was typically shared by the participants.

“I was in Tokyo last year, and I visited some Maker spaces and FabLabs and when I said that I was working for Arduino, people were saying ‘Can I show you one thing?? Look at this file. [...] This is my name!’. They are very happy to contribute. It’s very nice!” – Andrea, ESLOV

Most participants were active on different forums and platforms and visited different events, just like Andrea from Arduino, which helped to keep them contemporary. Facilitating discussions in forms of ideas and feedback is a common trait among them.

The campaign organizers tend to involve themselves in their communities in typically four ways: by listening to the communities, asking questions, answering questions and supporting the members. The importance of *listening* to the community was best explained by Andrea (ESLOV). A community does not always ask for improvements or changes. Therefore, they had the task to monitor the forum, look for issues, listen to what people said about the various aspects (project, product, board or software) of the project. In the same sense, *asking* the community what they would want to see in the product or how what turn the company/future products should take, *answering* questions about the product and campaign or *giving support* when needed, was a given fact by most of them. Mathieu expressed that open source product creators possibly are more attentive and open to suggestions that are given on the product, due to the open mindset surrounding the open source ethics.

Many times, this communication mentioned, was a two-way street with a give-and-take concept, where the community members sometimes, in exchange, offered help to the product creators.

“Some of them have contributed code, some of them have contributed hardware and ideas. Some of them are very active in their contributions, and active on the forum, helping newcomers, answering questions. Others just come along to see what it’s about, asking a few questions.” – Damien, MicroPython

Lastly, a few of the members mentioned that the concept of *goodwill* and being *nice* become a dominant factor at times. In Gordon’s case, he had a community member running his own software, for weeks on Espruino, telling Gordon how Espruino could break in unexpected ways. This type of goodwill was highly appreciated by the participants. However, it also makes them reliant on community members being nice, which is not a stable business strategy. Campaign organizers need to be *nice* in return, especially when users show up at their door asking for help. Ideally, a couple of the participants added, would be if the community was self-sufficient.

“A community is much like a garden. Fertile soil, plenty of water, plenty of attention and you know, sometimes, as well, it’s a bit of luck. It’s good weather. But you get out of a community as much as you put in. And only by being incredibly active and giving a community the tools and the resources they need to become engaged, that is the only way that you can not only build a bigger community but build a more powerful community. One that can really empower themselves.” – Mathew, Kano

6.5 Open Source Contribution to the Campaign

Most of the products were marketed as open source, but the element was not used as a primary statement. Instead, they tapped into information about the products, such as facts, need and usage purpose. Because ESLOV belongs to Arduino, the known open source company, there was no need to

further stress that ESLOV was open source, Andrea explained. Arduino is in other words considered to be synonymous with open source.

In some cases of advertisement, the open source factor did not have a major influence on the promotion. Such was the opinion of at least four of the participants. Two of them specifically pointed out that the impact of marketing the products as open source depended on the target groups. In Kano's case, there was a different experience with mainstream media, which did not fully comprehend what open source was. Mathieu added that open source was at times even seen as unprofessional or "too hobbyist". Internally among the members in Kano's community, the impact of open source made a difference within the translator's community, because they were excited about collaborating with each other. Their costumers however, did not know of open source. Instead, they decided to make people join them, try their product and learn it. When leaving, they could possibly leave with a better understanding of what their product and open source is. Informing, encouraging and teaching the non-technical crowd about open source was a common trait among the participants.

Lastly, what the answers pointed to, was that most of them worked to give the community *credit* and carefully show *respect* by avoiding depicting themselves as too business oriented. The appreciation of a product and creator was then believed to grow among the community members, rather than leading to discouragement.

