School of Computing
Blekinge Institute of Technology

How do intrinsic and extrinsic motivation correlate with each other in open source software development?

Are paid and unpaid contributors affecting each other's motivations and is intrinsic motivation more desirable than extrinsic motivation in the open source context?

Kim Hartman

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School of Computing
Blekinge Institute of Technology
SE-371 79 Karlskrona
Sweden

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Contact Information:

Kim Hartman
Härlöv Östregård 3 34292 Alvesta
kim.hartman@concussionwriting.com

University advisors:

Stig Holmberg
Anita Håkansson

School of Computing
Blekinge Institute of Technology
SE-371 41 Karlskrona
Sweden

Internet : www.bth.se/com
Phone : +46 455 38 50 00
Fax : + 46 455 38 50 57

ABSTRACT

Open source is growing outside the boundaries of hackers, amateurs and software development, creating a humongous potential in many different areas and aspects of society. The intrinsic and extrinsic motivations that drive open source have been in the subject of much research recently, but how they affect each other when paid and unpaid contributors come together is still hidden in obscurity. In this study I investigate how intrinsic and extrinsic motivation correlate with each other and how those correlations affect paid and unpaid open source software contributors. The literature synthesis is based on systematic reviews through searches in library databases, identification of articles by searching on the Internet and by reading relevant books. My results indicate that intrinsic and extrinsic motivations continuously affect each other and that paid contributors are more vulnerable since their extrinsic motivation in terms of money is reached only when many other motivations are fulfilled. The paid contributor's lower autonomy may result in a decrease in intrinsic motivation while social interaction may result in an increase of the same. The unpaid contributors are more likely to be intrinsically motivated than the paid contributors, resulting in higher psychological satisfaction, less stress, creativity and input of higher work effort among unpaid contributors .

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Keywords: Intrinsic motivation in open source, Extrinsic motivation in open source, Open source motivation

EXECUTIVE SUMMARY

[This paper suggests that the intrinsic motivation that amateurs hold is most efficient when developing open source software, although extrinsic motivation may be a strong factor for participation. Another contribution of this paper is the indication of how paid contributors' motivation may turn intrinsic when working with unpaid contributors. Intrinsic and extrinsic motivation are affecting each other all the time, making a holistic approach necessary in order to grasp the reality]

CONTENTS

1 INTRODUCTION

The alarm clock wakes you up in the crack of the dawn, forces you to drag yourself to work. To many people, the feeling of going to work is like an iron fist in the face. When the clock finally turns 5, the liberation in your heart is synonymous to a prisoner who has been sitting behind bars for a crime that he is not responsible for; you can finally leave the chair that you have been sitting in for the past 8 hours with handcuffs over your wrists, preventing you from living your passion. The jury that has judged the prisoner can correspond to the norms of our society if you were not doing your duty and showed up for work; you would be socially butchered. After work you have a couple of hours left of the day to do what you love before you have to go to bed and prepare yourself for the next workday. Your hobby, the interest that is intrinsic stimulating to you, is subordinated to the social peer pressure from society. Work and hobby have for centuries been mentioned as either or, like if we were talking about Ying and Yang or God and Satan. The world has changed and a new era is striving to leave the inhibitory shell behind and see the light of the day. A whole generation of individuals has grown up with constant access to communication and information which have created a transparency that blurs the distinction between work and leisure. This is especially obvious in open source software development.

The post-war generation was raised in an era of lack where it was honorable to put your time in and serve the higher powers of greater good (Turner et al. 2009). This view often made it impossible to unite your passion with work, and the motives could therefore rarely develop into intrinsic. Turner & Baylor describes the focus of the "boomers" as "feeding the giant machine of consumption" - work transforms into money that people can spend. When status is the same as owning, the society has its population in an iron claw. While human owns physical mass, the society owns them. Plato mentions "Askholia" – slavery (Himanen 2001, pp. 34). As Himanen puts it: *"The evening was the leftover of the day, the weekend the remainder of the week, and the retirement was the leftovers of life"* (Himanen 2001, pp. 29). Programming have for long have been regarded as leisure time activity (Bitzer et al. 2007), but you no longer have to be a hacker in order to develop an open source program. In fact, a survey made by Ghosh shows that half of the developers in his study were paid (Ghosh 2002).

An explosion of creativity and generous behavior has occurred that promotes amateur innovation (Shirky 2010). The digital culture that has arisen has many names. One is Generation Generosity, a subculture who is disgusted by greed and is eager to share, give, create, engage and collaborate in large numbers (Trendwatching 2011). The new generation is community-oriented, gets pleasure of giving instead of taking (Turner et al. (2009) and is characterized by speed, freedom, openness, innovation, mobility, authenticity and playfulness (Tapscott & Williams 2006). Sharing a passion and receiving recognition are the symbols for status (the word "amateur" actually heritages from the Latin word "*to love*" (Pressley pp. 62)). Csikszentmihalyi refers to Deci, who found that when people were giving money for doing things they enjoyed, they lost interest faster than when they were not rewarded (Csikszentmihalyi 1988, pp. 6). Steven Pressley has a more sceptic view of the amateur culture, though. While she describes the conventional interpretation as the amateur doing something for pure love, Pressley mean that amateurs don't love the game enough. If they did, they wouldn't do it as a sideline. Herzberg mean that "*the hobby becomes a substitute for the job in the sense of satisfaction, but the hobby can't give the complete sense of growth, the sense of striving towards a meaningful goal, that can be found in one's life work"* (Herzberg 1999, pp.130).

The heart of this research is those earlier studies, surveys and papers that have been made by the leading researchers in the field. The two psychologists Edward Deci

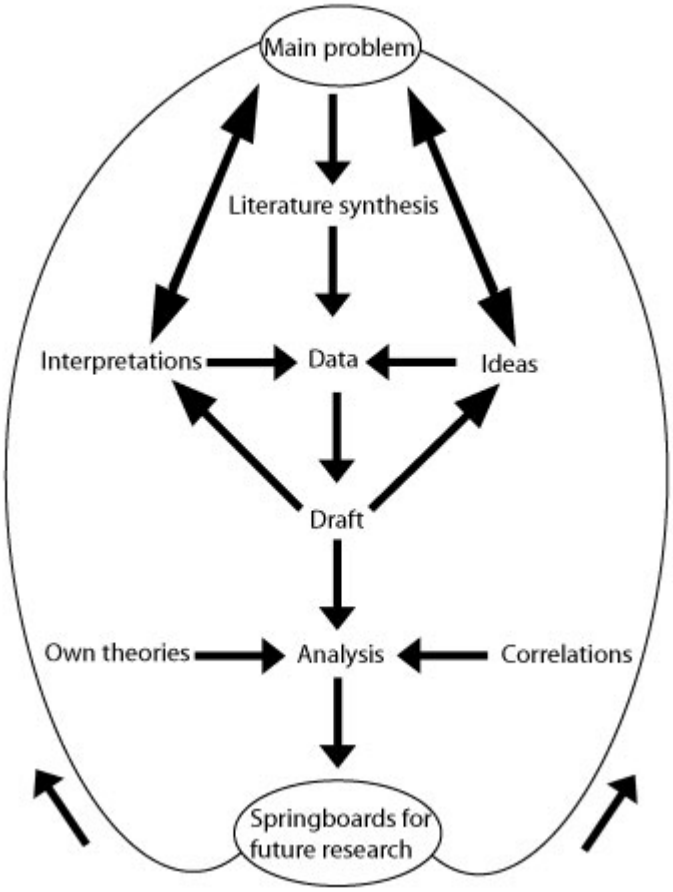
and Richard Ryan's work about intrinsic and extrinsic motivation are the cornerstones of this paper. When collecting data about the hacker culture, Himanen, Mikkonen and Lakhani have been important. Lakhani´s study made for the Boston Consulting Group is referred to throughout the paper. The study of the motivations for participating in open source software development has been extensive. Oreg & Nov, Bonaccorsi & Rossi, Von Hippel & Von Krogh, Krishnamurthy, Lerner & Tirole, Hars & Ou and Bitzer et al. is just a few of those researchers that have tried to clarify why volunteers are contributing to projects even when there are no monetary compensation looming. Other important material have been gathered from Bergquist & Ljungberg on the subject of gift giving, and also from Zeitlyn that have shed light on the art of gift giving from a anthropological point of view. There are however little research when it comes to the effects of intrinsic and extrinsic motivation meeting in the same arena; most earlier research deals with the two motivations separately.

Building upon the pride heritage of these scientists, my purpose of this paper is to investigate how paid and unpaid developers are affecting each other with their presence and how intrinsic and extrinsic motivations are correlating when paid and unpaid contributors meet and work together. Knowing the answer to this would be useful since the open source in fast pace are becoming an accepted way of working generally (not only within software development) and the effectiveness of the proved effective open source method might be affected if paid and unpaid contributors is influencing each other's motivation. I also want to see if the paid contributors intrinsic motivation may be gained when paid and unpaid developers working together, since it is my personal belief that work that is rooted in your heart always will be more qualitative than work done for money. If intrinsic motivations can be increased at those who are extrinsic motivated, it is my theory that both productivity and quality may increase. I will try to find answers to this theory as well.

With this said, I would like to add that it is not my intention to come to any definite conclusions but to present interesting leads for future research. My aim is to pick parts from different areas in my literature synthesis and analyze those pieces individually before I approach them from a holistic point of view. To clarify the purpose of this paper, the theories that I present should be seen as mental springboards rather than a path that leads to a final destination

2 RESEARCH PROCESS

My main problem was decided from a personal brainstorming process focusing on the field of informatics, economics and social studies. Because of my interest in the digital culture and the subjects technical kind, open source motivations were an area that fitted my like a hand in a glove. Although the specific problem has been changed a dozen times, the nature of the problem has always been approximately the same. I early decided to focus on reviewing existing material and try to form theories from that data. I saw a own study too time consuming, and if there were something that I promised myself before writing this paper it was to give it all my heart and soul.



Research process

The literature synthesis has consisted of systematic reviews through searches in library databases, identification of articles by searching on the Internet and reading relevant books. The first search was carried out in February 2011 and continued until the papers completion in the end of May. The databases that have been used are among other Elsevier, Management Science and ACM Digital library. The data that were collected were brought into an early draft, whose content gradually were transmitted to a more structured draft with clear headlines. This draft was created to work as a body and was continuously fed with relevant new data from the perspective of the main problem. In this phase I also changed the main problem slightly since I discovered that my initial research were way too wide.

With the main problem changed, the structure of the body was adjusted and new thoughts and ideas showed. I decided to present the different motivations under the area that they correspond too; either as intrinsic motivation or extrinsic motivation. I

interpreted the material and data that was collected in order to prepare for an analysis. In the analysis I developed own theories and played with different scenarios. By imaging the scenarios mentally before doing and physical work, I saved a lot of time since I pretty fast could calculate which theories that was likely and therefore worth to elaborate on. By using mental and writing brainstorm, I did find possible correlations that also were proved in the literature synthesis. I do not think that I would have seen these correlations without extending my own creative process and adjust it to my own primary weapon; writing.

