The Handbook of Peer Production

Chapter 10 – User Motivation in Peer Production

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1. Introduction

The advantages of "commons-based peer production" (Benkler, 2002, p. 375) on a national or firm level seem obvious: 1) it is better at identifying and assigning human resources to production processes, 2) increasing returns allow huge clusters of potential contributors to interact with huge clusters of information resources and 3) it achieves lower transaction costs by not relying on property and contract as the organizing principles of collaboration" (Benkler, 2002, p. 376). By reducing transaction costs through peer self-selection, Benkler argues an economic case for a commons-based peer production process. This does not explain why individuals would volunteer to contribute to such a system, though. Olson famously stated: "Indeed, unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interest*" (Olson, 1965, p. 2 emphasis in original). In the case of public goods, this is the classic consequence of under-provisioning and overuse: the tragedy of the commons (Hardin, 1968).

Yet, various forms of peer production obviously thrive, ranging from the obscure (such as proof-reading of scanned classic texts) to industry-wide dominant solutions (e.g. Wikipedia). Thousands of volunteers, both unpaid and paid, act in and contribute to their respective projects. Here, we examine what motivates these individuals to contribute on an individual level.

In 2000, the economists Lerner & Tirole called these peers' behavior "startling" and succinctly condensed their dilemma in the oft-cited question "Why should thousands of top-notch programmers contribute freely to the provision of a public good?" (Lerner & Tirole, 2000, p. 2). Similar questions have been asked about other forms of peer production besides free and open source software creation, such as Wikipedia contributors (Schroer &

Hertel, 2009) as well as   participants in electronic networks of practice in the legal

professions (who are not famous for their altruism) (Wasko & Faraj, 2005).

In this chapter, we summarize current research on user and peer motivations in peer

production systems, focusing on the following: 1) individual motivations to participate, 2)

selection of tasks and 3) participation in peer production as a social practice, which

influences motivations and highlights the critical role of institutions in enabling peer

production. Generally, we focus on motivation at the individual level (that is, not

addressing the question of why organizations choose to partake in peer production).

2. Individual Motivation

Most early studies on user motivations in peer production settings have adopted a

form   of self-determination theory (Deci & Ryan, 1985), which rests on the assumption

that individuals exhibit certain behaviors in order to satisfy three basic needs, namely

competency, social relatedness, and autonomy (Deci & Ryan, 2000, pp. 233–235). The

theory distinguishes between intrinsic and extrinsic motivation. While intrinsic motivation

rests on the inherently interesting and enjoyable act of performing the task itself, extrinsic

motivation requires an outcome that is distinct from the task itself (Deci & Ryan, 1985,

2000). Thus, extrinsically motivated individuals satisfy their basic needs indirectly, e.g. by

being monetarily rewarded (Osterloh & Frey, 2000). Some studies have extended the basic

concept and have added internalized extrinsic motivation (e.g., Chandler & Connell, 1987;

Deci & Ryan, 2000). Internalization of extrinsic motivation refers to "an active, natural

process in which individuals attempt to transform socially sanctioned mores or requests

into personally endorsed values and self-regulations" (Deci & Ryan, 2000, p. 235-236).

Thus, internalized motivation is by definition extrinsic but may be internalized by the

individual and, accordingly, be perceived as self-regulating behavior rather than externally

imposed (Deci & Ryan, 2000; Roberts, Hann, & Slaughter, 2006).

Much of the early research was conducted in the context of open source software programming (von Krogh, Haefliger, Spaeth, & Wallin, 2012) and online community contributions (such as Wikipedia contributors). Generally, surveys have identified a diverse set of motivations for starting and continuing engagement in peer production (Benkler, 2017) spanning intrinsic, internalized extrinsic and extrinsic motivations. Table 1 provides an overview of identified individual-level motivations, based on von Krogh et al. (2012).

Table 1: Overview of individual-level motivations in open source software production

Intrinsic	Internalized extrinsic	Extrinsic
Enjoyment & fun	Own-use value	Pay
Ideology	Learning	Career
Kinship amity	Reciprocity	
Altruism	Reputation	

2.1 Intrinsic motivation

Fun

One major intrinsic motivation discussed is enjoyment (Moilanen, 2012; Torvalds & Ghosh, 1998). It drives efforts due to the joy, creativity, and challenges associated with performing the task (Shah, 2006). Fun deriving from participating, creating objects or "hacking" software has been consistently cited as important drivers of effort (Hausberg & Spaeth, 2018; Lakhani & Wolf, 2005; Moilanen, 2012). This holds true even for contracted and paid contributors (Hars & Ou, 2002).

