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# Does Money Matter? Motivational Factors for Participation in Paid- and Non-Profit-Crowdsourcing Communities

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# Does Money Matter? Motivational Factors for Participation in Paid- and Non-Profit-Crowdsourcing Communities

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**Abstract.** Crowdsourcing, the use of an undefined group of external people to complete tasks for the corporation, gained significantly in importance over the last years. Yet little is known about the factors that motivate participants to join crowdsourcing communities.

This paper compares the findings of Kaufmann et al. [1] who conducted a study on MechanicalTurk -a profit oriented software development crowdsourcing platform- with the results of a questionnaire posed to the members of MobileWorks - a non-profit crowdsourcing platform.

Findings show that many motivational factors apply consistently whether for-profit or for-fun. However, some factors differ significantly; especially extrinsic factors are of far more importance in for-profit communities. The deeper analysis reveals that society may see a larger trend towards crowdsourcing as mean of employment, as more and more individuals regard it as serious work and reliable source of income.

**Keywords:** Crowdsourcing, Motivation Theory, Extrinsic/ Intrinsic Motivation

## 1 Introduction

The open source software (OSS) movement in the 1980ies built a foundation for the distributed development of software through a geographically non- localized community of programmers [5]. OSS developers use the internet to share software and code, coordinating the development of open source projects such as Apache Web Server, Linux etc. and provide the possibility to download, modify, use and further develop the communities' software [7]. By creating novel software codes and freely reveal it to the public, the OSS community neglected the commercial (i.e. financial) edge but gained appreciation for robust and easily modifiable code. Over time, OSS proved to be a viable economic model of private investment and collective action [5], [8]. The OSS community demonstrated a new and successful way how a group of programmers is able to develop software even without receiving any monetary compensation [9], [10].

The transformation of the World Wide Web through the collaborative mechanisms of Web 2.0 opened new ways for OSS communities for working together as it facilitates participation for information sharing and collaboration within virtual communities. However, there is still little understanding on how online community members get stimulated to participate, create and share content [11].

This research investigates the intrinsic and extrinsic motivation of individuals to participate in distributed software production. To cover different aspects of motivation (including monetary compensation) the research object has been extended to include not only OSS software but all types of software (including commercial software). Therefore the mechanisms of crowdsourcing are analyzed according to the following definition: "*crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call.*" [12]

The theoretical base for this paper is the research model developed by Kaufmann et al. [1] which contains classic motivation theory [2], work motivation [3] and open source theory [4]. A combination of qualitative and quantitative empirical measures has been used to gather new insights into the mechanisms of this new type of outsourcing structure. To account for specific effects depending on organizational structures the research domain has been set to small and medium-sized enterprises (SMEs) in the software development industry (and thus crowdsourcing communities working for those clients).

The paper is organized as follows: First the selected research domain is being discussed, followed by a review of the literature and the resulting description of the research gap and explication of the research question. This is followed by the research layout and description of the research method and its execution. The paper closes with a discussion of the findings followed by limitations, further research and the final conclusions.

## **2 Research Domain**

Crowdsourcing is a relatively new topic which shows a promising trend to be implemented as an alternative mode of software production by large companies, especially in Northern America. However, the number of SMEs using crowdsourcing is still comparatively low [13].

In-depth understanding why SMEs are lagging behind is still scarce. One reason postulated is that SMEs -specifically in Europe- have a high level of risk aversion which could lead to resistance in implementation of crowdsourcing and open innovation processes [14]. Nevertheless, SMEs need to position themselves for a new way of collaboration since several trends are pointing in the same direction like innovation strategies which move from closed to open innovation [13].

To enhance understanding of the described mismatch SMEs have been selected as research domain.

### 3 Review of the Literature

This section examines the available literature on worker's motivation in different crowdsourcing domains.

#### 3.1 Collaborative Practices in SMEs: Opportunities and Challenges

In various aspects SMEs differ considerably from large corporations. Decision-making is centralized to a few responsible individuals and bureaucracy is reduced. Limited long-term planning, greater dependency on external services and expertise, fewer financial resources, lower technical expertise and weaker management skills are crucial factors [16], [17].