The aim was from the start to come to several potential outcomes and partial conclusions that can act as a point of departure for further research. I did not plan to collect as much data as I did, and I did not expect to review as many articles and books that I did. To be honest, I got a bit carried away sometimes and dug into paths that were located outside my main road. When looking at the data from my own, researching view, more data is relevant than if an untrained eye look at it. I do however think that my broad perspective and extensive background description will gain those readers who really are interested in finding new paths of investigation, because in my opinion this background is vital in order to find the most interesting clues. Because my aim was to create springboards for future research, I want to look at my broad perspective as something that strengthens this paper; more relevant correlations can be made than when other factors are shielded out from the main subject. In my world, diversity promotes creativity and that explains why I have chosen to treat a rather limited subject from perspectives that at first sight not seem to be motivated to involve. In my view, they are.

Based upon earlier research in the area, I have chosen the motivations reputation, signaling, gift giving and money as extrinsic motivations for participating in open source, while autonomy, the need for competence, play and learning are chosen as intrinsic motivations. There are also two motivations that are extrinsic or intrinsic depending on the situation or whether you ask a psychologist or a biologist. These two motivations are social relatedness & social motivations and ideological & moral motivations. I have chosen not to discuss the most obvious motivation of them all - the need for software. This motivation will only be mentioned briefly.

3 BACKGROUND TO THE OPEN SOURCE PHENOMENON

In this section, my aim is to give an overview of the open source phenomenon and how it connects with the hacker culture and the paid developers. Understanding the target group(s) is vital in order to grasp the forthcoming paragraph that deals with the contributor's motivations. When reading the next paragraph about the contributor's motivations, this paragraph will make it easier to relate to the reasons behind the particular motivations that are presented.

3.1 What is open source?

Deek describes open source development as "a form of distributed, collaborative, asynchronous partly volunteer, software development" (Deek & McHugh 2008).Open source software development is based on a collaborative effort where software is created by a community of volunteers or members of organizations who support the open source software movement (Oreg & Nov 2008) and is characterized by strong identification, global effort and peer leadership (Lakhani et al. 2002). Since an open code permits the flow of feedback from developers and users, it is very useful for improving the software (Bonaccorsi & Rossi 2002). Bergquist and Ljungberg writes that "people share their knowledge and skills, the software they write undergoes peer-review by the owners of the open source software project, and if deemed well enough it is accepted and its contributors gain credit for it" (Bergquist & Ljungberg 2001). The reviews are often of high quality since the reviewer is interested enough to use the software, learning about how it works and attempts to find solutions to the problems they encounter (Von Hippel & Von Krogh 2003).

The open source movement was initially founded by Richard Stallman who started the GPL by releasing parts of codes under a license that allowed anyone to copy, distribute and modify the material as long as the person that modified the software released it under the exact same condition that he had done. By taking copyright on everything that was released under the license GPL, Stallman could prevent code from being closed. The expression "Copyleft" was born (Benkler 2006). Because the participants retain copyright of their contribution, no single participant can take control over the project (Benkler 2006, Osterloh & Rota 2005).This combined license together with licensing constraints is the foundation of the open source ideology. Since it is often the user themselves that are the innovators of open source code, the intellectual losses stemming from sharing intellectual property rights by using an open source license are often low compared to the gains from the expected feedback by other participants (Osterloh & Rota 2005). The respondents in Subramanyam and Xia`s study meant that within a community where code and ideas were donated, a better product for the user would rise and it would also go faster than if an proprietary approach had been used (Subramanyam & Xia 2008).

3.2 Who participate in open source?

There are three types of developers: one in which all developers are unpaid, one in which some are paid and a third in which all are paid (Krishnamurthy 2006). Lakhani et al. identified the participants in open source development as volunteers, IT professionals and Generation X: ers (Lakhani et al. 2002). The typical developer in

Mikkonen et al: s survey was an academically educated young male living in the first world (Mikkonen et al. 2007). The same goes for Deek and McHugh, who describes an open source participant is described as young, male and an IT professional or student. (Deek and McHugh 2008, pp. 162). Bitzer found that the average contributor to open source is young, well educated, enjoys programming and values gift culture type rewards (Bitzer et al. 2007). In Hars & Ou study, 54 % of the contributors were younger than 29 years old (Hars & Ou). One scenario that Mikkonen et al. suggest is that the career of a open source developer starts as a hobby during the student years, and with time and age turns more professional and salary-oriented (Mikkonen et al. 2007). This might, according to Brockmeier be because the students have a lot of free time and few financial obligations (Brockmeier 2010).

3.3 Why participate in open source?

The breakthrough of open source into the mainstream has several explanations. The combination of networks and PC: s have made it easy to arrange collaborations that earlier was carried out on an individually basis. People with complementary talents who otherwise would not have known or met each other, much less found a way to collaborate without much logistical friction, can be brought together to work on a project. (Zittler 2008). The technology have lowered the costs and raised the benefits of producing information and collaborating; open source is more efficient than firms or markets at allocating time and attention for certain tasks and better at attracting a diverse talent pool than individual firms (Tapscott & Williams 2006). Although an open source platform might be used for free, there might be switching costs companies that goes open source. These switching costs can be the cost of learning, installing and maintaining the new operating system, a smaller network of applications than the incumbent proprietary platform, or it might be higher support costs (Economides & Katsamakas 2006). In Lakhani study, 62 % of the paid contributors were in it for work functionality while only 21, 8 % of the volunteer contributors participated for the same reason (Lakhani et al. 2002).

3.4 The hacker culture

In a traditional organization, people work for money and managers while an open source organization is based upon self-motivated volunteers that work for different motives (Tapscott & Williams 2006). The hacker culture has its roots in the academia and early computer groups back in the 1960s. Computer programmers frequently and informally shared code that they had written (“hacked”), quickly recycling and freely modifying code that solved common technical problems (Britannica). The freedom to learn and use and modify software was exercised by informal sharing and co-development of code—often by the physical sharing and exchange of computer tapes and disks upon which the code was recorded (Von Hippel & Von Krogh 2003). Lakhani found that increasing knowledge were the biggest benefit for a hacker and that fun, skill, freedom and need where motivators (Lakhani et al. 2002).

Work can be seen as a compromise for many open source developers and hackers. One example of this is shown in Krishnamurthy’s study from 2006 where one of the respondents describes that “he does work that is as close as possible to his passions to make work tolerable, but he feel most himself when he is doing this open source stuff” (Krishnamurthy 2006). Even though the respondents work might be to do principally the same thing that he does in open source by his own will, it is not the same thing as doing the latter. Linus Torvalds, the founder of Linux, is reasoning in the same way. Linus believes that a hacker doesn’t worry about making that much money; they

develop code because they find it very interesting and because they like to share interesting things with others (Himanen 2001). One interesting result in Lakhani et al. survey is that 33, 1 % participated to keep code open, but only 11, 1 % participated to beat proprietary software. 11, 8 % of the paid contributors were motivated by beating proprietary software while 11, 1 % of the unpaid where motivated by the same reason (Lakhani et al. 2002). There is a natural clash between the original meaning of a hacker and capitalism; the supreme goal of capitalism is the increase of capital while the hacker emphasizes passionate and free-rhythmic activity (Himanen 2001, pp56). Therefore, the presence of a corporation can be seen as suspicious in some communities (Krishnamurthy 2006).

3.5 The hacker ethic versus the Protestant ethic

Mikkonen et al. calls the hacker culture within open source GOFHC; "good old fashioned hacker communities" that consist mostly of self-organized volunteers working for fun (Mikkonen et al. 2007). According to Himanen, the hacker culture is a good example of a more general work ethic – the Hacker ethic. Even though hackers are considered to be computer developers, the hacker ethics concerns a general social challenge that among other open source developers are a part of. It can be said to be a way of viewing work in a different way than the Protestant Ethic that for long been the only standard in the world (Himanen 2001, pp.7). Herzberg speaks about a sickness in our society that has been growing the last hundred years. One source of this sickness is the relationships of people to their work. Herzberg means that one clear indication of that is the fact that people are now letting leisure activities take so much of our energy and time (Herzberg 1999, pp.128). Csikszentmihalyi suggests that leisure should be defined from the quality of the experience rather than from the nature of the activity (Csikszentmihalyi 1988, pp. 12). Like open source have transformed the software industry, the term work are about to change as a concept in the same way. While the Protestant ethic talks about the paradise as a life without having to do anything, a hacker want to realize his passions and are willing to put in effort to do so (Himanen 2001, pp.18).

The Protestant ethic illustrates the work- and money-centred, bureaucratic and hierarchical attitude to work (Mikkonen et al. 2007). Traditional development management that is significant for the Protestant ethic is a necessary compensation for poorly motivated programmers who would not otherwise turn out good work (Raymond 2000). Himanen quotes Benedict's monastic rule that cemented the ground for the Protestant Ethic: "The nature of the work didn't matter because the highest purpose of work was not actually to get something done but to humble the workers soul by making him do whatever he´s told" (Himanen 2001, pp.10). This slavery is almost the direct opposite to open source development. The hacker culture stands for freedom, fun and sharing of information (Mikkonen et al. 2007), terms that do not comply with the Protestant ethic and certainly is far away from Benedict's monastery rule. Raymond mentions the constructed laziness that often is an attribute of a great programmer – they know that you get an A not for efforts but for results, and that its almost always easier to start from a good partial solution than from nothing at all (Raymond 2000).

3.6 Open source from an organizational perspective

Information can be made globally available in an unlimited amount of copies at zero marginal cost and old modes of organization based on waged labour are increasingly a part of developer communities (Mikkonen et al. 2007). The emergence

of organizational use of open source has created an alternative to market pricing – open sharing (Shirky 2010, pp.108). One reason for firms to engage in free software activities is to obtain indirect revenues by the sale of related products, another motives arise when a specific program for performing a particular task is missing (Bonaccorsi & Rossi 2002). Osterloh and Rota suggests that commercial firms are absolutely vital for open source software development because they contribute to the projects and because they have they have an interest to provide even inexperienced consumers with reliable services (Osterloh & Rota 2005). Open source analyst Stephen O´Grady mean that open source and commercial software built upon open source will be able to exist side by side as long as the business are giving back as much as they take from the community (O´Grady). Bonaccorsi found significant differences between the set of motivations and those of firms. Firms emphasize economic and technological reasons for entering and contributing to open source and do not subscribe to many socially-based motivations that are, by contrast, typical for individual programmers (Bonaccorsi & Rossi 2002). Bonaccorsi & Rossi concludes that business motivation does not destroy the community but on the other hand reinforce it. Mikkonen found that traditional hacker's values like freedom and sharing have much less importance in company-based communities (Mikkonen et al. 2007

In a survey about organisations participation in open source communities made by Mikkonen et al, the results indicated that the positive attitudes toward organisations were relatively high. The survey included four different open source communities, all which had a different amount of paid and unpaid developers, and there were almost no differences in the results (Mikkonen et al. 2007). Hars and Ou found that altruism is closely tied to effort for student programmers but not for paid programmers (Hars & Ou 2001). This might be because paid programmers already have reached their main extrinsic goal in terms of money. It may also be due to age differences; students are more often unpaid and younger than paid programmers (Deek and McHugh 2008, pp.162, Ghosh 2002) and are therefore in a learning phase of life and the open source culture.