While these studies focus on the quantitative impact of fun and enjoyment on contributions, Shah (2006) further argued that they play an important role for sustained long-term contribution.

Ideology

Besides enjoyment and fun, many report that ideology-based intrinsic aspects are important factors driving contributions (David & Shapiro, 2008; Ghosh, Glott, Krieger, & Robles, 2002; Lakhani & Wolf, 2005). Ideology is typically based on certain norms, values, and beliefs (K. J. Stewart, Ammeter, & Maruping, 2006). Especially requirements such as freedom of use and modification as well as publication of source code or the overall conviction that open source is the best way to develop software are typically strongly supported (David & Shapiro, 2008).

Empirical findings, however, suggest that the impact of ideology-driven motivation may differ between peer production systems. For instance, Hertel et al. (2003) find a positive and significant relationship between social and political motives and code contributions within the Linux developer community. In contrast, Xu and Li (2015) do not find a significant relationship between ideology-based motivation and participation levels for Wikipedia. Thus, they argue that individuals may choose to participate in multiple encyclopedic communities, diminishing the effect of strong ideological beliefs on the overall contribution level.

Kinship

Similarly to ideological motives, kinship amity has been identified as an intrinsic inducement. Kinship amity is associated with the desire to belong to a certain group or community where members are treated as "kin" (Hars & Ou, 2002). Thus, they exhibit an altruistic behavior as they do not expect something in return for their contributions. However, it differs from altruism in that it is limited to a specific community (von Krogh et al., 2012). Some surveys document kinship motives as respondents report a desire to interact with like-minded people (David & Shapiro, 2008; Hertel et al., 2003; Moilanen, 2012) This driver can be quite strong. As such, self-identification as a Linux developer

appears to be the strongest predictor for the average hours spent per week on Linux-related activities (Hertel et al., 2003).

Altruism

Some literature also discusses the role of altruism as an intrinsic motivation (e.g., Hars & Ou, 2002; Ke & Zhang, 2008). Altruism refers to the behavior where peers seek to increase the welfare of others at their own expense without necessarily expecting something in return (Hars & Ou, 2002). Thus, it is often considered in the context of open source projects since participants contribute to a public good while investing their own time or bearing opportunity costs (Osterloh & Rota, 2007; von Krogh & von Hippel, 2006). While there is some empirical support for altruism for a minority of survey participants, especially students and hobby programmers (Hars & Ou, 2002; Hemetsberger, 2004), it seems that altruism is too simple an explanation to account for the occurrence of peer production.

2.2   Internalized extrinsic motivation

Own use value

Between intrinsic and extrinsic inducements, research also identified a set of internalized extrinsic motivations. For instance, Raymond suggested that individuals might be motivated to contribute to public goods in pursuit of "scratching a personal itch" (Raymond, 1999), that is, they have a personal need that needs solving. The sometimes termed "own-use value" has been widely documented in surveys (Hars & Ou, 2002; Hemetsberger, 2004; Lakhani & Wolf, 2005). While most studies find a strong positive relationship between personal need and successful participation (Hars & Ou, 2002; Hertel et al., 2003), a few studies identify a negative relationship between personal need and the amount of one's contribution (Hausberg & Spaeth, 2018; Roberts et al., 2006). These argue that a personal need may only serve as a temporary driver to contribute, with peers

stopping their contributions as soon as their need is sufficiently addressed. Consequently, they might leave the community after a short period.

It is interesting to note, though, that motivations are dynamic. Shah (2006) reminds us that peers' motivations evolve over time, moving from utility driven to more intrinsic motives.

Learning

A second internalized intrinsic motivation often identified is learning (David & Shapiro, 2008; Shah, 2006; Ye & Kishida, 2003). It typically includes aspects such as the acquisition or improvement of new skills or knowledge and is associated with feedback on peers' work (Ye & Kishida, 2003).