The general challenges for SMEs are to "*sustain interoperability to larger entrepreneurs for better opportunities, to intermediaries for improving their capacities, and to the grass roots clients for offering better services*" [18]. Building new competences despite a lack of expertise and funding are further challenges. Crowdsourcing can become a suitable model to overcome some of these obstacles. A comparable model is that of open innovation where the role of internal research (R&D) changes from knowledge generation to a knowledge-brokering model [19].

Using these mechanisms SMEs can create new challenging ideas and position themselves to interact with large firms as well as individuals. Considering the possibility that several solutions with different technical paths could be provided by the crowd, this multiplicity of options needs to be taken into account for crowdsourcing to reach its full potential [13, 20]. Furthermore, receiving information from the crowd on a certain topic requires time and skills by the company employees involved. The multitude of different options can be seen as a threat through information overload [13]. This proves problematic for SMEs, fostered by a lack of time, activity and affordable resources that are not related to core business activities. In this context, Maiolini mentioned, "*the real power of the facilitator derives from his capabilities to acquire and convoy the wisdom of crowd*" [21].

A possible outcome of this trend towards collaboration would be to partner with other SMEs, online communities, or large organizations in an institutionalized way. SMEs would be able to connect their R&D department to agents outside the firm's boundaries by adopting an "open" paradigm to their current business model. All parties involved could benefit, particularly if projects complement each other's competences [22], [13]. Crowdsourcing thus can help SMEs evolve from competition to cooperation in the marketplace [18].

The risk of receiving a non-satisfactory input is likely to disappear if firms arrange an open call with financial incentives. Hafkesbrink and Scholl described that inter-firm relationships can be applied to crowdsourcing by combination competences of numerous individuals through integrated organizational and individual mechanisms [22]. By applying the Open Innovation paradigm through the reduction of internal independencies and R&D, Chesbrough [19] sees a chance for SMEs to enter into new markets by creating new value chains.

Nevertheless, there are some crucial challenges for crowdsourcing adoption by SMEs. According to Maiolini and Naggi a major challenge for a successful adoption of the crowdsourcing paradigm is to find new ways to internalize knowledge from outside the organization another one how to maintain this form of relationship [13]. Additionally there is an issue of trust towards external participants' contributions and external members require long-term motivation for a continuous and successful collaboration. Another major challenge is the question concerning the abilities and characteristics of the owner or CEO to manage crowdsourcing practices. Furthermore, the executive level vision or their lack of can impede small firms from innovative practices. This topic has already been considered in the context of Information System studies on characteristics of owners or CEOs [13]: innovativeness [23]; skills and knowledge [24]; age, educational level, gender and management experience [25]; creativity and attitude toward risk [26].

### 3.2 Motivational Aspects to Participate in Crowdsourcing Actions

Leimeister [27] analyzed motives and incentives within the *SAPiensi Idea Competition community*. The authors focused on literature from sports and open source competitions that follow the four overall motives direct compensation, learning, self-marketing and social motives. The study did not include intrinsic motivations.

Brabham [28], [29] investigated motivational aspects on the platform *iStockphoto*, a well-known platform for photographs, by conducting a question-based survey related to different motivational components. The results out of this study show that the possibility of earning money is the most dominant motivation; moreover, he analyzed the t-shirt contest site *Threadless* by conducting qualitative interviews. The results show five main motivations: Love of community and addiction to the community on the intrinsic side, and earn money, improve creative skills and get employed as a freelancer on the extrinsic side.

Ipeirotis [30] and Kaufmann et al. [1] analyzed motivational aspects in paid crowdsourcing platforms like *MechanicalTurk*. Their results indicated the intrinsic aspects: fruitful way to spend free time, kill time and tasks are fun, and primary source of income and secondary source of income on the extrinsic side as the most powerful motivational factors for participation.

Organisciak [31] investigated crowdsourcing motivations that are published in online sources like blogs etc. His findings show that the aspects of fun and interest on the intrinsic side and money making and self-benefit on the extrinsic side dominate.

Additionally, investigations in the open source movement show that "voluntary" and "unpaid" participation as well as "hobby" are the most common drivers for contribution in an (unpaid) open source project [4], [9].