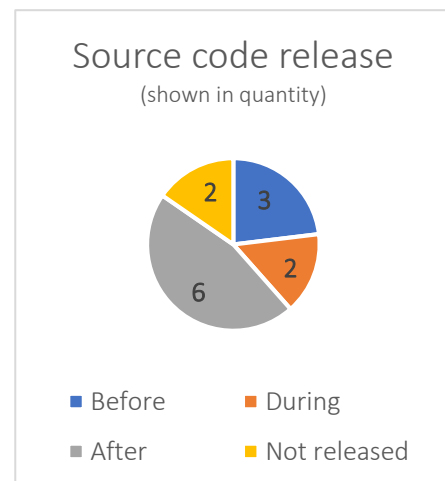
"Because it's essentially just me doing it and I'm obviously not a big business cashing on other people, I think people feel a bit happier about it and a bit more willing maybe because they feel like they are contributing to an open thing." – Gordon, Espruino

"We thought about that we don't want people to think that we are befitting from a community that does things for free. [...] So, we wanted to make sure that the community always felt like we were being fair. [...] To me, open source communities are all about credit. It's just about giving credit. [...] And I think that's what keeps people happy." – Matt, The Touch Board

6.5.1 The Code Release and Feedback Given

The pie-chart to the right shows when the source code of the products was released.

The popularity of sharing the code until after the campaign was clear. Most source codes were released after the campaign, mainly because the campaign organizers wanted to ensure it was a final product with as few bugs as possible (ideally none) and because they could avoid being beaten to the market. At least two of the participants had shared snapshots of the source code during the campaigns, only to keep the community members interested and engage them into contributing.



The ones that released the code before the campaign, were mainly creators that had not at the time fully conceived the large public interest in their product. They were on the lookout for expertise and feedback on it. On the other hand, the code that was not released at all was because the campaign was either canceled or the product had not reached the final stage yet.

However, regardless if the code was released or not, the products were still not a one-man-project. Feedback was still given by the communities on the aesthetics of the product, which was the case of RaceYa. Some children got to put prototypes into testing on the playground and indirectly shared their thoughts on it, e.g. "This is dumb", "This broke!" or "Wow, I had no idea it could do that!". Changes

to features on Mooltipass, depended on approximately 40% of member suggestions, according to Mathieu. Testing and receiving feedback was also a way of getting publicity if the product proved to be good. Additionally, it seemed to unburden the work of the campaign organizers, since community members were helping them to push the limits of their products, out of passion and usually for free.

Apart from new features desired, other feedback that was given to the various products were typically usability feedback, code issues and bug reports. Only two of the participants experienced that they barely got any feedback. Lauri shared that in their case, it could be because their members simply did not pay so much close attention to the RuuviTag-code.

The value of giving *credit* also surfaced during discussions about community contributions. At the same time, being open source also means that more people will be able to feedback many parts of the product. Once again, the importance of *listening*, in this case to the community member's feedback is highlighted. Feedback comes in various forms. Therefore, sorting through the feedback is an important and yet, time-consuming task according to the campaign organizers. Some feedback consists of valid suggestions or constructive criticism, while other feedback is purely negative or questionable about the work done around the product.

7 Discussion

The patterns that surfaced through the results, will here be discussed and correlated wherever applicable with the related literature. Section 7.1 will aim to answer the first research question by summarizing the advantages and disadvantages of crowdfunding open source products. It also mentions the campaign organizer's business perspectives and goals. 7.2 and 7.3 will be defining the second and third research question by explaining what kind of involvement the campaign organizers had with the communities and what the engagement looked like. Finally, conclusions will be presented and advice for further research will be shared.

7.1 Characteristics

To begin with, the motivation behind organizing a campaign of an open source product can be split into four categories. The first revolves around creating inspiration and facilitating innovation through the released source, in exchange for getting help to improve the products. This was also seen in the elements of *open communication and shared improvements* that constitute the techno-meritocratic culture portrayed by Castells (2002:50-51) in section 3.2.1. Next, organizers perceived the crowdfunding campaigns as the means to popularize their open source product, by broadening the awareness and interest around it as well as its surrounding technical domain. The third perspective that was encountered during this research was that hobbyists (e.g. Makers) often desire or expect products to be open source. Finally, some saw opening their product as a gesture of gratitude for the help they had received from the open source community to develop it. This sense of altruism and identification is also encountered in some of the previous studies mentioned in section 2.7, such as the findings of Hars and Ou (2001:25, 34-35). Additionally, it is relevant to findings by Lakhani and Wolf (2003:2) which show how motivations for joining an open source project is connected to personal needs, intellectual stimulation and the will to improve programming skills.