Several studies find support for learning motivations. Some show a positive impact on individual contribution levels, such as hours per week spent on open source software or hardware contribution (Hars & Ou, 2002; Hausberg & Spaeth, 2018) or lines of code written (Roberts et al., 2006). Other studies show significant relations between learning motivations and a higher intention to participate in the future (Spaeth, Haeflinger, Von Krogh, & Renzl, 2008; Wu, Gerlach, & Young, 2007).

Ye & Kishida (2003) argue that learning is one of the major forces that motivate developers to contribute as it may create the intrinsic satisfaction and the opportunity to earn a higher rank within the community. Some scholars, moreover, link learning with future job opportunities as it may increase human capital (Hars & Ou, 2002; Xu, Jones, & Shao, 2009).

Reciprocity

Besides own-use and learning, the literature frequently discussed reciprocity as internalized extrinsic motivation. Reciprocity is based on a "give and get mentality" of individuals (Alexy & Leitner, 2012), which is embedded in a gift culture (Bergquist &

Ljungberg, 2001; Zeitlyn, 2003). As such, individuals are motivated to contribute as they have already received something and feel the obligation to give something back to the community or they expect to receive something in return for their contribution (Lakhani & von Hippel, 2003). Moderate support for reciprocity as a motive was reported in several studies covering hackerspaces (Moilanen, 2012), virtual consumer communities (Hemetsberger, 2004), and open source projects (Lakhani & Wolf, 2005). In a similar vein, some studies suggest that individuals who received help from other contributors are more inclined to return help once they have gained more experience and knowledge (Ghosh et al., 2002; Hertel et al., 2003).

Further, Shah (2006) finds that individual contributions associated with obligation-based activities were rather small and limited to a shorter term. Specifically, she finds that individuals driven by this motivation tended to contribute in pursuit of releasing themselves from the obligation, and then retreated. Thus, reciprocity – similar to need-based motivation – might not necessarily lead to a sustaining motivation to contribute.

Reputation

Further, some scholars investigated individual reputation as driver for peer production. In this regard, von Krogh et al. (2012) identify two types of reputation discussed in the literature, namely peer reputation and outside reputation. Peer reputation is directed toward peers within the community. It is associated with demonstrating skills and capabilities to other contributors by making contributions of high quality and earning a corresponding status (Raymond, 1999; Roberts et al., 2006; D. Stewart, 2005). It thus serves as an indicator of community membership in the absence of hard and formal membership criteria (von Krogh, Spaeth, & Lakhani, 2003) and may be linked to learning motivations (Ye & Kishida, 2003). Peer reputation is also what drives other famous peer

production systems, such as the production of academic knowledge (von Krogh & Spaeth, 2007).

Outside reputation is concerned with the anticipated reactions of related people outside the community and the resulting prestige (Shah, 2006; von Krogh et al., 2012). Research on open source software production has frequently found a link between peers' motivation and outside reputation (Hars & Ou, 2002; Hemetsberger, 2004; Hertel et al., 2003; Roberts et al., 2006). Outside reputation also overlaps with the extrinsic motivation of potential career benefits as elaborated in the following.

2.3   Extrinsic motivation

In addition to intrinsic motivations, individuals can be motivated by extrinsic motives such as direct compensations or expected career benefits (e.g., Hars & Ou, 2002; Lerner & Tirole, 2002; Wu et al., 2007).

Pay

Indeed, contributors in peer production systems such as open source communities do not necessarily work for free. Rather, for some, contributing is part of their job or at least their supervisor knows about and tolerates such engagements during working hours (Hertel et al., 2003; Lakhani & Wolf, 2005). Regarding direct compensation, some scholars find that developers motivated by payment on average spent more time working on open source software than their voluntary contributors (Hertel et al., 2003; Lakhani & Wolf, 2005; Roberts et al., 2006). However, Alexy & Leitner (2012) only found an overall positive effect of payment on total motivation in cases where contributors did not show a strong norm against payment.

Career

Apart from financial incentives, signaling theory (Spence, 1976) provides an additional framework for extrinsic motivation, which was taken up by Lerner & Tirole

(2002). Their original argument that peers' behaviors may be driven by anticipated career benefits in an attempt to signal their skills and abilities to the labor market has been validated in numerous studies. As such, positive relations have been reported with respect to contribution intensity (Hars & Ou, 2002) and participation intention (Hertel et al., 2003).