Finally and most important, the results of the *MechanicalTurk* Study conducted with a combined model [1] containing theoretical researches from classic motivation theories [2] work motivation [3] and open source software theory [4] model shows that it is possible to distinguish "occasional workers" from "power workers". Moreover, the variable "payment" and "task autonomy" are the most fundamental values found in this study [1].

### 3.3 Formulation of Research Question

The literature review indicates that (a) SMEs are a viable domain for crowdsourcing research and (b) understanding on the motivational factors of individuals to participate in crowdsourcing actions is still in its infancy.

This leads to the key research question of this paper: "*What are the motivational factors for individuals to participate in crowdsourcing?*"

As discussed above, this question will be investigated in the context of software development tasks in small and medium sized enterprises.

## 4 Research Model

Kaufman et al. [1] found that many papers investigating motivation in the field of OSS are limited to a special point of view. For instance Roberts, Hann and Slughter [32] used a specific open source software model, Lerner and Tirole [33] focused their analysis on labor economics and Hertel et al. [34] assessed the social factors of OSS.

To overcome the resulting limitations Kaufmann et al. utilized the approach of Lakhani and Wolf [4] and assumed the extrinsic and intrinsic motivational factors depicted in tables 1 and 2. Lakhani and Wolf [4] described a basic model that separates intrinsic and extrinsic motivation. They tested the categories: Enjoyment Based Motivation, Community/ Obligation Based Motivation on the intrinsic side and Immediate Payoffs and Delayed Payoffs on the extrinsic side. This extensive coverage of motivational aspects is suitable as a basis for investigating the crowdsourcing environment [1] and has been adopted for the use of the combined model.

### 4.1 Intrinsic Motivation

A Part of the model consists out of Hackman and Oldham's [3] developed model in the area of job characteristics. It includes three psychological states, which are responsible for the internal motivation of a worker: (a) Experienced meaningfulness of work (b) Experienced responsibility for outcomes of work (c) Knowledge of the actual results of the work. [3] identified for each of them one or more stimulating job characteristics, these are: (a) **Skill variety, task identity, task significance**, (b) **Autonomy** (c) **Feedback from the job** [1].

Further investigations about return on education provide insights about additional motivation with regard to delayed payoffs. [35] And [4] explain the relationship between knowledge and skills and how these can be transformed into material advantages: (a) **Signaling** and (b) **advancement of human capital** [1].

Table 1 provides an overview of the intrinsic motivational factors:

**Table 1.** Intrinsic motivational factors [1]

	<b>Construct</b>	<b>Definition</b>	<b>Source</b>
<b>Enjoyment based</b>	Skill Variety	Usage of different skills which are necessary to solve a particular task. The higher the amount of skills is, the greater should be his motivation.	(Hackman and Oldham, 1980)
	Task Identity	Refers to the completeness of a task, the more tangible the results of the work is, the higher is he motivated	
	Task Autonomy	Explains the degree of freedom the worker has during task execution. The higher the worker can influence his own ideas the workers motivation will be better.	
	Direct feedback from the job	Explains how significant a sense of achievement can be perceived during or after task execution.	
	Pastime	If a worker acts just in order to kill time.	(Brabham, 2008)
<b>Community based</b>	Community Identification	Explains how a worker adapts norms and values from the crowdsourcing community.	(Lakhani and Wolf, 2005)
	Social Contact	Refers to the appearance of motivation caused by the existing of the community	(Brabham, 2008, 2010)

Kaufmann et al. [1] separate two categories within the intrinsic model: The Category of Enjoyment Based Motivation is measured by the constructs Skill variety, Task Identity, Task Autonomy, Direct Feedback from the Job and Pastime. The category Community based Motivation is measured by the constructs of Community Identification and Social Contact.

#### 4.2 Extrinsic Motivation

The extrinsic motivation separated into three categories: Immediate Payoffs, Delayed Payoffs and Social Motivation. All types of monetary compensation received for working on crowdsourcing tasks are covered in the **payment** construct. Delayed pay-offs comprises all benefits in order to generate material welfares in the future, measured by the constructs **signaling** and **human capital advancement**. Social motivation comprises from values: **action significance by external values, norms and obligations** as well as **indirect Feedback from the Job**.