Next is the perception that using a bottom-up approach, such as crowdfunding, makes the campaign appear less profit oriented. Due to the open source nature of the products, the campaign organizers feel like they get more publicity amongst hobbyists and enthusiasts. Releasing the code makes it easier to reach the crowd and inspires generosity, goodwill and altruistic feelings which translate into financial support for the campaign. Interestingly, keeping supporters in suspense was one of the proposed explanations behind not releasing the source before the campaign. This verifies the work by Krishnamurthy (2003:14-15) in regard to the open source nature being a marketing tool.

Furthermore, for the participants, crowdfunding campaigns often appeared to be the only viable option for commercializing an open source product. One of the reasons is that customers who can provide most revenue, such as businesses and public institutions, will not normally take the risk to purchase or pre-order an unfinished product. Secondly, many investors either do not take open source seriously, seeing the product as "less professional" or worse, see open source as a threat. From their perspective, a competitor can utilize the existing source to beat the original developers to the market. Lastly, if a community has already been formulated around a project, crowdfunding it is a relatively secure way to gather resources, as it is likely for the community to support it financially. This relates to the research of Gerber, Hui and Kou (2012:1), who argue about the extrinsic motivation that campaign organizers had in the pursue to secure funding.

Open source, being a factor that facilitates the formulation of communities, appears to be integrated well with crowdfunding campaigns. During the interviews, an organizer mentioned the importance of the early community members who, with their ideas and discussions, helped to boost the

crowdfunding campaign, especially in the beginning. This importance is in pair with the observations by Lu, Xie, Kong and Lu (2014:1) on the relation between the outcome of a campaign and early promotional activities. Moreover, the positive effects of the open source nature, are also prevalent after the campaign when the supporters get their hands on the product and start to engage or contribute to it in diverse ways.

Having a product open can also pose the risk of getting cloned and beaten to the market as already mentioned. This would increase competition and minimize the profits. To tackle this, some of the interviewees did not release the source until the end of the campaign. What is more, a proposal on mitigating this risk involved keeping parts of the product closed, such as the hardware. On the other hand, others were not as negative when it comes to cloning. They either embraced it as inevitable and a sign of success or viewed it as a non-threat since the existence of a dedicated community around the product would allow it to be financially viable.

Additionally, it is usually expected for a crowdfunding campaign of an open source product not to offer just software. Particularly, the hobbyists who typically support these campaigns anticipate software to be not only open but free as well. More importantly, it became evident that they prefer to pay for hardware or services around the software, rather than just the software itself. This can be interpreted by the fact that the source of the software, once acquired, can be easily transformed into a functional artifact. This is not the case with hardware which needs to be fabricated, the necessary components to be acquired at a retail price and assembled. Equivalently, additional software services (e.g. cloud storage or servers) are also hard or costly to set up by individual users, therefore they would be eager to purchase them. To phrase the above simply, there is a tendency to support campaigns which offer product and possibly services, that someone would have to pay for anyway or require advanced knowledge to materialize.

Most organizers had no other goal than to test the product on the market and verify the interest. A proper business perspective surfaced along the way. Their goal of crowdfunding became eventually to establish a line of products, reach out to a big market and to grow a business. For two of the participants, a business perspective was never formed. Their idea remained testing the product on the market. If proven to be overlooked, it would lead to valuable feedback, while on the contrary, if proven to be highly coveted, it would lead to the creation of a business. Ultimately, was considered a win-win situation.

Surprisingly, the participants showed no awareness of specific open source business models. That being said, the model they mainly identified themselves with was that of the *support seller* (Raymond, 2001:136). The interviewees aligned themselves with the specific model on the grounds of the support that they and their communities offer to each other. In this instance, support is given for free. However, we can perceive the hardware, that typically accompanies the software, as *packaging* that is *shipped* to the campaign backers. Therefore, the combination of packaging, distribution and branding feasibly places these cases under the *support seller* business model.