Complementary findings show that signaling indeed may lead to a higher average wage (Hann, Roberts, & Slaughter, 2013). In their study, they report a positive and significant relation between the developers' rank within the Apache foundation and their average wage and argue that employers may use a developer's rank as a measure of productive capabilities.

However, one question remains open as to the causality of the observed links: Do peers attempt to become employed so they can continue to do what they love to do, or do they participate in peer production as part of a rational signal to the labor market?

To sum up the above discussion, one may note that the general picture shows a range of user motivations (Benkler, 2017; David & Shapiro, 2008), whereas individual motivation is not based on a single motive but rather on a dynamic mix of several interacting inducements. Accordingly, some scholars started to research the links and mutual influences among different motivations within what Roberts et al. (2006) call the "system of motivations".

2.4   Crowding out

One popular effect often considered in peer motivation is "crowding out" (Frey, 1997), i.e., the undermining of intrinsic motivations through the introduction of extrinsic incentives. An early meta-analysis by Deci et al. (1999), considering 128 studies in the field of psychology, finds evidence for crowding out intrinsic motivation, especially in those cases where individuals affected by external interventions perceived them as

controlling. In contrast, external factors perceived as supportive can lead to the opposite effect of crowding in (Frey & Jegen, 2001).

Crowding effects caused by extrinsic motives

For open source software, Osterloh & Rota (2007) had suggested that extrinsic rewards may impede voluntary sharing of software and knowledge. However, much of the empirical research finds no evidence of a crowding out Roberts et al. (2006). Studies rather identify a positive effect of pecuniary rewards on overall contribution levels in various open source communities (Alexy & Leitner, 2012; Krishnamurthy, Ou, & Tripathi, 2014; Lakhani & Wolf, 2005; Roberts et al., 2006). Thus, financial (extrinsic) rewards seem to crowd in intrinsic motivation if they are perceived as supportive rather than controlling (Frey & Jegen, 2001; Krishnamurthy et al., 2014). Crowding-in denotes a positive effect of external interventions (such as pay) on intrinsic motivation (Frey & Jegen, 2001).

As these results appear counterintuitive, Alexy & Leitner (2012) examine the role of payment norms and find that crowding in is related to a community's and an individual's norms against payment and commercial involvement. In the face of strong anti-commercial and anti-payment norms, intrinsic motivation tended to be crowded out. Indeed, the results of a study by Krishnamurthy et al. (2014) examining the acceptance of monetary rewards in open source software development suggests that even intrinsically motivated participants might be willing to accept financial rewards without loss of intrinsic motivation. Individuals exhibiting a higher kinship-based motivation who are thus more exposed to social norms have a lower propensity to accept financial rewards. These findings reflect the contingency associated with crowding effects.

Crowding effects caused by internalized extrinsic motives

Further studies dealing with crowding effects consider the impact of internalized extrinsic motives on intrinsic motivation. A few studies find a crowding-in effect of

reputation on intrinsic motivation (Gallus, 2016; Roberts et al., 2006). Gallus explains this effect as the result of an increase in the identification with the community, which can be caused by symbolic reward systems as, for example, in the case of Wikipedia (Gallus, 2016). Further studies find a crowding in effect of learning on enjoyment-based motivation (Hausberg & Spaeth, 2018).

The effects are not clear-cut though: some studies in this field also find negative effects arising from internalized extrinsic inducements. Hausberg and Spaeth (2018) find in their study on user motivations in the open source hardware context a crowding out of enjoyment-based intrinsic motivation when makers were highly motivated by reputational benefits. The study of Roberts et al. (2006) unveils a negative effect of own-use value on contribution levels in open source software development.

2.5   Summary of self-determination theory

Overall, we can say that contributors to commons-based peer production systems are motivated not by a single motive, but by a whole range of intrinsic, internalized extrinsic and extrinsic motives. Further, motivation is not static: there is instead an evolution of motives over time (Shah, 2006).

Empirical support is provided for almost all the discussed motives. However, differences regarding their magnitude can be observed. While kinship amity is found to be a strong driver of intrinsic motivation, the effects of ideology vary significantly between different peer production systems. Furthermore, altruism appears a too simple explanation in the context of peer production.