4 WHAT DRIVES OPEN SOURCE CONTRIBUTORS?

To be motivated means to be moved to do something (Ryan & Deci 2000). Oxford Reference defines motivation as "The mental processes that arouse, sustain, and direct human behaviour" (Oxford reference). Motivation may come from factors that affect the person from the outside. In that case, the motivation is referred to as extrinsic motivation; someone expects a separable outcome *(Deci & Ryan 1985).* Motivation may also come from processes taking place within an individual, which is called intrinsic motivation. Murray refers to this as "The driving force" that drives a person to action through an inner process (Murray 1964, pp.18) while Deci and Ryan uses the term to describe the situation in which somebody is doing something because it is inherently interesting, enjoyable or challenging *(Deci & Ryan 1985).* It can be affected by the outside environment, but is in itself an inner process. Human beings are and have always been diversely motivated beings acting for both material gain and fort psychological well-being and gratification and for social connectedness (Benkler 2006). Therefore, the extrinsic motivations are closely related to intrinsic motivations. In the hacker perspective of open source development, knowledge is seen as the ultimate token of status – 42, 6 % felt that the intellectual stimulation that they got from open source development were a main factor (Lakhani et al. 2002).

4.1 Motivation in the Open Source Context

A programmer participates in a project only if there is something in it for her – she must derive a benefit from engaging in the activity (Lerner & Tirole 2002). In the open source context, motivations of contributing have been widely studied. Linux founder Linus Torvalds suggests that there are three ultimate motives for participating in open source; Survival, social life and entertainment. Survival is seen as a prerequisite for fulfilling the higher motives, while entertainment corresponds to passion, the state of being motivated by something intrinsically interesting and joyful. Social life means the need for belonging, recognizing and love (Himanen 2001). Linus view of the hacker mentality reminds us in some parts of Maslow's hierarchy of needs, where Maslow describes a restlessness or discontent that will emerge unless the individual is doing what he or she are fitted for;

"Musicians must make music, artists must paint, and poets must write if they are to be ultimately at peace with themselves. What humans can be, they must be. They must be true to their own nature. This need we may call self-actualization" (Maslow 1970).

From an economic theory perspective, Dalle and David suggest that motivation for participating in open source have to do with gaining a reputation, signalling quality of human capital, and learning (Dalle and David 2003). The question whether open source developer's motivations are extrinsic or intrinsic has also been widely disputed. Bitzer mean that the motivations for participation is a mixture of extrinsic motives like signalling and future wages, and intrinsic motives like their own need for software, fun and gift culture (Bitzer et al. 2007). Krishnamurthy agrees with the suggestion that intrinsic and extrinsic motivations are closely related to each other (Krishnamurthy 2006).

4.2 Extrinsic Motivation

Ryan and Deci define extrinsic motivation as “a construct that pertain whenever an activity is done in order to attain some separable outcome” (Ryan & Deci 2000a). Extrinsic motivations arises from factors outside the individual such as the need for software, signaling competence to potential employees and gaining reputation among peers are external motivations (Ke & Zhang 2008). Other examples of extrinsic motivations are financial rewards, signaling quality and to improve future job prospects (Krishnamurthy 2006). When an individual works on a task only by her external motivation, she is focused on the outcomes of the process (Ke & Zhang 2008) through the indirect satisfaction of her needs (Osterloh & Rota 2005). A merely extrinsic motivated participant of an open source project will only contribute when the expected benefits of contributing are believed to exceed the contribution’s costs (Oreg & Nov 2008). Hars and Ou mean that while intrinsic motivation play a role, external factor are of greater weight. In their study they found that hobbyists and students were the most internally motivated, and paid programmer mainly seeks to sell related products, services and self-marketing, and are therefore extrinsic motivated (Hars & Ou 2001). This theory is supported by Deci & Ryan, who refers to Ryan & Connel´s study on extrinsic motivations. The study showed that the more students were externally regulated, the less they showed interest, value or effort, and the more they blamed others for negative outcomes (Ryan & Deci 2000a). In another study, Baytiyeh & Pfaffman found that indicating social stature, being better than others, or possessing powerful qualifications inside the community were extrinsic factors that not were very important to the contributors *(*Baytiyeh & Pfaffman 2010).

Extrinsic rewards can undermine intrinsic motivation – Ryan & Deci refers to a study made by Deci, Koestner & Ryan where they found that virtually every type of expected tangible reward made contingent on task performance undermine intrinsic motivation (Ryan & Deci 2000a). In addition to external rewards, also threats, deadlines, directives and competition pressure diminish intrinsic motivation since people experience them as controllers of their behaviour (Ryan & Deci 2000a). Roberts et al. found that the presence of extrinsic motivational factors does not diminish intrinsic motivation (Roberts et al. 2006), which is in line with Krishnamurthy’s suggestion that intrinsic and extrinsic motivations goes hand in hand and should not be separated (Krishnamurthy 2006). Baytiyeh & Pfaffman found that if extrinsic rewards are offered for pleasurable activities, interest can be reduced if the possibility of reward is removed *(*Baytiyeh & Pfaffman 2010). They did however not find any differences between paid and unpaid contributors considering altruism, creation, learning, flow and extrinsic motivations. In Roberts et al study, extrinsic motivation affected the level of contributions while the level of intrinsic motivations didn’t affect the level of contributions at all (Roberts et al. 2006). In company-based or mixed communities, traditional rewards that correspond towards the Protestant ethic are easier to use (Mikkonen et al. 2007).

4.2.1 Money

“The money that you own is a mean for freedom; those that you hunt a mean for slavery”
Jean-Jacques Rousseau

Weber and the Protestant ethics taught their followers that money is the greatest good and if a person ranks work higher than money she no longer worries about maximization of her income (Himanen 2001, pp.44). By forgoing intrinsic rewards, material plenty and economic security can be achieved (Csikszentmihalyi 1988). Although monetary compensation might not be an immediate objective for the developer, many contributors see their participation as a way of doing their full-time

job better or ultimately improve their job prospects (Deek & McHugh 2008, pp.165). Financial incentives play a major role in work life in general and that includes open source development (Krishnamurthy 2006). Brockmeier sees the pay check as "a tool to allow contributors to continue to focus on open source developing instead of something else to pay the bills" (Brockmeier 2010). There is also a risk involved in offering monetary rewards; if you get paid for reaching a specific target you are most likely to choose the shortest way to that target and therefore learn less on the way (Pink 2008, pp. 53).

A company in the open source context can provide financial incentives through employment, bounties, sponsorships and grants (Krishnamurthy 2006). Linus Torvalds describes money as "a motivation for what it brings, as a bartering tool for the things we really care about" (Himanen 2006). While the actual money might be the final target for many paid developers, a hacker sees money as a helping hand to reach a higher target, to be able do what he wants to do: the paid developers in open source are often not contributing because they are paid, they are paid because companies see value in the contributions and therefore support their work (Brockmeier 2010). Money can therefore be a way of increasing self-actualization, but doesn't have to be.

Open source developers are self selected concerning both interest and ability to contribute to the specific project and this is according to Raymond also true when the individual is paid salary to hack open source (Raymond 2000). Raymond's argument is supported by Hars and Ou, who made a study that concluded that paid developers ranked some intrinsic motivation highly and unpaid developers ranked some extrinsic motivations highly (Hars & Ou 2001).Lakhani and Wolf noticed that paid contributors showed a higher work-related need while unpaid contributors indicated a higher non-work-related need for code (Lakhani & Wolf 2005). Osterloh and Rota describes the ideal incentive system for intrinsic motivation as the actual work content (Osterloh & Rota 2005). Herzberg et al. mentions salary as a form of recognition that means more than just money. A high salary shows that individual is progressing in his work and that he have done his job well. Salary has more potency as a job dissatisfier than a job satisfier when it comes to affecting job attitudes (Herzberg et al. 1999, pp. 83). Money as a motivator can also create competition. Competition leads to a shift from intrinsic to extrinsic motivation; winning prestige and profit are becoming the highest goal (Csikszentmihalyi 1988, pp. 55).

4.2.2 Reputation & Peer Recognition

"Work is the price paid for reputation"
Baltasar Gracián

The right sort of attention, such as been recognized as a good programmer, creates status and reputation in open source (Bergquist & Ljungberg 2001). The more attention the developer gets, the more status and reputation he achieves. The desire to gain reputation is according to Raymond strong within the hacker community, and the names of the contributors are logged and distributed inside the source code. That way, individuals acceptance within the community are boosted and thus its reputation and social status **(**Raymond 2000**).** The gift that the programmer gives to the community thus determines his social status within it (Raymond 2000). This argument is however not undisputed. According to a survey made by Bonaccorsi and Rossi, gaining a reputation does not rank highly as an incentive for free software programmers (Bonaccorsi & Rossi 2002). However, Raymond talks about the Linux world as an ecology or free market building on ego satisfaction and reputation among other hackers **(**Raymond 2000), and this view is also proved by Hertel et al. who found the identification as a Linux developer was important among the developers **(**Hertel et al. 2003). The same goes for Bergquist and Ljungberg, who points out that the

hierarchy in the virtual environment is a matter of giving or receiving more or less attention (Bergquist & Ljungberg 2001). The more attention the developer gets, the more status and reputation he achieves; relationships of power between groups and individuals are transformed to interdependencies based on the idea of reputation (Bergquist & Ljungberg 2001). Looking from an extrinsic point of view, the value for the contributor lies in demonstrating competence according to social standards in order to show personal success **(**Oreg & Nov 2008**).** In some cases, companies do not want their programmers to be visible since this increases the chance that a competitor will steal them (Lerner & Tirole 2002).

In Lakhani's survey, reputation as a motivator was almost equal for both paid and unpaid participants (Lakhani et al. 2002). One respondent in Subramanyam & Xia`s study articulated that programming was a kind of art, no matter if you were paid or not. He saw the greatest benefit from participating in open source in the fact that the big arena could help him expose himself and his work and by that gain peer-recognition (Subramanyam & Xia 2008). One reason to why programmer are easier to attract on an early stage is that the project will keep attracting a large number of programmers if it is successful and therefore make early contributions more visible (Lerner & Tirole 2002). Being a successful first-mover gives status and visibility, a reputation. The developer thus might have extrinsic motivation when starting on an early project, no matter if she is paid or unpaid. For a hacker, recognition within a community that shares her passion might be more important than money – peer recognition is not a substitute for passion, but a result of passion (Himanen 2001, pp51). By contributing to the community, the developer receives acknowledgment: the giver is paid by the community by receiving a certain amount of fame and respect (Bergquist & Ljungberg 2001). Ryan & Deci mentions Deci´s study from 1971 that shows that positive performance feedback enhance intrinsic motivation while negative performance feedback diminish it (Ryan & Deci 2000a).