7.2 Description of the Relationship

To begin with, it was revealed that five communities around the product had emerged before the campaign and two communities after, while for six of the products, a community was never created. Communication was instead made through social media or other communication forms. The reason for not creating a community seemed to lean towards the fact that not enough effort was made to create a one.

When looking at the communities that were created before launch, such as websites and blogs, a few of them were initially created for personal use where technological news and projects were shared. The personal involvement in open source communities prior to the campaigns, concerned nearly half of the organizers. Their contributions encompassed answering questions, publishing source codes, making modifications to some extent and sharing content. Apart from using their own websites and blogs, others were involved in forums like Arduino and Raspberry Pi. It was also common to see that several of the campaign organizers and their team members had careers within technological companies which sprung interest and introduced them to the open source communities.

Observing the engagement with the community, it emerged that the Makers were the main target group. Online and offline communication channels were utilized in correlation with each other to communicate with the target group and the communities. The most popular online communication channels used by the majority, were Twitter and Facebook, while the second most favorable standalone communication channel was mailing list. Commonly, some of the organizers used separate channels, based on the level of technological knowledge among people. Surprisingly, all but one organizer used offline communication. The most used channels were talks on conferences and participation in Maker Faires. Even though many engaged FtF with their target group and community members, some participants also stressed how these types of activities are time-consuming and ultimately not considered to be worth exhibiting during a campaign. Ultimately, the frequency of engaging with their community and target group, was essentially daily for half of the participants, because it is said to be the most important part of the campaign. The other half felt either content with the frequency of communicating a few times per week or experienced a lack of time.

Lastly, their involvement with their communities can be described through mutual communication and a close connection, that of which involves shared attitudes, reciprocity, selflessness and a sense of goodwill. Many organizers are emotionally involved with the communities, seeing them as family members rather than consumers and sensing a bond to them regardless of where they geographically originate from. Four main elements surfaced, that illustrate the organizer's involvement: listening, asking, answering and giving support to their communities. Selflessness to support the communities, help to engage them and being generally nice to them was commonly mentioned. Conversely, the organizers signified that the community members often offer the same kind of attitudes and gestures in return. These attitudes and gestures include contributing or modifying code, testing products and supporting newcomers. This community goodwill can be tied to the study of Brabham (2010:1139) that explains how members are enthusiastic and committed to the same cause as the organizers, recognizing themselves as more than just costumers. Once again, correlations with the technocratic culture can be made. Indeed, the value of the project is highest in the community and the enjoyment of higher influence in decision-making seems apparent among the members (Castells, 2002:49-51). Ultimately, the hacker values presented by Raymond (2003), such as reciprocity and altruism, seems to be a mutual and strong factor.

7.3 Community Impact

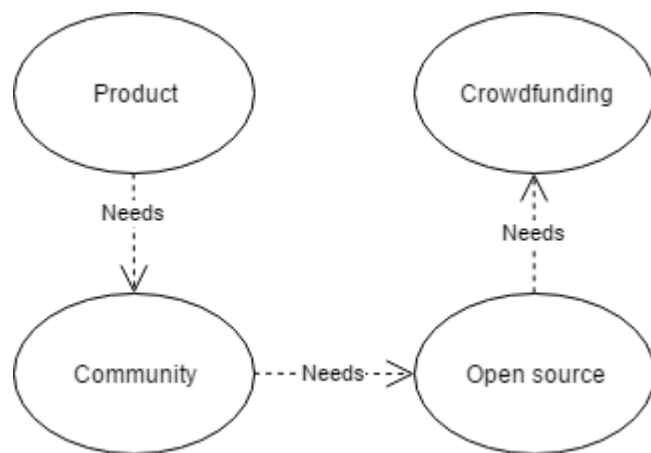
To evaluate the impact, I examine the effect of the community on the following sectors: a) the promotion of the campaign, b) the received contributions and feedback and c) the business aspects of the campaign.