Similarly, in the case of internalized extrinsic motives, own use value and reciprocity are widely documented (Hars & Ou, 2002; Hemetsberger, 2004; Lakhani & Wolf, 2005), but do not necessarily lead to more contributions as some studies find a short-term pursuit of quickly solving personal needs (Hausberg & Spaeth, 2018; Roberts et al.,

2006) or fulfilling obligations of giving something back to the community (Shah, 2006). Learning and reputation appear as sustainable drivers (Hars & Ou, 2002; Roberts et al., 2006; Shah, 2006; Ye & Kishida, 2003).

Regarding extrinsic motives, payment can lead to an increased overall motivation, especially when the individual and the community are not principally against payments (Alexy & Leitner, 2012). Moreover, signaling effects are discussed in the literature as a further motive, which is linked to anticipated career benefits (Hars & Ou, 2002; Lerner & Tirole, 2002).

As motivations may interact (Roberts et al., 2006), several scholars suggested crowding out effects of extrinsic factors in intrinsic motivation (Haruvy, Prasad, & Sethi, 2003; Osterloh & Rota, 2007). However, empirical investigations cannot confirm the assumptions, but find instead the opposite effect of crowding in (Alexy & Leitner, 2012; Krishnamurthy et al., 2014; Lakhani & Wolf, 2005; Roberts et al., 2006). For internalized extrinsic motives, the effects vary significantly.

3. Choosing a Task to Work On

Peer production systems, such as open source software or hardware communities, typically cover plenty of different tasks (Hausberg & Spaeth, 2018; Moilanen, 2012), which can coarsely be categorized into creational tasks and community-related tasks (Xu & Li, 2015). While creational tasks include direct contributions to the public good, such as writing source code of software or editing content (e.g., Wikipedia articles), community-related tasks cover duties such as administration issues or technical user support (Lakhani & von Hippel, 2003; Xu & Li, 2015).

As the individual's motivation depends on the characteristics inherent in the task (e.g., creative or challenging), variations might also be reflected by differences in the tasks'

attractiveness and selection (Lakhani & von Hippel, 2003). Benkler (2002) postulates that task self-allocation in peer production systems is based on more or less well-informed assessments of the individual's own fit to the respective task or job.

3.1   "Sexy" tasks

The reasons for individuals to take on attractive – "sexy" – creational tasks are obvious. Individuals performing such tasks may receive direct or indirect rewards such as fun and enjoyment (Hausberg & Spaeth, 2018), learning benefits (Roberts et al., 2006), the enhancement of reputation (Lakhani & von Hippel, 2003), or the satisfaction of a personal need (Shah, 2006) as elaborated above. In addition, this self-selection might lead to neglecting less attractive but vital tasks, because peer production systems heavily rely on the self-selection of tasks by volunteers, potentially jeopardizing the survival of individual peer production systems (Benkler, 2002; Lakhani & von Hippel, 2003; von Krogh et al., 2012).

While specifically creational tasks exhibit high popularity among peers (Moilanen, 2012), covered by a variety of motivations (Lakhani & von Hippel, 2003; Roberts et al., 2006; Shah, 2006), some scholars are especially concerned with community-related tasks as they may be mundane or tedious, without providing obvious direct or indirect benefits.

3.2   Mundane tasks

Some articles suggest that long-term contributors are more inclined to take on community-related tasks. For instance, Shah (2006) finds that they take on mundane and unattractive tasks such as rewriting source code in order to keep code simple and extensible, while newcomers tend to work on attractive and creative tasks. Hence, these groups appear to form a symbiotic relationship: new need-driven participants tend to provide new directions and challenges, while an old core provides support, creates the requested features and integrates them into the source code, while also taking on further

maintenance duties. Similarly, some studies suggest that participants may be inclined to take on more challenging tasks the more experienced they are within a specific project and the more knowledge they have gained over time (Hann et al., 2013; Hertel et al., 2003). Certain project governance structures can help to make community-related and mundane work more manageable: O'Mahony & Ferraro (2007) argue that peer production systems structure themselves in ways that are beneficial for community-related tasks such as coordination of efforts and integration.

The necessity of performing mundane community-related tasks leaves space for the involvement of commercial actors providing extrinsic incentives, such as payment, or providing internalized extrinsic incentives. For instance, Alexy & Leitner (2012) conclude that using financial rewards could compensate for the absence of intrinsic motivation. *Bounty programs* (Krishnamurthy & Tripathi, 2006) where users pledge financial support for someone else performing certain tasks are another way of providing such extrinsic motivation. In some open source communities with defined roles, individuals accept certain mundane tasks by occupying respective (more or less formal) roles (Hann et al., 2013).