4.2.3 Signalling

"The caterpillar does all the work but the butterfly gets all the publicity"
George Carlin

Individuals may participate in open source software development as a way of demonstrate their capabilities and skills in programming (Hars & Ou 2001). This extrinsic motivation works as a way of self-marketing; the visibility in open source projects is higher than in proprietary projects which makes the signalling incentives stronger (Deek & McHugh 2008, pp.286). Lerner & Tirole mentions signaling as an ego gratification incentive that comes from a desire for peer recognition (Lerner & Tirole 2002). In a commercial program, outsiders can't see the source code and are therefore excluded from what has been done and who has done it. In an open source project, the transparency makes the work open to the world and the visibility creates a display window for the programmers who have contributed to the program (Lerner & Tirole 2002). It is also possible to see whether the task was hard, if the problem was addressed in a clever way and if the code can be useful in the future, and all these facts tell the observer something about the programmer. The programmer receives an identity in the observers mind (Hars & Ou 2001). Paid and unpaid contributors are therefore competing on the same terms when it comes to marketing themselves and their skills, since all participants in an open source project are treated as individuals even if they construct code for a company (Tapscott & Williams 2006).

Individuals with strong signaling incentives might use open source software as a port of entry (Lerner & Tirole 2002). Hann et al investigation of the participation in Apache showed that there are several levels of rank a developer can reach, and the progress depends on the individual's contribution to the project. The study showed a

strong correlation between status and subsequent employer salary; the higher status, the better signaling arose for the individual (Hann et al. 2004). The contribution did not raise the wages directly by the quantity of the contribution, but those who had higher rank in the project had about 29 % higher wage than those with a lower rank (Hann et al. 2004). Since the source code contains information of the performance of the programmer, the programming can work as a signal that creates a larger transparency between the programmer and potential employers. Therefore, community members have a huge interest in revealing as much information as possible to their project to either display value of their gift and/or to signal their abilities to potential employers (Bitzer et al. 2007).

4.2.4 Gift Giving

"The value of a man resides in what he gives and not in what he is capable of receiving"
Albert Einstein

Bergquist & Ljungberg mean that the gift economy creates openness and organizes relationships between people in a certain way (Bergquist & Ljungberg 2001), while Zeitlyn emphasize that gift giving forms the moral basis for society (Zeitlyn 2003). Bergquist & Ljungberg also argue that open source development relies on gift giving as a way of getting new ideas and prototypes out in circulation. In a gift culture, social relations are not regulated by the possession or exchange of money or commodities but on gift exchange. By giving a gift, social interdependencies are created based on altruism which becomes a web upon which social structure is organized. When the developer gives away something she is expressing an advantageous position in relation to the recipient. The open source developer get power from giving away and this power is used a way of guaranteeing the quality of the code (Bergquist & Ljungberg 2001).

While sociobiologists mean that altruism is a basic human instinct, psychologists see altruism as "the result from a desire to look good in front of others" (Schwartz 1986, pp.123). Community identification is a variant of altruism where the programmer identify himself as a part of the open source community and align his goals with those of the community (Hars & Ou 2001). Altruism allows the individual to remain engaged in the group activities even though his peers are not reciprocating; the contribution does not rest on the reciprocating of the gift, but on the advantages that the individual can build for himself by contributing. (Ke & Zhang 2008). The receiver can also demonstrate superiority by declining the gift. Zeitlyn describes a gift as an obligation to make a return presentation. In a small social world, this is a powerful force. The world of the software engineer is a very small world (Zeitlyn 2003). A gift is often not given to anyone in particular but is made public in the community, which means that the giver is given a kind of "hero"-status within the community (Bergquist & Ljungberg 2001).

Eric Raymond suggests that the gift culture plays an important role in open source; "If you treat your beta-testers as if they're your most valuable resources, they will respond by becoming you're most valuable resource" (Raymond 2000). The paid contributors can participate in the gift culture on the same terms as the unpaid contributors as long as their contributions are not restricted by the organization that they represent. If the paid contributors start to withhold information, they will be rejected by the community, the "kinship". Kinship amity and gift relationships structure the social ties that link participants in open source development; within the family there are no calculated economic relationships, it is a type of gift relationships. The same goes for open source development. Each software project can be seen as a kin group with its patriarch or matriarch (Zeitlyn 2003). There are no monetary transactions within a kin group while there might be such with strangers. Gift giving

and acceptance establish moral lasting relationships between the giver and receiver. Zeitlyn means that it is better to being owed than owing; it makes you look more generous, which makes both you and others think better of you. Successful gift giving accumulates reputation for generosity, which is one of the moral establishments for hackers and Generation Generosity (Zeitlyn 2003). Sowe et al. proved that there is a power law distribution of effort in the open source community – the distribution of the number of posts and replies shows that there is a long tail of posts and replies (Sowe et al. 2008) **–** a core of developer stands for the majority of the contributions.

4.3 Intrinsic Motivation

Ryan and Deci define intrinsic motivation as "the doing of an activity for its inherent satisfaction rather than for some separable consequences". An intrinsic motivation is to act for the fun or for the challenge and will occur only for activities that have the appeal of novelty, challenge or aesthetic value for the individual; when an individual does something for its inherent satisfactions rather than some separable consequences, the motivation is intrinsic (Ryan & Deci 2000). In an open source context, a lot of the research on motivations has been focusing on intrinsic motivation. Krishnamurthy, for example, points out that intrinsic motivation in open source can be to have fun, to learn, to be a part of a community or to feel a "flow" (Krishnamurthy 2006). Deci & Ryan also mentions fun as an intrinsic motivation and adds challenge as another motivation (Ryan & Deci 2000). In Oreg and Nov´s study, self-development motives was given the highest rating when the contributors were asked for their reason to participate followed by altruistic and reputation-building motives (Oreg & Nov 2008). Intrinsic motivation are important for open source because when an individual experience more positive affective states and has higher psychological satisfaction, he or she will exert more effort on conducting behaviors that are not mandated (Ke & Zhang 2008). In a self organized environment like open source, this behavior is as important as life of the project itself; if the contributors are not taking on responsibilities and assignments voluntarily, there are no project to work on.

Ryan and Deci are the fathers of the Self-determination Theory, in which feelings of competence, autonomy and social relatedness are named as the components of intrinsic motivation for contributing to open source. People who identifies with making own choices, learning, creating and exploring tend to appreciate creativity (Ryan & Deci 2000). These motivations are also mentioned by Burton, who means that extrinsic motivation lowers perceived competence, autonomy, and relatedness and therefore lowers the intrinsic motivation (Burton). Van Dijk and Kluger mentions self-direction as values that guides individuals attention and actions towards intrinsically rewarding intellectual opportunities (Van Dijk & Kluger, 2004), (Oreg & Nov 2008). The relation between intrinsic and extrinsic motivation have been discussed in earlier research. While some researcher focus on the negative aspects and suggests that extrinsic motivations undermine intrinsic motivation (Ryan & Deci 2000), other sees them as two important components that have different forms of value (Krishnamurthy 2006). Bitzer writes that intrinsic motivation such as need for a particular software solution, the fun of play and gift culture are incorporated simultaneously (Bitzer et al. 2007). These findings strengthen Krishnamurthy's suggestion of viewing intrinsic and extrinsic motivations from a holistic view. The extrinsic motivated workers can also have intrinsic motivation. Ryan and Deci describe the process of going from extrinsic motivation to intrinsic motivation as the process of taking in a value or regulation. Internalization, as they call the process, is when ones motivation for behaviour range from amotivation, to passive compliance, to active personal commitment. Greater internalization means greater persistence, more positive self-perception's and better quality of engagement (Ryan & Deci 2000a). Also, the actual change of motivation

can create acceptance in the community; humility is described by Bergquist and Ljungberg as a way of gaining acceptance (Bergquist & Ljungberg 2001).

The most important cost of participation in open source software development was according to 32 % of the respondents the loose of sleep, while 29, 7 % felt that the loose of social life were most hurtful. It is interesting to see that only 4, 7 % mentions stress as the most important cost (Lakhani et al. 2002. This can be compared to the Gallup poll "Attitudes In The American Workplace VI" made in year 2000, where 82 % of the workers felt at least a little bit stressed at their jobs and 6 % were extremely stressed (Harris Interactive 2001). In another Gallup report, only 13 % of the engaged workers on the workplace very often felt frustrated compared to actively disengaged workers where the number was 26 % (Gallup 2006). Stress occurs when an individual sees a situation as threatening and frustrating and cannot reduce his frustration by means of socially acceptable behavior (Bradley 2006). The social norms that are making the individual stressed are also a part of open source, but not in the same way as in a traditional organization. The Gallup report showed that engaged workers cope better with stress (Gallup 2006).

4.3.1 Autonomy

“To be one's own master is to be the slave of self”
Natalie Clifford Barney

Autonomy is a basic human need and an important motivation for participating in open source development. All people have a need for autonomy and that represents the need to be self-determining (Ryan & Deci 2000a). According to Pink, control might be a good motivator short term but bad in a longer perspective. Control make motivation less intrinsic (Pink 2008, pp. 43) When people voluntarily self-select for creative, knowledge-intensive tasks they are more likely than managers to choose tasks for which they are uniquely qualified (Tapscott & Williams 2006). Osterloh and Rota found that external interventions crowd out intrinsic motivation if the individuals affected perceive them to be controlling. On the other hand, intrinsic motivation is crowded in if a person’s feelings of autonomy are raised (Osterloh & Rota 2005). Deci and Ryan refers to their own study made in 1985, where choice and opportunities for self-direction were found to enhance intrinsic motivation because they allow people a greater feeling of autonomy (Ryan & Deci 2000b). 60 % in Lakhani`s study of Sourceforge.net answered that they would program frequently or always if they were given another hour in the day (Lakhani et al. 2002. Intrinsically motivated goals as autonomous goals in open source are according to Hars and Ou associated with the most effortful behaviours comparing to controlled personal goals and will thus lead to higher possibility of goal attainment. Open source programmers with intrinsic motivations will therefore spend more time and effort in open source projects (Hars & Ou 2001). She will also seek to improve competency and value self-determination (Ke & Zhang 2008). Baytiyeh & Pfaffman found that the user’s freedom to contribute to their efforts however and whenever they choose was an important motivation for involvement in open source (Baytiyeh & Pfaffman 2010).

The sense of autonomy is not restricted to the volunteer programmer in the open source context. Osterloh & Rota found that even though a developer contributes to open source on behalf of a company, feelings of autonomy can be stronger than when working on a proprietary project (Osterloh & Rota 2005). The respondents in the study emphasize the importance of owning your own code, and even though the programmer is doing the job for a organization the output of their work belongs to the programmer and everyone that have been involved in the project. Also Hippel & Krogh report findings of how contribution to open source gives a sense of ownership and control over their work product (Von Hippel & Von Krogh 2003).

