

The discussion of innovations on the Internet is increasingly focusing on the active role of customers and users. Especially in the development and improvement of digital products and services (such as software, information services or online trade), adapted to consumer demands, we observe an expansion of autonomous activities of customers and users. The division of labour between suppliers and users, producers and consumers is no longer definite. This also brings into question long standing and firmly established boundaries between employment which is still structured by the capitalist law of profit and a private world following other principles.

The digital mode of production and distribution, together with the necessary means of production (personal computer) in the hands of numerous private users, provide these users with expanding possibilities to develop and produce digital products and services. In addition, the Internet as a platform of communication facilitates world-wide production with participation of a great number of users ("mass collaboration" – see Tapscott 2006).

The development of Open Source Software (OSS) and the online encyclopaedia Wikipedia represent a particularly far-reaching participation of users. It is true that we are dealing with the production of public goods here and therefore specific basic conditions for "mass collaboration". However, concepts like "interactive value creation" (Reichwald/Piller 2006) or "open innovation" (Chesbrough 2003, Chesbrough et al. 2006) propagate an opening of innovation processes for users unrelated to companies also in the framework of commercial value creation, as a central new dimension of promising organisation of innovation processes. Here they explicitly refer to these particularly far-reaching forms of user participation. It is controversial however, how such folds of activities of companies (as organisations of commercial value creation) and of private users can be organised and what implications follow. Voß et al. (Voß/Rieder 2005, Kleemann/Voß 2008) focus their theory of "working customers" on the interest of companies to utilise unpaid labour of customers for their own profit. In contrast Eric von Hippel (2006) emphasises the chance of the growing influence of customers and users on innovation processes ("democratizing innovation").

Altogether, we feel that up to now the debate has suffered from a lack of a precise and sophisticated description of the role of customers and users in internet-based innovation processes. This makes it difficult to properly understand and analyse the propagated new quality of the role of users in development processes of products. This is not a simple continuation or extension of what for some time has been discussed in economic and social science debates in terms of the active consumer, consumer as co-producer or lead-user. In the following we want to characterise the new quality of user participation on the Internet as well as discuss its social preconditions and implications for a fold with processes of value creation. As yet we can neither base this on specific empirical studies of user activities nor on our own empirical findings. We will therefore utilise studies about Wikipedia and Open Source Software (OSS) development and supplement these with limited investigations of our own on the Internet, in order to characterise how users are included in these new collaborative processes of production and innovation. In the first section we will mark our starting point

within the social science debate on different varieties of the active consumer as co-production or do-it-yourself (1.). The second section will examine how the Internet widens the scope for participation of many users (2.). In the third section we want to show that the developments of new kinds of collaboration between producer and user roles evolve in Wikipedia and Open Source software. In sections four and five we will then focus on the roles of users in these cases. Finally we will summarise our statements focusing on characteristics and prerequisites of the new quality of user participation on the Internet and discuss results with regard to the initial debate.

## **1. Debate about the "Active Consumer": Co-production or Do-it-yourself**

Including users and customers in the manufacturing of products and services is not a new phenomenon. Indeed the methods of customer integration have played a central role in social science treatment of the services sector development, even if with highly varied facets, depending on the respective concept. One line of discussion focuses on the customer as "co-producer" (Gardner/Riesman 1978; Badura/Gross 1976; Gross 1983). Hereafter, customer co-production is seen as an absolutely indispensable prerequisite for many fields of services. The author further states that, according to his point of view, especially the production of many personal services would be impossible without physical, intellectual and emotional participation of consumers as co-producers. This definition of user participation implies that customers are virtually integrated in the value creating process of the provider and *thereby co-production takes place in the domain of the provider*. It is furthermore implied that user activities would be subject to conditions moulded by the companies' interests of value creation. This is not very far from expanded forms of customer integration which have been discussed in recent years by the slogan "mass customization" (Piller 2000). The contribution of the customers here lies in providing "needs information" (Reichwald/Piller 2006).

Quite a different point of view on the "active consumer" is offered by concepts that look at contributions of customers and users in the context of *do-it-yourself* as an alternative to commercially produced services. The most classical example here is Gershuny's (1977) observation that after World War II, consumers work in the households had substituted commercially offered and professionally delivered services to a large degree. Here do-it-yourself serves as an alternative to gainful employment, using industrially manufactured mass products as tools or as raw products to be processed. Accordingly, Toffler (1980) predicted an expansion of the fields of activity of do-it-yourself and expected the sphere of do-it-yourself to extend itself opposed to the sphere of gainful employment. Toffler further connected this with the belief that do-it-yourself would, since it is free from outside control and commercial profit seeking, eventually be perceived and desired as a creative autonomous activity. Do-it-yourself therefore, unlike co-production, traditionally *takes place in the domain of the consumer (in the private household) and is both self-organised and self-reliant*. Thus the basic conditions under which do-it-yourself is performed are free from company value creation interests.