Table two provides an overview of the extrinsic motivational factors:

**Table 2.** Extrinsic Motivation of the combined Model [1]

	Construct	Definition	Source
Immediate payoffs	Payment	Motivation by monetary compensation received for completing a task.	(Lakhani and Wolf, 2005)
	Signaling	A worker who wants to join a platform in order to show presence and being noticed by possible employers.	(Lakhani and Wolf, 2005; Weiss, 1995)
Delayed payoffs	Human capital advancement	Refers to the motivation to advance skills that could be important for possible material advantages in future.	(Lakhani and Wolf, 2005; Weiss, 1995)
	Action Significance by External Values	Motivational aspects with values from outside the crowdsourcing community.	(Deci and Ryan, 1985; Hackman and Oldham, 1980)
	Action Significance by external obligations and norms	Motivation provided by a third party from outside of the crowdsourcing platform.	(Hackman and Oldham, 1980)
Social motivation	Indirect feedback from the job	Motivation caused by feedback about the delivered work results by other individuals.	(Hackman and Oldham, 1980)

The research model developed by Kaufmann et al. [1] contains theoretical researches from classic motivation theories [2], work motivation [3] and open source software theory [4] and aims to cover the intrinsic and extrinsic motivations of individuals to participate in crowdsourcing communities. It is used as basis for the investigations of the *MobileWorks* platform.

## 5 Research Method

Data collection was done via an online self-reported survey using the software LimeSurvey. The questionnaire has been posted on *MobileWorks*, a crowdsourcing platform for businesses and developers, specializing in developing software applications [37]. Participants were forwarded to the survey which consisted of 34 questions. All items were measured using 7-point Likert scales.

From February 1<sup>st</sup> to February 5<sup>th</sup> 2012, 323 responses were collected whereby 43 incomplete responses have been excluded resulting in 280 complete replies.



The survey questions are based on Kaufmann et al. [1]. For every construct (Skill Variety/ Task Identity/ Signaling etc.) two types of questions were designed: One, that directly address the reader with a well-explained question; in addition, a supporting question that ensures a better understanding of the question to avoid irritations of the participants [1].

Measuring 13 constructs with 2 items leads to 26 survey elements about motivational aspects; moreover, demographic questions (e.g. annual income, gender, current employment status, age etc.) have been adapted from existing studies [1], [30], [36].

## 6 Results

### 6.1 Differences in Motivational Aspects

Table 3 shows an overview over the mean comparison test. For every motivational aspect on the left hand-side of the table (Payment, Signaling etc.) the following values are calculated (1= Kaufmann et al. study, 2= this study): mean value (MV), standard deviation (Std.), test-value (TW), degree of freedom (DF) and the acceptance of the H0 hypothesis.

The aim of these calculations was to identify and test the H0 Hypothesis: “mean values are equal” ( $H_0: \mu_1 = \mu_2$ ). This calculation was enabled by the use of the Student’s t-Test which goal is to compare the means identified for each motivational aspect. Popular levels of significance are 10% (0.1), **5% (0.05)**, 1% (0.01), 0.5% (0.005), and 0.1% (0.001). If the test of significance gives a value within the critical area ( $\alpha=0,05\%$ ) the null hypothesis is **rejected**. The average value does not significantly differ from each other and is **accepted** if the value stays within the confidence interval of CI=95%.

$$TW \in \text{critical area} \geq 1,65 \rightarrow H_0 \text{ rejected} \rightarrow \text{MV differ significantly} \quad (1)$$

$$TW \notin \text{critical area} \leq 1,65 \rightarrow H_0 \text{ accepted} \rightarrow \text{MV does not differ significantly} \quad (2)$$

### 6.2 Comparison of Quantitative Results

In contrast to the results of Kaufmann et al. where the intrinsic motivation dominates its extrinsic counterpart (see Table 3), the results of this study show the extrinsic motivation (e.g. Payment, Signaling, Human Capital Advancement or Action Significance by External Values etc.) dominates its intrinsic complement (e.g. Skill Variety, Task identity or Direct Feedback from the Job etc.).