Some studies find internalized extrinsic motives to be drivers to perform mundane or tedious tasks. For instance, some scholars consider peer reputation and kinship as major drivers to motivate "Wikipedians" to perform community-related tasks (Gallus, 2016; Kittur, Pendleton, & Kraut, 2009; Xu & Li, 2015). Another study finds learning to be a major driver (Lakhani & von Hippel, 2003). Specifically, they examine the reasons why contributors in the Apache community are providing technical support to others. They find that answering questions on Usenet help forums was mainly driven by anticipated learning benefits. Accordingly, community members spent considerable time scanning and reading questions in forums that may also have been relevant for their own projects.

3.3   Summary of findings

Altogether, we can see that peers' motivation partly determines the type of task they will self-allocate. In order to perform all required tasks (both creative and community-related) a mix of various incentives and motivations is required in a healthy commons-based peer production system, as it is a mix of a diverse set of actors. Specifically, extrinsic and internalized extrinsic motives seem to play a crucial role to impel individuals to perform mundane tasks in peer production systems.

4. Peer Production as a Social Practice

While self-determination theory provides some insights into the psychological processes that may adopt impulses external to the individual as inputs, leading to immediate observable behaviors, it neglects the wider context that may explain, for example, why individuals maintain their participation and contributions over time (von Krogh et al., 2012). Peer motivations are not detached from influences springing from an individual's environment, as shown by the dynamically evolving motivations of peers embedded in the social structure of a peer production system (Shah, 2006). Rather than identifying individual-level motivations in isolation, an alternative promising approach is to view peer production systems from a practice perspective (Feldman & Orlikowski, 2011).

Some theoretical approaches started to view peer production systems as social movements (McCarthy & Zald, 1977) or linked them to the collective action literature (Ostrom, 1990, 1999) as they share many traits. By becoming part and member of a social practice, contributions stop being seen as expensive investments and collaboration instead become part of the intrinsic incentive itself. In this regard, Jon Elster remarks:

"Cooperation reflects a transformation of individual psychology so as to include the feeling of solidarity, altruism, fairness, and the like. Collective action ceases to become a prisoner's dilemma because members cease to regard participation as costly: It becomes a benefit in itself, over and above the public good it is intended to produce" (1986, p. 132).

One comprehensive approach considers peer production as social practice, which explicitly accounts for the interrelation of collective activities with institutions (Ostrom, 1990; von Krogh et al., 2012). The approach builds upon MacIntyre's seminal work, which describes a practice as

"any coherent and complex form of socially established cooperative human activity through which goods internal to that form of activity are realized in the course of trying to achieve those standards of excellence which are appropriate to, and partly definitive of, that form of activity, with the result that human powers to achieve excellence, and human conceptions of the ends and goods involved, are systematically extended" (MacIntyre, 1981, p. 187).

Following this view, peer production involves the creation of internal goods with public goods characteristics, such as source code or encyclopedia articles, which are produced by members of the practice. The collective of contributors follows certain general principles (so-called *standards of excellence*) that are determined and shared by the whole collective (von Krogh et al., 2012). As individuals decide to contribute, they gradually adopt the general norms and principles of the social practice (Rullani & Haefliger, 2013) and over time collectively adapt them. Internal goods are defined by the social practice and do not

only benefit individual contributors but also other members in the social practice as well as the wider community (von Krogh et al., 2012).

Institutions house these practices and provide external goods, such as status or capital that enable and extrinsically motivate contributors (MacIntyre, 1981; von Krogh et al., 2012). Institutions can be seen as "sustainable forms of human cooperation" (von Krogh et al., 2012, p. 660), including companies and foundations, that are governed by certain organizations (e.g., the community), rules (e.g., coordination), and routines (von Krogh et al., 2012).