As discussed previously, communities can catalyze the reach of a campaign and boost the marketing efforts. A noteworthy factor regarding the promotion of the products was that the majority did not have open source as their primary marketing point. They preferred to focus more on facts, need and usage. Therefore, it does not come as a surprise that some of the interviewees claimed that the open

source factor posed no major effect on their publicity. Furthermore, two of them pointed out that open source had a varying impact. According to them, mainstream media proved to be unfamiliar with the field or regarded it as unprofessional. On the contrary, the hobbyist community valued open source. Thus, despite open source not being the primary statement during the promotion, it did eventually become relevant since organizers had to be careful not to depict themselves as “too business oriented”. This was to avoid Makers feeling exploited and in accordance with Dahlander and Magnusson (2006:127). A company’s intentions to create revenue can potentially come into conflict with the open source communities’ norms and values that concern acceptable behaviors, therefore great attention should be paid to keep the two entities aligned.

Next, in most occasions software was released after the campaign, therefore limiting the interaction with the community to questions regarding the functionality and feature requests. The most significant reasons behind this were to ensure a final bug-free product and avoid being beaten to the market. In the case of products that had released the source before the beginning of the campaign, all but two received a large amount of contribution. It typically consisted of features, usability remarks, code issues and bug reports. Furthermore, a point that was often stressed out, was the importance of *listening* to feedback. Feedback would come in forms of suggestions, constructive criticism and in some cases negative and questionable comments about the work done around the product. Sorting through it could be time-consuming, but still proved to be vital for a healthy relationship with the community members as well as for the progress of the product.

Nearly half of the campaign organizers aimed to create a line of products utilizing the crowdfunding campaign as the basis for this initiative. The existence of a vibrant and active community that offers feedback, develops and raises awareness can be viewed as fundamental for a long and successful line of products. Additionally, most of the products that were involved in this research targeted specific niches which hold open source in high esteem. These target groups expect parts of the product to be open and therefore this translates into going down the open source path, business-wise. Moreover, crowdfunding is often regarded as the only viable option to finance an open source product. Combining these two points, one can see that the impact of the community is not only the deciding factor behind the product being open source but also behind selecting crowdfunding as the means to commercialize it.



7.4 Conclusion

Open source and crowdfunding seem to have some common pillars. These include the communities and a sense of freedom. In the case of the former, software and hardware are being developed by like-minded individuals who often share common goals, values and ideals. Everyone is free to copy, change and sell the source, while individuals who choose to disagree with the direction a project is going, are allowed to “fork” it, i.e. change its course. This open and democratized process can be parallelized with crowdfunding. Unlike lobbying behind closed doors to convince high-profile investors, modern entrepreneurs appeal directly to the consumers and engage with like-minded communities in order to bring a product into production. That being said, it comes to no surprise that modern entrepreneurs utilize the combination of open source and crowdfunding. Despite considerable

amounts of money being invested in such campaigns involving open source products, research on the subject has been scarce, to say the least. This study attempted to fill that gap, by combining empirical data with previous literature, to shed light on the relationship between communities and crowdfunding campaigns with open source products.

The first question that might come to mind when contemplating about open source products being crowdfunded, is why would someone accept the risk of investing in a product that has not been mass-produced, tested or completed yet. This, considering that at some point in time the source will be released and therefore it will be possible to build themselves. After discussing with various campaign organizers, it became evident that what backers are usually willing to pay for, is products with hardware elements that are hard to reproduce individually and incorporate open source software. This type of software is preferred by Makers and Hackers. The open source nature of the product as well as the potential of a developer community around it, guarantee, to an extent, that it will keep evolving, users will be supported and more related products are to follow.

Communities are generally perceived to play an important role in crowdfunding campaigns. The majority of a product's revenue throughout its life-cycle potentially comes from high-profile customers, such as public institutions and businesses. However, the dedicated community behind the product is the stepping stone into commercialization. This importance becomes even more prevailing when open source is involved, as communities are one of the determining factors behind the success or demise of an open source project. Campaign organizers repeatedly emphasized the need to engage as often as possible with the community and place themselves among their customers to increase the sense of belongingness. Avoiding appearing as business-oriented outsiders, who just want to sell a product to the community, is of great significance.