4.3.2 Need for Competence

"A happy programmer is one who is neither underutilized nor weighed down with ill-formulated goals and stressful process friction. Enjoyment predicts efficiency."
Eric Raymond

The hacker Eric Raymond once said that "every good work of software starts by scratching a developer's personal itch" (Raymond 2000). In an open source project, programmers are likely to be motivated by the feeling of competence, satisfaction and fulfilment that arises from writing programs (Hars & Ou 2001). When participants of a software project understand what they are doing and feel responsible for the outcome, a feeling of competence may occur that makes the individual more efficient (Osterloh & Rota 2005). To feel competent are therefore an important motivation for participating in open source development; no matter if the contributor is paid or not, the individual can achieve a feeling of competence (Baytiyeh & Pfaffman 2010). Maximized motivation is reached when a balance is achieved between abilities and responsibilities, when the individuals skills that he possess are in proportion to the challenges he face and when his talents are neither under stimulated or overused (Csikszentmihalyi 1988). While 46.2 % of the volunteers in BCG: s Hacker survey was interested in improving their skills, only 30 % of those who were paid had the same interest (Lakhani et al. 2002). In the same study almost 45 % indicated that one of their top motivations to participate in open source were because "it were intellectual stimulating". The unpaid contributors were more motivated (46, 6 %) than the paid (40, 8 %) (Lakhani et al. 2002).

Deci´s cognitive evaluation theory argues that interpersonal events and rewards, communications and feedbacks that conduce toward feeling of competence during action can enhance intrinsic motivation for that action because they allow satisfaction of the basic psychological need for competence (Ryan & Deci 2000). Linus Torvalds is a good examples of this, since Linus was (and is) an expert on "keeping his hackers rewarded, stimulated by the prospect of having an ego-satisfying piece of the action, rewarded by the sight of constant improvement in their work" (Raymond 2000). Feelings of competence will not enhance intrinsic motivations unless they are accompanied by a sense of autonomy. For a high level of intrinsic motivation people must experience satisfaction both for competence and autonomy (Ryan & Deci 2000). The act of creation itself might be a motive, to be able to be a part of the creation from start to finish and witness the end product. Contributors in open source like to create something new and to be able to personalize it; the feeling of that have made a different and created something that none other have before seem to be important (Baytiyeh & Pfaffman 2010).

4.3.3 Learning

"You cannot teach a man anything. You can only help him discover it within himself"
Galileo Galilei

A hacker program because programming challenges are of intrinsic interest to them, the problem that the hacker expose himself to creates genuine curiosity and makes him eager to learn more (Himanen 2001, pp.3). Intrinsic motivations result in high-quality learning and creativity (Ryan & Deci 2000a) and the "intellectual need to write code" was also ranked second in Lakhani & Wolfs survey. There were no differences between those who were paid and those who weren't. To "improve programming skills" was ranked third in the survey and unpaid developers saw this attribute as more important than paid developers (Lakhani & Wolf 2005). Learning

and sharing was the most important motivation factors in Subramanyam and Xia`s study. The communities were strongly driven by the desire to learn and to share their skills with other developers in the community (Subramanyam & Xia 2008). Hars and Ou means that open source programmers tend to prioritize the learning experiences that meet their interest in order to form a human capital consisting of personal skills, capabilities and knowledge (Hars & Ou 2001). In 2002, Ghosh made a survey of 2784 developers where it was found that to learn and to develop new skills were ranked in top along with sharing of knowledge and skills (Ghosh 2002). Also the chance of participating in a new form of cooperation was a top motivation, which can be associated with the intrinsic motivation for exploring and learning something new. It is by engaging in ones inherent interest that one grows in knowledge and skills, (Ryan & Deci 2000) and therefore learning is closely related to autonomy; the hacker's autonomy increases the chances of doing what she really loves and thus creates larger skills and knowledge.

The social interaction is a critical component of learning since participants learn from practice. In a survey made by Baytiyeh & Pfaffman, many participants "enjoyed realizing that there are so many people willing to share their time and expertise"(Baytiyeh & Pfaffman). Open source provides an opportunity for participants to develop expertise in niche areas and interact with like-minded but uncommon individuals who share the same interests. (Subramanyam & Xia 2008). Also, the user has to read the documentation and learn about the capabilities of the software by himself which stimulates his learning (Von Hippel & Von Krogh 2003). According to Himanen, there is a correlation between learning and gift giving; if one is able to teach something to others, she must have the material very clear to herself (Himanen 2001, pp.75). Also, if the code is revealed to others the developer can learn from critique and correction (Von Hippel & Von Krogh 2003).

4.3.4 Play

"Work and play describes the same things under differing conditions"
Mark Twain

When a human is born, she is a playful being that want to learn and explore (Ryan & Deci 2000a). When she grows up and get a job, this playfulness seem to disappear or at least getting smaller. Why is that? If we look in our rear mirror, it is not hard to see why play has become a synonymous to leisure. The protestant ethics meant that there were no time for play in work, and therefore playfulness was removed and at the same time eliminated from the most time of the day of human (Himanen 2001, pp. 26). Himanen describes the time left as "optimized leisure time", where leisure started to assume the same patterns as work; when play was removed from work, playfulness was removed from play. Himanen quotes Witold Rybczynski: "People use to `play´ tennis, now they are "working" on their backhand". One example of how play and work had become enemies can be found at Fords River Rough plant in the 1940´s where you would get disciplined if you laughed at work. The same thing was for humming, whistling and smiling – Henry Ford saw the combination of work and play as toxic that would make the pace of production suffer (Pink 2005, pp.187).

Instead of optimizing leisure, hackers optimize time to be able to have more space for playfulness (Himanen 2001, pp.32). This way of life is expressed in open source software development, where joy, humor and playfulness are considered to be assets (Raymond 2000). Hackerism is joyful and rooted in playful experiences (Himanen 2001, pp4.), an attitude that is characteristic for creative individuals (Pink 2005, pp. 198). Raymond means that play is the most economically efficient mode of creative work, and that open source is a proof of this (Raymond 2000). Pink agree by calling humor "a sophisticated form of intelligence that can't be replicated by computers and

that is becoming increasingly valuable" (Pink 2005, pp. 199). A play ethic can strengthen and ennoble the work ethic (Pink 2005, pp. 204). Bitzer found in his study that play is a motive for participating, but it is not sufficient on its own (Bitzer et al. 2007). Osterloh & Rota made a study about motivations for participating in open source development and made similar discoveries to Bitzer et al.; the most important motivations for participating in the Open source community was having fun, learning *and* the public display of one's capabilities (Osterloh & Rota 2005). The work itself was found to be intrinsically rewarding based on personal enjoyment (Osterloh & Rota 2005). Bitzer also found in his study that open source developers are characteristic for deriving a high value from play (Bitzer et al. 2007). Because joyfulness makes us more productive and fulfilled, fun and play are important attributes in open source development, not least because of the creative skills that are needed. Himanen emphasize the importance of allowing playfulness and individual styles of creativity for economic reason since the creative rhythm that is a big part of open source development would go lost without it (Himanen 2001, pp.38).

4.4 In the shadow land

There are two motivations that are intrinsic or extrinsic depending on the situation or whether you ask psychologist or a biologist – Ideological motivation and Social relatedness. These two motivations are discussed here.

4.4.1 Ideological Motivation

"*Code should always be open as in free speech, not as in free beer*"
Richard Stallman

The battle between open source and proprietary software have for a long time been the fight between good and evil, leaving Microsoft in one the corners and Linux in the other. Lakhani et al. found that 72, 5 percent of the respondents in his study would work on a closed-source software project if it would pay enough to support his lifestyle (Lakhani et al. 2002). In a survey from 2010, (Baytiyeh & Pfaffman found that one motivation for participating was "*to help to free others from the tyranny of proprietary software and the companies that profit from it*". Another similar comment was "*open source is one of the world projects to provide free software for everyone, I feel better to contribute to all people instead of a few who have big wallets*" (Baytiyeh & Pfaffman2010). Participants value being a member of a free community with no boundaries; they love open source because it is open (Baytiyeh & Pfaffman2010). This culture is forming the moral and ethic that the open source structure is built upon and which is kept by experts and enthusiasts from all over the world. Lakhani means that here are three obligations that constitute a form of moral in open source; to give, to receive and to reciprocate (Lakhani et al. 2002). There is no formal obligation to pay back but there is a moral obligation to pay back in the form of having some solidarity to the community by praising the project and those associated with it (Bergquist & Ljungberg 2001). People also enjoy punishing others who are doing wrong, even if it costs them energy, time or money. Clay Shirky calls this altruistic punishment, and this is an important aspect of the amateur and volunteer part of developing open source software - the less market driven a given culture is, the greater the like hood that its members will generous and open to each other (Shirky 2010, pp.108). In Lakhani`s study from 2002, 34, 8 % of the unpaid contributors was motivated by keeping the code open compared to only 29, 1 % of the paid contributors. 43, 7 % thought that free software is a matter of liberty, not price. 5, 4 percent reported that they would never

participate in proprietary software development, no matter what happened (Lakhani et al. 2002).

Von Hippel and Von Krogh found in their survey that it was not important whether the participant contributed or not, those who did not contribute was seen as an asset even if they did not contribute since they increased the "market share" and importance of the project (Von Hippel & Von Krogh 2003). On the other hand, Tapscott and Williams identifies sharing as a price of admission the community for firms and organisations. The firm can from that admission derive various benefits and obtains a "license to operate" in the community – a tacit permission to harvest some of the value created in collaboration with community members (Tapscott & Williams 2006). In order to impress others and climb the ranks of the community and be fully accepted, less technically proficient members need to actively demonstrate their compliance to Community norms and behaviors (Gwebu & Wang 2010).

The open source community is according to Hertel et al. often described as a social movement that includes a strong identification with common norms of freedom of information and of fighting against the monopoly of large companies (Hertel et al.2003). One example where the ethics can be questioned is Microsoft – Windows NT uses code from the BSD program with just an acknowledgment in the release note (Krishnamurthy 2006). Lakhani's study supports the non-existence of the war between open source software and proprietary software; companies are welcome as long as they follow the rules and norms of open source. Only 10, 2 % saw the open source community as a place to live a classic hacker life. However, the study shows that hacking is central to the community participators lifestyle (Lakhani et al. 2002). Mikkonen et al. made a survey including four open source communities that goes against the belief of ideological war against proprietary software as a common goal. They found no seriously anti capitalistic voices in the communities that were included in the study (Mikkonen et al. 2007).