By drawing attention to social practices, the focus shifts from short- and mid-term motivation – going back to direct rewards – towards the long-term motivation of participants, as the social practice becomes intertwined with their lives, creating the perception of a moral obligation associated with the pursuit of the *unity of life* (von Krogh et al., 2012). In particular, the theory postulates that individuals attempt to reach and maintain the uniformity of their actions, forming a consistent journey that emphasizes values such as personal development (c.f. von Krogh et al., 2012). In this way, peer production as a social practice explains interview statements, such as "this is just how open source programmers are supposed to act" or "it is kind of a moral obligation to contribute". Social practices frame peer production as a school of virtue in which norms, attitudes and standards are concurrently being created with the internal goods themselves. Peer production becomes a lifestyle.

4.1   Social exposure

Research suggests that social exposure in a peer production community is crucial. Community participation and kinship are powerful drivers aligning individuals' activities with overall goals and social norms inherent in the community. Thus, the exposure to the

community may positively affect the overall contribution level of participants (Rullani, 2007).

As such, literature considers the architecture of social practices as comprising a core and a periphery, where individuals start as passive lurkers and observers situated at the periphery, eventually starting to make small contributions while gradually tending to be dragged towards the core (Rullani, 2007; Rullani & Haefliger, 2013; Ye & Kishida, 2003). Reaching the core, they tend to focus more on maintaining the social practice by taking supportive tasks or helping to educate new members (Shah, 2006).

In the process of joining, an individual socializes with the community (Rullani & Haefliger, 2013) and acquires an identity related to the social practice that intertwines individual motivation with experiences related to the membership (von Krogh et al., 2012). While membership is typically granted by a consensus vote by the core group, studies found a tendency of lurkers to attempt to prove their abilities to that core (Midha & Bhattacherjee, 2012). Specifically, Misha & Bhattacherjee (2012) find that lurkers tried to complete assigned mundane maintenance tasks as quickly as possible to get attention and acceptance.

Further, on one hand, the community core may exert social pressure by using collective sanctions to enforce certain social norms and standards of excellence (Sagers, 2004). As outlined before, norms within the group such as the refusal of payments can have a significant effect on certain motives (Alexy & Leitner, 2012). On the other hand, communities may reward members for their past performances, i.e., meritocratic self-organization. In this regard, Roberts et al. (2006) find that promotions within the Apache meritocracy led to higher intrinsic and extrinsic motivation and to higher participation levels as status increases.

Apart from that, some scholars illuminated the effects of two socialization outcomes, namely social identification and social integration, on motivation. Social identification refers to the extent to which an individual identifies with a certain community, whereas social integration denotes the perception of being accepted and trusted by the community. Several studies demonstrate that they can positively influence contributors' behaviors within the community towards kinship amity and lead to an increase in task performance (Carillo, Huff, & Chawner, 2017; Gallus, 2016; Spaeth, von Krogh, & He, 2015).

4.2 Institutional frameworks

In a social practice, institutions and institutional frameworks impact on the peers' behavior, with impacts ranging from the enabling (by providing infrastructure and support or by remunerating them) to the corrupting (by introducing conflicts of interests or formal restrictions).

Governance structures

One such institutional framework is the governance structure of a peer production system. It plays a crucial role in influencing individuals' motivations. Governance can be defined as "the means of achieving the direction, control, and coordination of entirely or partially autonomous individuals and organizations on behalf of a [peer production] project to which they jointly contribute" (Markus, 2007, p. 152). Markus (2007) highlights the importance of governance as it may solve collective action problems as well as coordination problems and determines the climate for contributors. The relevant literature identified different governance structures and examined their relation with individual motivation (Di Tullio & Staples, 2013; Klapper & Reitzig, 2018; Shah, 2006).

In this regard, studies show that the formalization of conflict management and development processes can lead to a higher task performance and a better community

climate, if overall goal-definition remains within the decision-making scope of the project

members (Di Tullio & Staples, 2013; Klapper & Reitzig, 2018). A complementary study by

Ho & Rai (2017) shows a further positive effect of input and output control on the

continued participation intention of contributors. Specifically, they argue that a formal

accreditation process of members and leaders based on their skills (input control) as well as

a careful code review and acceptance (output control) can effectively signal high standards

of excellence, attracting further volunteers to the social practice.

Sponsorship

Moreover, the organizational integration of the peer production system into a

private firm appears crucial. In that regard, research distinguished two governance

structures, namely "open" and "gated" communities. While open communities produce true

public goods, gated communities constitute hybrid forms of collective development and

private ownership and are controlled by a focal company (c.f. Shah, 2006; Spaeth et al.,

2015).