Additionally, it was discovered that launching a product that targets communities which are accustomed to open source, paves the way for the product itself becoming open source and eventually acquiring resources through a crowdfunding campaign. This signifies the magnitude of influence that certain communities have on products. To take the study of this topic forward, I suggest more research be done on the matter, to verify these results. Specifically, investigate whether the perspective of crowdfunding campaign organizers that was illustrated here, is at par with that of the backers.

Acknowledgment

The process of writing a thesis is a rollercoaster when one day you find yourself inspired with lots of energy, and the next moment you struggle.

In this section, I would like to thank all the kindly-hearted people who agreed to participate and contribute to my thesis. The time you spent on being interviewed is preciously appreciated and I wish you all the best of luck with your businesses.

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Attachment 1

The screenshot shows the GitHub profile page for Linus Torvalds. At the top, there are navigation links for Features, Business, Explore, and Pricing, along with a search bar and 'Sign in or Sign up' buttons. The profile header includes a profile picture, the name 'Linus Torvalds', and the username 'torvalds'. Below this, it lists 'Block or report user', 'Linux Foundation', and 'Portland, OR'. The 'Organizations' section shows the Linux Foundation logo. The main content area is titled 'Popular repositories' and lists four repositories: 'linux' (Linux kernel source tree, 43.7k stars, 16.6k forks), 'test-tlb' (Stupid memory latency and TLB tester, 62 stars, 10 forks), 'subsurface-for-dirk' (Forked from Subsurface-divelog/subsurface, Do not use - the real upstream is Subsurface-divelog/subsurface, 27 stars, 10 forks), and 'libdc-for-dirk' (Forked from Subsurface-divelog/libdc, Only use for syncing with Dirk, don't use for anything else, 13 stars, 8 forks). At the bottom, it shows '2,240 contributions in the last year' with a monthly breakdown from April to March.

Figure 1 Example of profile page in GitHub.
SOURCE: github.com/torvalds

The screenshot shows the GitHub repository page for 'torvalds / linux'. At the top, there are navigation links for Features, Business, Explore, and Pricing, along with a search bar and 'Sign in or Sign up' buttons. The repository header shows 'torvalds / linux' and statistics: 5,412 Watch, 43,698 Star, and 16,614 Fork. Below this, there are tabs for Code, Pull requests (138), Projects (0), Pulse, and Graphs. The main content area is titled 'Linux kernel source tree' and shows statistics: 663,064 commits, 1 branch, 505 releases, and GPL-2.0 license. Below this, there are buttons for 'Branch: master', 'New pull request', 'Find file', and 'Clone or download'. The repository content is a list of folders and their latest commit information:

| Folder | Latest commit | Time ago |
|---------------|--|----------|
| Documentation | Merge branch 'akpm' (patches from Andrew) | 5 days |
| arch | Merge tag 'nios2-v4.11-fix' of git://git.kernel.org/pub/scm/linux/ker... | 2 days |
| block | blk-mq: include errors in did_work calculation | 13 days |
| certs | certs: Add a secondary system keyring that can be added to dynamically | a year |
| crypto | Merge branch 'linus' of git://git.kernel.org/pub/scm/linux/kernel/git... | 6 days |
| drivers | Merge git://git.kernel.org/pub/scm/linux/kernel/git/davem/net | 14 hours |
| firmware | WHENCE: use https://linuxtv.org for LinuxTV URLs | a year |

Figure 2 Example of project folders in GitHub.
SOURCE: github.com/torvalds/linux



Figure 3 The Linux magazine "Linux user & developer"