Both studies come to the same conclusion regarding pastime score: a highly significant positive correlation with the annual household income. According to Kaufmann et al. this fact leads to the suggestions, that it might be suitable as an estimator for the individual importance of the motivation by payment.

**Table 3.** Results of motivational aspects - Mean comparison test

Motivationsl Aspects	MV1 [1]	Std1 [1]	MV2	Std2	TV	DF	HO
Payment	3,0	0,7	2,8	1,3	2,3	∞	Rejected
Signaling	1,9	0,9	2,0	1,3	-1,3	∞	Accepted
Human Capital Adv.	2,2	0,8	2,3	1,6	-0,7	∞	Accepted
Action Sig. By Values	1,7	0,9	2,1	1,2	-4,2	∞	Accepted
Action Sig. By Norms	1,0	0,8	1,6	1,4	-6,3	∞	Accepted
Indirect Feedback	2,0	0,8	2,0	1,4	-3,9	∞	Accepted
Skill Variety	2,4	0,7	2,4	1,2	0,7	∞	Accepted
Task Identity	2,3	0,9	1,9	1,3	4,0	∞	Rejected
Task Autonomy	2,4	0,8	1,8	1,3	7,0	∞	Rejected
Direct Feedback	2,0	0,7	2,2	1,2	-1,8	∞	Accepted
Pastime	2,1	1,2	1,6	1,5	5,1	∞	Rejected
Community Identification	2,0	0,9	1,8	1,3	2,4	∞	Rejected
Social Contact	1,3	1,0	1,7	1,4	-4,0	∞	Accepted

Table 4 shows the demographic details of the participants.

**Table 4.** Respondent's Demographics

Time on platform per week	1 [1]	2	Annual Income	1[1]	2
<3 months	17,2%	19,0%	<\$7000	23,0%	24,0%
<1 year	4,60%	16,0%	<\$7000-\$14,999	15,3%	21,0%
<6 months	21,3	14,0%	<\$15,000-\$34,999	25,1%	16,0%
<1 month	18,6	14,0%	<\$35,000-\$74,999	20,9%	14,0%
<2 years	17,9	11,0%	<\$75,000-\$124,999	12,3%	6,0%
<1 week	13,7	8,0%	<\$125,000	3,0%	6,0%
no answer	4,2	8,0%	no answer	0,5%	2,0%
Membership	1 [1]	2	Employment Status	1 [1]	2
<3 months	22,7%	24%	fulltime	41,3%	41,0%
<1 year	15,5%	16%	part time	19,0%	28,0%
<6 months	15,8%	13%	in education	17,9%	15,0%
<1 month	19,0%	12%	unemployed	21,8%	13,0%
<2 years	13,9%	12%	no answer	0,0%	4,0%
<1 week	5,6%	10%			
no answer	0,5%	8%			
Highest Level of Education	1 [1]	2	National Representative	1 [1]	2
Bachelor's Degree	41,8%	43,0%	India	38,5	56,0%
Master's Degree	20,0%	16,0%	Other	13,9	17,0%
Some college, no degree	18,6%	10,0%	USA	47,6	15,0%
Associate Degree	5,6%	10,0%	no answer	0	1,0%
Professional Degree	1,6%	5,0%	Europe		11,0%
Doc.	0,9%	6,0%			
High School	8,8%	4,0%			

Moreover, both studies noticed that participants working part time state human capital advancement significantly higher than participants who are still in education of working fulltime.

Another similarity between the two studies concerns the attributes pastime and weekly time on *MobileWorks/MechanicalTurk*: Both results show, that there is a highly significant negative correlation between this two attributes. According to Kaufmann et al. this fact leads to the assumption, that pastime can only be attributed to occasional workers on this platform who do not tend to use *MobileWorks/MechanicalTurk* very frequently.

Moreover, both studies indicate that the variable weekly time on *MobileWorks/MechanicalTurk* is highly significant positively correlated with 5 (recent study) or 9 [1] of the other motivational construct scores. According to Kaufmann et al. this fact qualifies to distinguish the motivation of power workers from the motivation of occasional workers.