A study by Shah (2006) found that particularly in the long run, developers who

were primarily motivated by use-value were more inclined to contribute to gated

communities, whereas developers motivated by enjoyment (i.e., hobbyists) tended to

contribute to open communities. Furthermore, the sponsor's specific characteristics as well

as their perception by the contributors can play a crucial role in influencing their

motivation by affecting social identification (Spaeth et al., 2015; Stewart et al., 2006).

Contributors may assess institutions such as sponsoring companies or foundations and

consider them as either supportive or restrictive depending on their adherence to the

standards of excellence (von Krogh et al., 2012). For instance, attributes such as expertise

and trustworthiness as well as an attitude towards mutual knowledge exchange were found

to have a positive impact (Spaeth et al., 2015). Overall, scholars suggested that firm

sponsors should avoid extracting too much benefit from the peer production community as this may depress community morale and work (Haruvy et al., 2003; von Krogh et al., 2012).

Licensing

Another institutional framework to consider are the licenses of the goods produced. Generally, research focusses on the restrictions embedded in the applied license. The famous GNU General Public License (GPL) imposes two restrictions: 1) modified versions of the source code need to be open as well (*copyleft*), and 2) the code can only be combined with programs distributed under the same license (*viral* provision). The intuition that more intrinsically motivated individuals tend to prefer more restrictive licenses, while less restrictive licenses attract more extrinsically motivated ones is reflected by empirical findings (Allyn, Misra, & Kozyreva, 2008).

Furthermore, contributions may differ across both types of licenses. For instance, Fershtman & Gandal (2007) find that output per contributor in open source projects is much higher when licenses are less restrictive and more commercially oriented, such as the Berkeley Software Distribution (BSD) type license, while the number of contributions is higher when licenses are more restrictive such as the GPL. It highlights the differences among individual motivations and the role of appropriate protection mechanisms for intellectual property in influencing contributors' behaviors.

It is noteworthy, however, that the effect of licenses may depend on the type of sponsor. In particular, Stewart et al. (2006) find that the presence of non-market sponsors such as non-profit foundations may reduce concerns about the project's future. Thus, development activity and user interest were the highest when the application was distributed under a non-restrictive license and the sponsor was a non-market organization.

4.3   Summary of social practice view

Altogether, we can say that a social practice perspective complements an isolated analysis of peers' individual motivations as it allows investigating the social practice and the influence it has on individuals. Thus, we showed that social pressure exerted by the community may either sanction or promote certain behaviors, influencing individual motives. Furthermore, social integration and identification seem to be crucial factors influencing the individuals' behavior as well as performance. The social practice view further allows to identify institutions (such as financial sponsors) and institutional arrangements, such as the project governance structure and the produced good's license as well as their impact on peers' motivation.

As the social practice view stresses, the overall social context surrounding an individual, one should observe that participation in peer production systems as reflected by the reviewed studies is a privilege of Global North nations.

5.   Conclusion

Peers are motivated by a number of individual motivations, ranging from the intrinsic (ideology, altruism, kinship amity, enjoyment & fun), to the internalized extrinsic (reputation, reciprocity, learning, own-use value), to the purely extrinsic (pay, career benefits) although   boundaries between these categories can be somewhat blurry at times. Studies have generally found a mix of motivations in various empirical peer production systems. Diversity is high though, and motivations have been shown to change over time (e.g. from own-use problem solving to pure enjoyment and kinship amity), which can be explained by considering peer production systems as a social practice (the self-given term "Wikipedians" nicely illustrates the strong community identification in such systems). Commercial involvement in these systems is not necessarily bad *per se*, as we have shown,

and empirical evidence of crowding out of intrinsic motivation is scarce. However, domination of a gated community by a commercial entity and controlling core aspects of processes and goods produced can indeed prevent voluntary contributions in the first place.

Most individuals will be consumers and free-riders of commons-based peer production systems. Still, in many cases and under the right conditions enough peers can be motivated to achieve impressive output. Success seems to depend on the right mix of motivations and types of peers in peer production settings. Fortunately, as Elinor Ostrom (2000, p. 138) succinctly put it, "the world contains multiple types of individuals, some more willing than others to initiate reciprocity to achieve the benefits of collective action."

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