Attachment 2 – First version of the interview guide

1. Can you please briefly describe the crowdfunding campaign you were involved in?
 - a. Product
 - b. Outcome
 - c. Interesting facts
2. What was your role in the campaign?
3. Which parts of the product were OS?
4. What were the reasons that led you to adopt OS?
Contribute back to the community, marketing/publicity, derivative of a GPL product, creating a platform for others to build their business cases upon etc.
5. Were there any reasons against adopting OS?
 - a. If YES: What were they?
6. Were there advantages in crowdfunding a product that was OS?
 - a. If YES: What were they?
7. Were there disadvantages in crowdfunding a product that was OS?
 - a. If YES: What were they?
8. What was the goal of your campaign from a business perspective?
Presale and promote a specific product, establish a line of products, start a company that is engaged in a relevant domain etc.
9. Which of the following business model do you believe you relate the most to?
 1. “support seller” where you give the code for free, but build a whole business around the product
 2. “loss leader” where you use an OS product only for marketing purposes to attract potential clients and users, then selling the ‘real’ product, or other products from your company
 3. “brand licensing” where you share the code, but sell your brand to companies
10. Which communities were targeted in your campaign? Makers, Linux, Arduino etc.
11. Were you involved in any open source community prior to the campaign?
 - a. If YES: For how long?
 - i. Can you give examples of which communities and what kind of contributions you made?
12. How were the communities engaged?
 - a. How did you communicate with them?
Campaign comments, forum posts, Facebook, newsletter, mailing lists, articles, video tutorials etc.
 - b. Did you use any offline communication channels?
Maker Faires, conferences, exhibitions etc.
13. Do you think that the OS elements helped to engage the community?
 - a. If YES: How?
14. Was a specific community created around your product and did you initially intend for one to be created?
15. How did the OS elements of the product affect its promotion?
Did you stress out how it benefits the community, advertise yourselves as members and contributors of the community, appeal to logic or emotion, point out that you were altruistic etc.
16. Did you release the source of your product before the end of the campaign?
 - a. If YES - What kind of feedback did you receive on the source, if any?
 - b. If NO - What were the reasons of not releasing the source before the end of the campaign?
17. Did you make changes to the product or the campaign, based on the community feedback?
 - a. If YES, can you give some examples?

Attachment 3 – Final version of the interview guide

1. How and when was the product idea formed?
2. What made you decide to have a crowdfunding campaign?
3. Can you please briefly describe the crowdfunding campaign you were involved in?
 - a. Product
 - b. Collaborators/partners
 - c. Outcome
 - d. Interesting facts
4. What was your role in the campaign?
5. Which parts of the product were OS?
6. What were the reasons that led you to adopt OS? Contribute back to the community, marketing/publicity, derivative of a GPL product, creating a platform for others to build their business cases upon etc.
7. Were there any reasons against adopting OS?
 - a. If YES: What were they?
8. Were there advantages in crowdfunding a product that was OS?
 - a. If YES: What were they?
9. Were there disadvantages in crowdfunding a product that was OS?
 - a. If YES: What were they?
10. What was the goal of your campaign from a business perspective? Presale and promote a specific product, establish a line of products, start a company that is engaged in a relevant domain etc.
11. Which of the following business model do you believe you relate the most to?
 - a. “support seller” where you give the code for free, but build a whole business around the product
 - b. “loss leader” where you use an OS product only for marketing purposes to attract potential clients and users, then selling the ‘real’ product, or other products from your company
 - c. “brand licensing” where you share the code, but sell your brand to companies
12. Did you target any communities (OS and non-OS), and if so, which communities were targeted in your campaign? Makers, Linux, Arduino etc.
13. Were you yourself involved in any open source community prior to the campaign?
 - a. If YES: For how long and can you give examples of which communities including what kind of contributions you made?
14. Was a specific community created around your product and did you initially intend for one to be created?
15. What communication channels did you use to communicate with the communities that were involved in your campaign? Campaign comments, forum posts, Facebook, newsletter, mailing lists, articles, video tutorials etc.
 - a. Did you use any offline communication channels? Maker Faires, conferences, exhibitions etc.
16. How would you describe your relationship to the communities and its members?
 - a. Do you perceive the members to be likeminded? Do you feel like you/they share attitudes?
 - b. How did the communication with them look like? Did you go to them for advice? Did they come to you for advice about the product? Did you collaborate? Did you use communities to learn of news and update yourselves about the field your product belongs to? Did you try to build a relationship with them (for loyalty, commitment and trust)? Did you simply market yourselves to gather backers?
17. Do you think that the OS elements helped to engage the community?
 - a. If YES: How?
18. How often would you say that you connected with the communities during the campaign? Informing, marketing, giving support etc.
19. How did the OS elements of the product affect its promotion? Did you stress out how it benefits the community, advertise yourselves as members and contributors of the community, appeal to logic or emotion, point out that you were altruistic etc.
20. Did you release the source of your product before the end of the campaign?
 - a. If YES - What kind of feedback did you receive on the source, if any
 - b. If NO - What were the reasons of not releasing the source before the end of the campaign?
 - c. Did you make changes to the product or the campaign, based on the community feedback? Give some examples.