The application of a t-Test to compare the means shows some interesting significantly consistencies concerning 8 of the 12 motivational aspects of the applied model (see table 3). It can be seen that the means of the motivational attributes *Signaling*, *Human Capital Advancement*, *Action Significance by external Values*, *Action Significance by Norms & Obligations*, *Indirect Feedback from the Job*, *Skill Variety*, *Direct Feedback from the Job* and *Social Contact* **do not significantly differ** ( $H_0: \mu_1 = \mu_2$ ) to the means found by Kaufmann et al. with a probability of 95% ( $TW \notin$  critical area  $\leq 1,65 \Rightarrow H_0$  accepted  $\Rightarrow MV$  does not significantly differ).

Due to the fact that 66,67% of the motivational aspects do not significantly differ between the software development crowdsourcing platform *MobileWorks* and the paid crowdsourcing platform *MechanicalTurk* allows to directly consider a compliance of workers motivation in mentioned domains.

**Significantly differences** could be noticed concerning the attributes *Payment*, *Task identity*, *Task Autonomy*, *Pastime* and *Community Identification* ( $TW \in$  critical area  $\geq 1,65 \Rightarrow H_0$  rejected  $\Rightarrow MV$  differ significantly). This means that the overall importance of above-mentioned attributes in the paid crowdsourcing domain was rated higher than in the software development crowdsourcing domain; moreover and logically, especially the key-attribute *payment* stresses the importance of performance-based payment of workers motivation in paid crowdsourcing domains.

There are also differences concerning the demographic data and the motivational aspects. Kaufmann et al. mention that participants stating to be still in education rank *Skill Variety* and *Social Contact* significantly lower than participants of all other subgroups of employment status.

This study indicates that participants stating to work fulltime rank *Social Contact* lower and *Skill variety* higher than participants who are still in education.

Finally, both studies indicate that the relevance of *Social Contact* is marginal.

### 6.3 Expert Discussions / Qualitative Results

The results of the study and further outlook to the field were discussed with experts on crowdsourcing. A Senior Lead Analyst of Citigroup Incorporation, an Engineering Manager of StorNext File Systems and a Global Customer Support Director of Oracle's Assurance and RAC Support Team.

The interviews provided valuable insights from a crowdsourcing business point of view. In order to answer the question about the sustainability of the crowdsourcing model in software development domains, various and useful information was provided. One possibility is to provide "financial incentives" to participants, which reflects the hope of the market for their services at some point in the future. Another crucial point to successfully deploy crowdsourcing environments is to have one or more "sponsoring agreements": furthermore, without sponsors, individuals would be required to coordinate financial support of the community on their own.

This fact could make scheduling deliverables and planning difficult; furthermore, a "Balance in Flexibility" could provide important oversight in overall directions in order to manage organizational challenges. Most interesting would be the approach adopting a "rating system" in order to rate not only owner satisfaction, but also the developers reliability and quality in separate categories. That approach could be useful for future project owners in order to weigh costs against skills and performance.

Structuring software development for a SME for crowdsourcing requires a high degree of flexibility. First, "incorporate feedback" from limitless different sources but still maintain control over the final quality with the help of a "tiered system" to ensure experienced contributors could be a possible approach; furthermore, this approach could provide valuable input which increases the quality of the final product and gains the possibility of financial success with regard of the earned prestige. Second, based on lower risk, SMEs should place their software development process "alone"; furthermore, if crowdsourced resources or e.g. certain parts of a software development process fail to deliver, it would not negatively impact a project's success.

In general, for successful incorporation the key point is, to have some clear "direction set" in order to avoid organizational vacuum; in addition, the timelines that can be met with distributed efforts vary to the number of resources.

To conclude, SMEs who are planning to engage into the crowdsourcing area, it is advisable to obtain sustainability and furthermore put some thought about how to structure its software development process to ensure product success and avoid financial losses.

## **7 Limitations and Further Research**

This study described different intrinsic and extrinsic motivational factors of influence between paid and non-paid crowdsourcing platforms. Using the model developed by Kaufmann et al. this study explored salient drivers of motivation for participation.

Moreover, a meaningful comparison of means by the application of the t-Test delivered differences and consistencies between the paid crowdsourcing domain and the software development crowdsourcing domain concerning motivational aspects; nevertheless, it should be considered that asking for the importance of money directly has to be regarded as non-objective [1]; According to Kaufmann et al. [1], a better and more suitable approach for measuring the importance of money has to be established.