4.4.2 Social Relatedness

"A team will always appreciate a great individual if he's willing to sacrifice for the group"
Kareem Abdul-Jabbar

Wilfried Bion wrote in 1961 that "*human are hopelessly committed to both"* when given the question whether groups are best thought of as aggregations of individuals or as a cohesive unit (Bion 1961). Himanen describes the protestant ethics view of using social norms to its benefit. Instead of working for survival, people are often working to satisfy a form of social need characteristic to a society. Work has become a source of social acceptance (Himanen 2001, pp.49) that motivates the individual to follow the unwritten social laws. Clay Shirky means that the personal value that is received from being active and creative instead of being passive is what drives volunteers. Adding the social motivations of membership and generosity to the personal motivations for autonomy and competence may increase activities. Human have both social and personal motivations, and social motivations can drive much more participation than only personal motivation (Shirky 2010, pp.172). Ryan and Deci touches on the topic in their classic paper from year 2000; since extrinsic motivation are not inherently prompted and thus must initially be externally prompted, the primary reason people are likely to be willing to do a behaviour is that they are valued by significant others to whom they feel connected to (Ryan & Deci 2000a). Internalization is therefore providing relatedness – a sense of belongingness to a person, group, or culture. Osterloh and Rota refers to a study made by Kollock in 1998, where prosocial motivations were found to raise group identity which in turn had a strong impact on the amount of contributions to common goods (Osterloh and Rota 2005). Social relatedness raises group identity which have a strong impact on the contributions to

common good (Osterloh & Rota 2005).). Brown points out that belonging is a innate human desire to be a part of something larger than the individual itself and that we often try to acquire it by fitting in and by seeking approval, which diminish rather than increase belonging; we can only reach true belonging when we are our genuine, authentic imperfect selves (Brown 2010, pp. 26).

Baytiyeh & Pfaffman found, by asking participants why they continued to participate, that the community spirit are highly valued (Baytiyeh & Pfaffman 2010). Sunstein calls experiences made possible by modern technology for solidarity goods; their value goes up when many other people are enjoying them. The experience is rated high because it is shared, just like contributing to an open source project. Shared experiences works as a social glue since it helps to promote and ease social interactions. By gluing together diverse people, a shared culture can be achieved (Sunstein 2001, pp.97). Von Krogh et al. made a study of Freenet where it was found that those who would want to join have to act consistently to the shared culture of the group that exist (Von Krogh et al. 2003). A culture is a collectively set of norms and behaviours within a group (Shirky 2010, pp.134). When a shared culture has evolved within the community, community etiquette can be constituted that makes the moral backbone of the community (Bergquist & Ljungberg 2001). The shared culture helps the participants functioning together (Shirky 2010, pp.129). Bion found in 1961 that in order to keep a group of voluntary participants committed to the creation of shared value, internal threats are far more serious than external and therefore voluntary organisations need some kind of control that keep the road clear from ill behaviour (Bion 1961). This control within the open source community is the shared culture, where members are rewarded for hard work (Shirky 2010, pp.181). By being a part of a culture where experiences are shared, developers can learn from each other and gain both personal and professional rewards. Interviews have shown that the possibility to work with extremely talented people and to be a part of their shared culture is a motivation for participating in open source *(*Baytiyeh & Pfaffman 2010).

Clay Shirky refers to Ostrom, who have proved that when we assume that people are selfish, we design systems that reward selfish people. Instead of privatizing resources, Ostrom mean that a shared culture can work better than a market in some cases by relying on repeated communications and interactions among the participants. Having a creditable commitment to a shared goal promotes the shared culture and therefore creates ties inside the group that relies on genuineness and ethics of motivations; if you participate in an egoistic way, the shared culture will be more egoistic and less generous which in turn means that the system will be adjusted to a selfish mentality – you are still working for the common good, but you have an selfish goal. The nature of the open source model might however affect organizations, because people in social circumstances will moderate their behaviour to be less selfish (Shirky 2010, pp. 113). Cooperation creates feelings of solidarity, altruism and fairness, and the participator stops to see his work as “costly” (Von Hippel & Von Krogh 2003). Krishnamurthy’s concludes that corporations wants their employees to be maximal motivated and uses financial incentives as one element, but motivations in the open source context may be seen different due to the presence of the unpaid programmers. The financial inequality might be a problem - when everyone benefit in an open source project, group cohesiveness is maintained. When only a few receive financial benefits, the group morale could be hurt and the group might be fragmented (Krishnamurthy 2006).

5 CORRELATIONS BETWEEN INTRINSIC AND EXTRINSIC MOTIVATIONS

Open source have transformed into a business model that create new motives for participation. The Protestant ethics are becoming less and less powerful, and this is especially noticeable in the open source environment where measuring work by the result instead of presence is the natural and only way. Doing things out of pure passion instead of acting merely based on extrinsic motivation such as money is a natural evolution since the welfare have made the lower needs of Maslow´s hierarchy obvious to the western society. What human can be, they must be, and there is nowhere that it is as obvious as in the open source community. In this section I will analyze, interpret and try to come to some sort of conclusions based on the data collected. Although my theories might be interpreted differently, my aim is as I mentioned earlier to come up with possible correlations between paid and unpaid contributors motivation and to create leads for future research. In order to do this as structured as possible, I will present my theories under the same headlines that have been used in the previous section under extrinsic and intrinsic motivation. Put on your thinking hat, here we go.

5.1 Extrinsic motivation versus intrinsic motivation

Intrinsic motivation leads to a higher psychological satisfaction. Therefore, we can draw the conclusion that intrinsic motivation is something desirable in open source software development since higher psychological satisfaction renders in higher working effort from the programmer. There are however different view on the importance of intrinsic motivation. Some researchers see extrinsic motivation as more important than intrinsic, while some think that extrinsic motivation undermines intrinsic motivation. It is a bigger risk for paid contributors when it comes to this threat since their autonomy is less than for the unpaid contributors. Ryan and Deci mentions deadlines, threats, directives and competition pressure as possible under miners; all of these are most easily associated with paid contributors. Roberts et al findings do however go against Ryan and Deci´s theory, which creates some confusion. More research in this area would indeed be appreciated. I think Baytiyeh & Pfaffman are something important on the track in their study where extrinsic rewards that is offered for pleasurable activities and later are removed diminishes intrinsic motivation. This would mean that those paid contributors that enjoy contributing to open source are more vulnerable to changes in open source projects than those who are unpaid; if the paid contributor loses his external reward such as money, he might not put in as much effort as he would if he not have had any external reward from the beginning although he used to love what he was doing. This scenario can of course be applied to unpaid contributors as well, but because paid contributors are more likely to be motivated extrinsically I see it as more likely that it applies to them.

Greater internalization means greater persistence, more positive self-perception’s and better quality of engagement. The Gallup report showed that engaged workers cope better with stress, which means that those who are intrinsic motivated are less stressed. This could also be due to the different social norms that exist in open source; since unpaid developers are free from the organizational control, they don’t have to adjust to traditional rules and norms that decrease their autonomy and creativity. In the Gallup study, results showed a higher percentage of stressed people compared to those who participated in open source development. Although the results include both paid and unpaid contributors, this might indicate that when you have an organization that puts up extrinsic rewards, it also follows obligations which might mitigate creativity.

Ryan and Deci mention several of the intrinsic motivations as characteristic for creative persons, which is why we can assume that an intrinsic motivated contributor often is creative.

5.2 Money

Earlier research indicate that a paid developer are more extrinsic motivated than an unpaid developer, although the extrinsic motivation might be other than money. The paid contributor's motivation might be built upon the Protestant ethic and its social rules; instead of being afraid of losing his job and starve, the developer might fear the negative status that he would receive if he did not produce what was expected from him. The unpaid hackers contribute voluntarily and are therefore excluded from the hold that the Protestant ethics have on its members. It is easier to break rules when you`re already an outcast. The social iron claw may decrease the paid developer's intrinsic motivation because it makes their autonomy decrease.

To conclude; the paid programmer has a social reputation a´la Protestant ethic to live up to. At the same time, studies show that money is a just a checkpoint on the way to intrinsic motivation; earning money means that he can hack more. The extrinsic motivation may lead to an increase in intrinsic motivation since the paid contributor can do what he loves more often, like Pressley mentions. Pressley`s theory about amateurs are worth thinking of. An amateur must make his money somewhere else and can therefore not engage in open source as much as he would like (students excluded). The intrinsic motivation makes money less valuable since the programmer no longer sees the maximization of income as the highest goal; the Protestant ethic have lost its grip of the individual and this might lead to an increase in autonomy as well.

5.3 Signaling

The paid contributor gain signaling when contributing to an open source project. The employee cannot hide him from competitor and his work is visible to everyone in detail. The paid contributors can actually increase the unpaid programmer's extrinsic motivation for contributing since their participation on a project mean that more organizations will have their eyes on the specific project. The unpaid programmers are aware of this, and might therefore choose to contribute to a project to signal. Because although an unpaid programmer works out of pure passion, he might want to signal to potential employees that he is good since this would give him the opportunity to do what he love on full time; extrinsic motivation might make way for the possibility to actualize the intrinsic.

My conclusion based on the results of Hann et al study is that the specific work that the participant perform not lead to more money, but the status that he receives from doing a good job is working as signals that raises the chances of getting a higher wage. Even though money is the main extrinsic motivation, signaling might be an even stronger motivator for paid contributors since its outcome leads to money and the programmer knows that.

5.4 Gift Giving

A lot of the contributors are giving many of the gifts to the community for other reasons than to get something in return; even if they don't get a gift in return, they are willing to share their work. The reason to share might be extrinsic motivated, since the

contributor know that he will receive status by making his work public. Signaling, reputation and peer recognition are all attributes that might motivate the act of sharing without expecting anything concrete back. If the contributor is paid, there is always an extrinsic motivation in form of money. The paid programmer will always to some extent be extrinsic motivated while the unpaid contributor can, at least in theory, be totally intrinsic motivated.

The gift giving is a crucial element in open source, no matter if you are paid or not. For the paid contributor, gift giving can be a way of getting inside the open source community and start creating relations. The creation of relations means that the participant's initially extrinsic motivation may be perhaps not totally transformed, but at least less strong compared to his intrinsic motivation. The feeling of belongingness might transform the quest for reputation into a search for peer recognition; being admitted as a good programmer by peers is according to studies more important to an unpaid contributor, but when the paid programmer sees that the gift giving is paying off he will try to be a part of the successful culture in order to reach his monetary goal. When doing this, he will acknowledge peer recognition which makes his earlier motivation for money less important and his new motivation for peer recognition more important – the social relatedness that the paid contributor feel with the other contributors increases his intrinsic motivation. Therefore, my conclusion is that gift giving may enhance the paid contributors chances of developing intrinsic motivation because of social relatedness. The paid contributor comes one step closer to the "kinship"-structure when reciprocating, since reciprocating is one of the most important rules in the open source development.

5.5 Reputation & Peer Recognition

The reputation forms the programmers status within the community as well as outside (signaling) and competence is needed if gain is to be won from reputation. It is therefore easier for those programmers who have the need for competence to gain reputation (extrinsic motivation) and peer recognition (intrinsic motivation). Data from Lakhani shows that reputation is as important to paid contributors as it is to unpaid contributors. Bonaccorsi & Rossi's survey does however show that paid contributors are more eager to create themselves a reputation than unpaid contributors. This might be an indicator that those who already are extrinsic motivated by other attributes is more prone to be motivated by other extrinsic motivations as well. These correlations can also be found between money and reputation; those who are motivated by money are also more eager to get themselves a reputation that gains their motivation. You can see the same correlations for intrinsic motivation; autonomy stimulates the need for competence and learning, making intrinsic motivated contributors more intrinsic motivated.