Appendix A

The participants and their products

- RuuviTag:** A sensor beacon that can be placed on objects and be used for various purposes, such as for finding a lost object, measuring G-forces on a motorbike, working as a bicycle alarm system or a sauna thermometer. Participant: Lauri.
- Espruino:** A small computer made simple, preinstalled with software that can be used to control things when programming it, for example to change color and animation of Christmas lights. *Espruino Pico* is an even smaller computer, in USB-form, with a long-lasting battery that can work on its own, e.g. as a remote control for a helicopter toy or can be embedded in larger projects to add intelligence to projects. *Puck.js* is based on the same principles of the two previous products, but works wirelessly and can e.g. notify when the fish need feeding again or control TV and smartphone by turning it on/off or playing music. Participant: Gordon.
- The Touch Board:** Works as a complement to one of Bare Conductive's previous closed-sourced products, an electrically conductive paint. The circuit board provides a stable and easy-to-use platform for the paint which can ultimately lead to projects like a stereo made from cardboard, a table as drums, or a wall to working as a sensor where children can learn the alphabet. Participant: Matt.
- MicroPython:** A small electronic circuit board which runs the programming language Python and is connected to a small computer. It can be used to make LED-lights blink, make motors move and electronic devices to play sounds. *MicroPython on the ESP8266* is ultimately an improvement of the original product, allowing it to run smoothly on a different small computer with integrated Wi-Fi called ESP8266 owned by the company Espressif. Participant: Damien.
- snapVCC:** A small portable device, a regulator, that can be attached on a 9V battery. It cuts down the amount of additional circuits needed to plug in electronic devices. Participant: Mahesh.
- USB Armory:** A USB stick computer that works as a tool for testing the security of other devices consisting of virus scanning and data self-destruct mode among other things. Participant: Andrea.
- UDOO:** A small easy-to-use computer with functionalities taken from Arduino and Raspberry Pi. This computer can smoothly run Arduino and Linux software. *UDOO neo* is an updated version of UDOO with added sensors, Wi-Fi and Bluetooth-connectivity. *UDOO X86* differs slightly from the others in the way that it is a combination of a PC and an Arduino. As an example, it can run all PC-software, including gaming or video streaming like Netflix. Participant: Andrea.
- ESLOV:** A plug-and-play toolkit that enables the building of gadgets, even for beginners through Arduino's own software. It can e.g. help create a fire-alarm for the house,

work as a monitor for parents to keep track on their children or a washing machine notifier. Participant: Andrea.

Kano: A computer that children, as well as grown-ups can build themselves. It then allows you to play videos, play Snake, Pong, Minecraft and music. They encourage children to learn more about Science, Technology, Engineering and Math (STEM). *The camera, speaker and pixel kit* works as an addition to the computer to e.g. help learn how to make a camera and code photo filters, build a lightning board with the pixels and make an instrument with the speaker. Participant: Mathew.

Paperino: A small sized e-reader with an accelerometer that includes a tap sensor which can trigger screen updates. Changing font and size of text are few of its features. Participant: Robert.

Mooltipass: A simple-to-use offline password keeper. It can store website credentials or logins and passwords for computers for example. *Mooltipass mini* is a smaller and developed version of the original product. Participant: Mathieu.

LimiFrog: An Internet-of-Things-oriented development platform. In a small factor and user-friendly manner, it offers connectivity via Bluetooth and capabilities to interpret its environment and movement via a large number of embedded sensors. Participant: Xavier.

RaceYa: A radio-controlled race car to teach children about STEM through active play. It is based on a programmable Arduino circuit board that allows the car to be modified. Participant: Abigail.