Referring to this, new and promising approaches like list experiments [38] or natural experiments [39] have been developed [1]. A comparison of the data after the use

of such list experiments or other promising applications would be an advantage to classify the findings.

Moreover, further researches could investigate if the motivation in the software development crowdsourcing domain is related or clearly different from open source development platforms; in addition, there is a lack of study aiming the effect of motivation on participation outcomes such as performance, which is defined as the cognitive outcome of conducting a series of activities [40].

Since possible outcomes of crowdsourcing processes are even more important than the action of participating itself, investigations about how motivational factors affect task performance could provide scientific parameters and enhance the chance of project success; to conclude, additional research to identify and investigate other salient factors for member contribution to crowdsourcing tasks in the software development domain is necessary.

## 8 Conclusion

*„At the core of crowdsourcing is the understanding that the crowd is an online community voluntarily participating in the creation of value for an organization" [28].* With the transformation of the World Wide Web into the collaborative Web 2.0 new ways of productive interaction between companies and individual users evolved.

Even though preliminary studies exist, there is still little understanding on what motivates online community members to participate, create and share content [11]. Online Communities play a major role in the investigation of incentives and motivations for the participants since crowdsourcing processes are held in online communities through an open call via the Internet [28]. Therefore, SMEs that wishes to successfully utilize and integrate crowdsourcing into their software development process, must nurture these communities, respect their time investments and talents, and gain a better understanding of user motivation and incentive.

This study provides a contribution to the field of workers motivation in the software development crowdsourcing domain. First, the investigation of crowdsourcing adoption for SMEs showed, that it might be a suitable approach that enables SMEs to crowdsource certain parts of their software development process to online communities such as *MobileWorks*, provided that SMEs adopt an "open" paradigm into their current business model; furthermore, another major precondition for SMEs in this context is to nurture community bonds, respect the time investments and talents of the crowd for a better understanding of user motivation and incentive for participation, since crowdsourcing processes are held in Online Communities [28]. Second, by applying the combined research model developed by Kaufmann et al. [1] to discern what factors motivate people to participate, the questions concerning motivational aspects being most important.

The results show that the highest score is payment, followed by task related factors like learning new or sharpen existing skills, which is in line with results from open source Software studies [41], or the usage of a variety of skills and talents which are part within a numerous continuum of factors that motivates members to participate.

Moreover, a meaningful comparison of means by the application of a t-Test delivered differences and coincidences between the paid crowdsourcing domain and the software development crowdsourcing domain concerning motivational aspects. Due to the fact that 8 of the 12 motivational aspects (see table 3) do not significantly differ between the software development crowdsourcing platform *MobileWorks* and the paid crowdsourcing platform *MechanicalTurk* allows to directly consider a compliance of workers motivation in mentioned domains.

Significant differences could be noticed concerning the key-attribute *Payment* and the attributes *Task identity*, *Task Autonomy*, *Pastime* and *Community Identification*. Furthermore, Ghosh and Glott et al. [9] identified intrinsic motivation on free and open source Projects as well as Kaufmann et al. [1] in their study about workers motivation on the paid crowdsourcing platform *MechanicalTurk* as the main contributing factor, this study found that the extrinsic motivation dominates its intrinsic complement.

Moreover, Kaufmann et al. [1] qualified the attribute “Weekly Time on *MobileWorks*” to distinguish power workers from occasional workers and is therefore a qualified variable for further investigations in crowdsourcing domains.

Third, this study delivers insights into the crowdsourcing business point of view. Three crowdsourcing experts delivered insights to the question about sustainability of crowdsourcing and offer the most suitable options how to structure a SMEs software development process. The responses show, that financial incentives, a well-balanced number of sponsors and the development of a rating system qualify as a requirement to obtain sustainability. Furthermore, SMEs who are able to incorporate feedback through the establishment of a tiered rating system and moreover are able to keep their software development process separated from its domestic business environment, is moving in the right direction and gains the possibility of commercial success. According to the global economic success and importance of the open source approach, the software development crowdsourcing domain has an excellent possibility to gain interest and application for capable and flexible SMEs.

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