When paid and unpaid contributor comes together, the data that I have found indicates that although unpaid contributors becomes more extrinsic motivated than before and paid contributors become more intrinsic motivated than before, the latter change in motivation is the largest. Deci proved that the nature of the feedback affect motivation and it would be interesting to see a study that investigates if there are any differences in feedback between paid and unpaid contributors. Knowing this could give us more knowledge about the paid contributor's odds on developing intrinsic motivation compared to those who already are contributing on mainly intrinsic motivation. Since all members of the open source are seen as lone members, they also receives acknowledgement as an individual. Therefore, paid contributors should have the same opportunity as unpaid contributors to receive positive feedback and by that strengthen their intrinsic motivation. This area does however need more research.

5.6 Autonomy

Since participants in open source can choose their tasks by themselves, their intrinsic motivation grows. A paid contributor may choose his task, but he is also likely to be governed by the organisation that he represents. With less autonomy, his intrinsic motivation decrease and at the same time affects other intrinsic motivations than autonomy. It is proved that external intervention crowd out intrinsic motivation if the individual feels them to be controlling. When the paid contributor feels controlled, he works no more than enough to reach the external target which affects learning negatively since he doesn't learn as much as he could have.

An unpaid contributor that feels self-determination and autonomy works because he has chosen to by himself; he will not take any shortcuts since he genuinely loves what he does and this also increase learning. He works on code that he "owns", and he can put a larger amount of his effort and add it to his personal online portfolio since he have chosen the subject himself. The action is the target in itself, which mean that autonomy will enhance learning. This could also means that the intrinsic motivation of autonomy increases the extrinsic motivations of reputation, peer recognition and signalling because the contributor can show more skills when he have had autonomy. It is however not sure that he actually wants to brag about his competence if he is genuinely intrinsic motivated.

5.7 Need for Competence

Feelings of autonomy is necessary in order to gain from the feeling of competence.The contributor can fulfill his need for competence no matter if he is paid or not. Studies show however that unpaid contributors see the need for competence as a much more important motivator than paid contributors. This might be because paid contributors already have a receipt on their competence in form of monetary rewards. Money might work as a substitute for the intrinsic feeling that first brings the programmer to the table. The need for competence will be less powerful accompanied with money than accompanied by autonomy; Ryan and Deci showed that the need for competence must be followed by autonomy in order to enhance intrinsic motivation. Without autonomy, the contributor isn't fully responsible for the task.

Since paid contributors have less autonomy than unpaid contributors, we can draw the conclusion that the need for competence strengthen the unpaid contributors intrinsic motivation more than it strengthen the paid contributor's intrinsic motivation. Because a "Driving force" is needed to gain the knowledge that is needed, the intrinsic motivation is extrinsic at the same time. Some participants are seeking the status of a hacker and hold therefore an extrinsic motivation, but in order to gain the status they need intrinsic motivation. I propose that wannabe-hackers extrinsic motivations over time lead to intrinsic motivations because when they engage in the task, they will be influenced by the other contributors and the open source culture.

5.8 Learning

According to several studies, learning is the most important motivation for participating in open source. Studies show that unpaid contributors value this motivation higher than paid programmers which could mean that the extrinsic motivation that drives the paid programmer is decreasing learning as a motivator. This might also indicate that the paid programmer's skills are decreasing because they are paid, which in the long term would affect their extrinsic reward in terms of money.

The extrinsic motivation is actually working against themselves and can therefore be seen as self-destructive. Learning is more efficient together with social interaction because developers learn from practice. This gain both paid and unpaid contributors since all members are seen as individuals in open source development. It may actually make the paid contributors motivation more intrinsic because when he learns from the social interaction he may feel a growing social relatedness which in turn makes it easier for the community to accept him.

Himanen mentions a correlation between learning and gift giving. The competence that is gained from learning might be used to improve the contributor's status. Even though the developer not are learning to improve his reputation, it may be a side-effect that comes when the developer want to return gifts to the community. The contributor is therefore extra rewarded when he learns; he returns the gift and feel intrinsic well, but does also get a reputation for his action. It is a win-win situation and a big reason for an paid contribute to internalize his motivation towards intrinsic motivation.

5.9 Play

Where Ford often is seen as the father of mass production, the open source movement embrace an ideology that could be seen as its antithesis. Mass production has turned into customized and individualized products that demand other skills from the worker than just blood, sweat and tears. Joyfulness and creativeness makes us more productive. These two attributes are components of the intrinsic motivation that might be the most important of them all when it comes to developing open source software. There are several studies that show that play was one of the main motivations for participating in open source. The challenges stimulate the programmer, and since he still has his freedom (autonomy) he does not feel the pressure that a paid developer might do. He is neither over stimulated or under stimulated. These conditions are ideal for developing intrinsic motivation and even though the paid contributors can enjoy their work, they might be disturbed by the potential loss of autonomy. They might enjoy play as much as the unpaid contributors in periods but over time the paid contributor will most likely be affected in the disturbance of autonomy.

It is my theory that the paid contributor can't exploit the benefits of play to its maximum as an unpaid contributor can because of the limited autonomy, and this makes his intrinsic motivation decrease. Although not maximizing benefits from play, the paid contributor might enjoy play because he has the safety of monetary compensation. This might make him more relaxed and less stressed. Joyfulness makes us more productive, and to be a part of the open source culture you need to have a playful mind, no matter if you are paid or not.

5.10 Ideology motivation

The hate against proprietary software is not at all as strong as the love for keeping the code free. This is synonymous with Generation Generosity and their philosophy. Generation G is disgusted by greed, so the hacker participants in the community is not seeing the paid contributors presence as greedy. There are evidence that show that the unpaid contributors are not minding the participation of paid contributors as long as they follow the norms and rules (especially by keeping the code free).When the paid contributors have accepted the rules and norms of the open source society they are equal, no matter if they are paid or not. When money is a motivation for participation, suspicion may occur. This seems to be the case when the contributor has extrinsic motivations, and this might also decrease the groups benefit as a whole because the lack of trust create cracks in the community.

There are also results that indicate that the old hacker culture that open source arose from are living like a nostalgic dream in some contributor's eyes. They want the myth to live on, but in a "light version" compared to how it originally was developed. Extrinsic motivation have clearly grown, but the results In Lakhani´s study shows that they are stronger among paid contributors; only 11,8 % of the paid contributors was in it to keep the code open compared to 33,1 % among the unpaid. The results did however indicate that the paid developers were welcome; there were no difference in motivation for beating proprietary software. There are ideological and intrinsic motivated people that guard the open source code of law like hawks. Although evidence shows that the war between open source and proprietary software is more or less a myth, this does not mean that the hackers are leaving their ideals and beliefs behind. Hackers do still have a strong belief in keeping the code open, and if the paid contributors not respect this he will not be accepted by the community. It is more important to keep the code from greedy companies which further indicate Tapscott and Williams's suggestion that the paid programmer is seen as an individual when he participates in the community. When the unpaid contributors sees the paid contributors adjust to the same rules and norms that he believes in it is likely that the paid contributor will be accepted in the community. As Bergquist mentioned; humiliation can be a way of get acceptance and that is what is happening here. The actual motivation may be subordinated to the behavior that determines if the contributor is accepted no matter if he is paid or not.This simple rule (respect us and become one of us) makes it also easier for paid contributors to internalize their extrinsic motivation and might create a snowball effect – the intrinsic motivation that is created as the paid programmer boosts his intrinsic feelings for the community makes him even more alike his community fellows and leads to a greater feeling o belonging, a basic human need. The feeling of belonging are now authentic and may therefore lead to social relatedness on the same terms as the unpaid programmer who are intrinsic motivated.

Ryan and Deci wrote that the primary reason people are likely to be willing to do behaviour is that they are valued by significant others to whom they feel connected to. This also means that the social relatedness that the paid contributor feels when being accepted in the community leads to an increase in extrinsic motivation. It is a kind of gift giving; the hacker's gives their trust to the paid contributor who responds by living up to the expectations set on him. This is in the interest of the open source core, since the open source movement get more powerful when it gets more members, no matter if they contribute or not. Von Hippel and Von Krogh found that free-riders were welcome; the contribution of the group as a unit and voice for open source is seen as most important. The advantages of contributing were the intrinsic rewards like competence that the programmer received, because this was something that those who did not contribute didn't receive.

5.11 Social Relatedness

The shared experiences that come from participating in an open source project might transform the extrinsic motivation that drives the paid developers into intrinsic motivations since social interaction group identity. When the paid contributor becomes a part of the group, he are also more likely to contribute to the common good by intrinsic motivations since the people around him now have started to mean something; the contributor feels social relatedness and a responsibility to return gifts that has been given to him. He now has something to lose; his status in the community. Status is important to the paid contributor for social reasons; if he´s not accepted by the community, he cannot do his job well and therefore his monetary reward will decrease. But when the paid contributor feels a social relatedness to the shared culture, he will also be craving for peer recognition and to be a good example of the

community spirit since he is a human being and, as Yoshi Benkler puts it, social gratification is important. He wants to return the gift of reputation that he has received from the other participants and live up to their expectations. If the paid contributors embrace the rules of the community, the community will accept him as a contributor. Selfishness breeds selfishness, like Shirky mentions in his book. The opposite should also be true, especially when it comes to Generation Generosity. It is the intrinsic motivated contributors that keeps the moral and order by act as good examples; through their unselfish actions, an unselfish system can be created and this increases intrinsic motivation in general. Unselfishness breeds unselfishness. When monetary rewards are involved, this might be seen as selfishness or injustice by unpaid contributors.

There seems to be a correlation between the attitude towards paid contributors and group cohesiveness – when financial inequalities are a fact, this might damage the collaboration and at the same time make the divide between corporations and volunteer developers grow. The shared culture within the volunteer community becomes stronger, and the paid contributors might have harder to break that wall and become a part of that shared culture. Thus, we can conclude that paid contributors might have difficulties in gaining the same benefits as unpaid contributors in the community if the financial situation creates envy. The paid contributor's extrinsic motivation in form of money might therefore decrease his chances of gaining the same benefit as the unpaid contributors from social relatedness and at the same time reduce his chances to develop intrinsic motivation; "if you don't care about me, I don't care about you and keep focusing on my extrinsic reward (money) that you can't control".

6 VERIFICATION

Because of the short time, I have chosen to present a logical verification that at least partly backup my theories. Krishnamurthy sees a new employee motivation grow in open source and this is what I have been trying to emphasize throughout this paper; when paid and unpaid contributors come together, new motivations are created just like Krishnamurthy says (Krishnamurthy 2006). Nov assumes that the correlations that he found in his study of motivation behind Wikipedia contributions involves causality which is much alike my conclusion that all motivations, no matter extrinsic or intrinsic, is causally integrated and affecting each other in every second (Nov 2007).

Another important verification is made by Hars and Ou, who out that students and hobbyists are the most internally motivated (Hars & Ou). Since most students and hobbyists are unpaid, the thesis that unpaid programmers are most intrinsic motivated is strengthened. Hars and Ou also found that self-marketing is one of the paid contributor's most important motivations. In my study, I found reputation as one of the main motivations for paid contributors which are in line with earlier research.

Ryan and Deci conclude that internalization is the process through which extrinsically motivation becomes more self-determined with respect to extrinsic motivation (Ryan & Deci 2000). In my paper, I have mentioned internalization as a way for paid contributors to transform their extrinsic motivation into intrinsic motivation and the higher self-determinations that Ryan and Deci mentions fits well with my theory that the contributor will have a better chance of achieving his extrinsic targets as well. The higher self-determination, the more intrinsic motivations and by that a better chance of adjusting to the community and in the end reach their extrinsic monetary goal. Zeitlyn concludes that the hierarchy in open source is a matter of receiving more or less attentions (Zeitlyn 2001), and I found similar results; attention leads to reputation, and reputation man transform intrinsic motivation into extrinsic motivation.

My conclusion that paid contributors are more vulnerable are supported by among others the Gallup report, who concluded that engaged workers cope better with stress and intrinsic motivation leads to engagement (Gallup). It I also supported by Himanen and Mikkonen, who mentions the Protestant ethics social pressure on the paid contributors; this pressure might make it hard to live up to those motivations that is needed to maximize their main target.

Pink goes against my theory that Autonomy might be an efficient short term motivation (Pink 2008). I believe that we are seeing the situation from different perspectives; Pink means that control may decrease autonomy and in the long term make the contributor less efficient. I am not arguing with this, but with my conclusion I would like to add that even though the autonomy is less on the long term and this decrease the intrinsic motivation, the negativity in this happening may not be larger than the positivity in the fact that the contributor have the safety of a monetary reward that lets him focus on his main interest.

My belief that the most efficient motivation is intrinsic motivation is supported by Ryan and Deci, although Krishnamurthy emphasize that intrinsic and extrinsic motivation must be seen from joint perspective. In this paper, I have agreed upon Krishnamurthy's holistic view but also added my view that intrinsic motivation in the end will lead to more efficiency for the individual as well as the organization. This theory is verified by Hars and Ou, who points out that open source programmers with intrinsic motivations will spend more time and effort in open source projects (Hars & Ou 2001).

7 MY CONTRIBUTIONS

No motivation is sufficient on its own or bigger than the sum of its parts; only a holistic view can give us valid clues about how motivation affects open source participants. Different motivations including both intrinsic and extrinsic motivations affect the total sum of motivation differently, and this is where the real gain is to be found in research. If those parts that enhance each other the most can be found, the sum of all motivation can be optimized.

In my work I have tried to find some of the correlations that exist between different motivations in order to see motivation in open source software development from a larger perspective. My conclusion is that intrinsic motivation should be seen as a desirable goal in open source software development since it seems to lead to higher psychological satisfaction, less stress, creativity and higher working effort. The social pressure from the Protestant ethic may decrease the paid developer's intrinsic motivation because of the lower autonomy. At the same time, intrinsic motivation may increase since the paid contributor can do what he loves on full-time and this result in that money becomes less valuable. Paid contributors are more vulnerable than unpaid contributors because they have something to lose; their wage. If this extrinsic motivation is lost, the contributor's intrinsic motivation for the task will decrease as well and therefore harm the project.

When it comes to signalling, paid contributors may increase the unpaid contributor's extrinsic motivation because the latter knows that more eyes will be focused on the project and him. By signalling to potential employees, the unpaid contributor might be able to get a job that lets him do what he love on full time (develop code). This means that extrinsic motivation might give way for the possibility to actualize the intrinsic motivation and reach self-actualization. Even though money is the main motivation, signaling might be an even stronger motivator since its outcome leads to money.

Gift giving can be a way for the paid contributor to get inside the open source community and start creating relations. Sharing code might be extrinsic motivated since the contributor know that he will receive status by making his work public. Although his initial motivation might have been a quest for status and reputation, the feeling of belongingness may transform that quest into a need for peer recognition. Gift giving may therefore enhance the paid contributor's chances of developing intrinsic motivation because of social relatedness, a basic human need.

The social relatedness that the paid contributor feels when being accepted in the community may also lead to a higher need for peer recognition and an increase in extrinsic motivation. If the paid contributors embrace the rules of the community, the community will accept him as a contributor. The peer recognition is also important to the paid contributor for extrinsic reasons; if he's not accepted by the community, he cannot do his job well and his monetary reward will decrease. Peer recognition is therefore closely connected to money as a motivator for paid contributors. A need for competence makes it easier to gain peer recognition and reputation, and the same goes for money.

Autonomy stimulates the need for competence and learning. Competence may be gained from learning and might also be used to improve the contributor's status. The need for competence strengthen the unpaid contributors intrinsic motivation more than it strengthen the paid contributor's intrinsic motivation, which in another indication that intrinsic motivation leads to even stronger intrinsic motivation. Paid contributors who engage in open source may over time transform extrinsic motivation into intrinsic motivations (internalization) because of influences from other contributors and the open source culture.

The paid contributors limited autonomy may stop him from exploit the benefits of play to its maximum, and this could make his intrinsic motivation decrease. Although not being able to maximize his benefits from play, the paid contributor might enjoy play because he has the safety of monetary compensation. This may make him more relaxed and less stressed, which in the long term can make play more rewarding for paid contributors than for unpaid contributors who have to code on their free-time; in the end, it might be the amateurs that are following the Protestant ethic where work and leisure are separated instead of the paid contributors that can spend both their working time and free-time on their passion.

One result that speaks against this thesis is that a decrease in autonomy means a decrease in intrinsic motivation. Since autonomy enhances learning, also learning will decrease and make the contributor less knowledgeable. Autonomy may increases the extrinsic motivations of reputation, peer recognition and signalling because the contributor can show more "own" skills when he have had autonomy – the work feels more like his own and he can brand it within the software. The paid contributor may therefore have less quality time programming although he have more quantity of time since his intrinsic motivation is lower than the unpaid contributors.

Unpaid programmers appreciate learning as a motivation higher than paid programmers. This could mean that the extrinsic motivation that drives the paid programmer lowers learning as a motivator and that the paid programmer's skills are decreasing because they are paid. This would also eventually affect their extrinsic reward in terms of money negatively. Learning were found to be more efficient together with social interaction, which indicates that it is critical for the paid contributor to be able to get inside the community in order to keep up with the unpaid contributors. The paid contributor's intrinsic motivation may grow because when he learns from the social interaction he may feel a growing social relatedness which in turn makes it easier for the community to accept him. My results indicate that it is the behavior that determines if the contributor will be accepted, no matter if he is paid or not.

Unpaid contributors does not mind paid contributors and do not see them as greedy, although there may be a suspicion toward them. Keeping the code open is the most important value to the unpaid contributor. The advantages of contributing versus not contributing are the intrinsic rewards (like learning) that the programmer receives. Because the contribution is seen as the reward in itself, even those who are not contributing are welcome since they strengthen the open source as an ideology. Paid contributors might however have difficulties in gaining the same benefits as unpaid contributors in the community if their financial rewards create envy. The paid contributor's extrinsic motivation in form of money might in this case decrease his chances of gaining the same benefit as the unpaid contributors from social relatedness and group cohesiveness and at the same time reduce his chances to develop intrinsic motivation.

To conclude my findings, intrinsic and extrinsic motivation are affecting each other in every second, creating a complicated chain of causality. My results indicate that intrinsic motivation that is the driver of amateurs and volunteers leads to higher psychological satisfaction, less stress, creativity and higher work effort. This strengthens my theory of intrinsic motivation as increasing productivity and quality compared to extrinsic motivation.

The paid contributor's lower autonomy may result in a decrease in intrinsic motivation; when the contributor has more autonomy, he may gain more quality from play, learning and social relatedness. Autonomy may lead to more efficiency on a short term while money works better in the long term since it creates continuity.

The paid contributors are more vulnerable since their extrinsic motivation in terms of money is reached only when many other motivations are fulfilled. If the extrinsic motivations can be internalized into intrinsic motivation, the paid contributor will have a better chance of reaching his extrinsic targets as well. Need for competence as a

motivator is likely to enhance peer recognition and reputation for the paid contributor. The paid contributor's intrinsic motivation may grow from social interaction, something that is inevitable in open source software development. This indicates that paid contributors intrinsic motivation may increase from collaboration with unpaid contributors, but not necessarily because the contributor is unpaid but simply because he or she starts to feel social relatedness.

Unpaid contributors might use the paid contributor's presence for signaling, which mean that their intrinsic motivations may transform into extrinsic motivation. Gift giving may increase the paid contributor's intrinsic motivation through social relatedness.

My results indicate that it is the behavior that determines if the contributor will be accepted, no matter if he is paid or not.

8 CONCLUDING REMARKS

My results have been built upon earlier theories and data from the leading researchers within open source and motivation. In order to secure the validity in my theories, practical studies need to be arranged that treats the subject in its actual context. The reliability also needs to be secured since many of my theories heritage from just a few studies and some of them have been executed in other contexts than the open source. Because open source is spreading outside the software development area, such studies could help other fields to evolve as well and perhaps save them from making old mistakes. If I ought to be self-critical, my work process could have been more structured when it comes to method and process. I do not feel, however, that the loss of structure in working process is something that have harmed the results an findings that I have made, merely extended the workload and eaten time from other activities that should have been done instead

I have done my study through a literature synthesis in which my results act as theoretical suggestions for further research. I do by no means suggest that my words is the absolute truth, what I am trying to show is how possible scenarios that are likely to happen in the open source context may affect each other and what this mean. My suggestion for further research in the area is that every motivation should be studied separately but at the same time in a larger context. By letting other motivations affect the specific motivation that is studied, correlations can be found that hopefully take the research forward.

An interesting question for the future may be to find out how intrinsic motivation creates a flow in the developer and how this affects the efficiency in open source software development. It would also be interesting to see a study that investigates if there are any differences in feedback between paid and unpaid contributors. Knowing this could give us more knowledge about the paid contributor's odds on developing intrinsic motivation compared to those who already are contributing on mainly intrinsic motivation.

One suggestion of choice of method in future research is to integrate with the open source developers in their home arena (their community) during a longer period of time and passively study them, their behaviour and the results from their work. Doing this in both communities where all developers are paid, communities where some of the developers are paid and communities where no contributors are paid may enhance our understanding for how intrinsic motivation can be boosted in order to create more a better world. It is my belief that we would get a happier, healthier and more nonviolent world if everyone followed their intrinsic passions. Goodness comes from within.

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