However, the classical approaches towards the “active consumer” lie in the fact that both customers and users work “for themselves” with their contributions. The traditional sense of do-it-yourself is limited to the own household or the social proximity (for example in the form of neighbourly help). Even in forms of co-production, the customers’ participation does not aim at improving the product regarding other customers or users, but at rendering individual services for the customer who is involved in the production process. Thus it first of all modifies the division of labour between the customer and the provider of services. Co-production and do-it-yourself all had the goal to serve *one’s own consumption*, whether externally provided services were tailored to the individual situation or “unfinished” products were processed for personal needs. The working consumers so remain isolated from each other, consumption as work practically takes place on a small social stepladder. Consequently, the traditional do-it-yourself work and the customers’ and users’ co-production show little division of labour and specialisation.

The participation of customers is not limited to the private consumption if it does not deal with private customers, but with companies in the sector of material production. In this sector, the significance of the users’ contributions for industrial innovation processes (“innovation by user“) is also not new. Be it in the form that user companies modify and adapt the machines and installations which are bought from suppliers for their specific needs or even develop and perfect them, or be it in the form that the knowledge and creativity of the users become an important input for development processes of the providers (von Hippel 1978; 1988; Piore/Sabel 1985; Asdonk et al. 1993). As professional customers and operational users, yet no private customers<sup>1</sup> are involved in these cases, a framing by value creation interests is a moot question. Value creation interests can be taken for granted both by customers and providers; the possibly competing interests are matters of negotiations and maybe of contractual regulations.

## **2. Internet: New Possibilities for User Participation in Innovation and Production Processes**

Due to the Internet, the possibilities of involving customers and users in the creation of products and value creation processes have now radically expanded. Due to this new medium, an essential fact for this process is first of all that co-production and co-innovation are no longer bound to face-to-face-interaction, but on the other hand are naturally no longer embedded in social relationships. With it, traditional space and time limitations for the participation of customers and users become void and this leads to a drastically higher *number* of possible participants. This rising number of participants alone evokes a considerable leverage effect; the Internet enables considerable economies of scale in co-production und co-

---

<sup>1</sup> Also in these cases the users’ inputs at first benefit themselves. As has been expressed in the concept of “lead user“, there are certainly systematic spill-over effects here. What a producer develops, tests and improves with lead customers as a first step, he generally offers as a new or improved product to other customers as a second step. The inputs of lead customers contribute to a higher or lower degree to the product development for third parties. There is a need for formal agreements and a different form of relationship between firms.

innovation – an effect, which is currently being discussed under the concept of “crowdsourcing”<sup>2</sup> (Howe 2006).

At the same time the *range* of co-production by the user is increasing. Especially in the creation of digital products and services the possibilities of not only consuming the WWW as a super medium in a passive way, but also to contribute to it in many different ways and to re-organise it for users are increasing; this is also the tenor of the discussion about a changed quality of the Internet as “collaborative web“(Web 2.0) (O’Reilly 2005; Tapscott/Williams 2006). The “collaboration“ of customers and users is made easier here, especially in those cases in which the Internet as a medium is linked with the digital and technical basis of the products (such as pictures or photos, videos, texts, software). For the creation of digital products and services, a big number of users dispose of the necessary means of production in order to participate in the product creation and development and to then distribute their contributions via the Internet. Ranging from “user generated content” in the media sector to extensive customer ratings to online games, which only take shape by substantial user-input (such as “second life”) – in all these cases the contributions of customers and users are no longer limited to specify their needs or to configure or cut product and service characteristics according to their individual needs. Instead they develop and shape the characteristics of products and services in an active way. Next to the formerly rather passive forms of co-production, in which the customers’ cooperation finally served to enable the provider to render services, the active forms of participation in innovation and production processes, initiated and controlled by the customers and users themselves, now play a role. In other words, customers and users do not only deliver “needs information” but also “solution information” (Reichwald/Piller 2006).

With this process, the *quality of customer integration* is also changing. This is due to the fact that users and customers do not only provide “solution information” for their own needs, but also solution information for other users or customers, users make contributions for the development of the services (rendered on the Internet) or (digital) products. Companies use those contributions of the customers to create new or modified services for third parties. Book reviews written by customers on the Amazon.com website, just to mention one of the most famous examples, change the configuration of the website, increase the benefit and thus the attractiveness of the website for others. The work of the customers in these cases no longer only serves the purpose of the own consumption, as it was the case so far, but also the consumption of third parties. With this process, the customers are integrated in a different way into the commercial value creation of the providers than it was the case “offline“(Kleemann/Voß 2008). Users and customers become co-developers of products and services; however, without being employees of the provider or without existing contractual relationships between themselves and the provider, which would refer to the co-development. The authors of customer reviews for Amazon.com, to stay with the same example, are in no way obliged to write these reviews, nevertheless, they do not get paid for what they write.

---

<sup>2</sup> The made-up word crowd-sourcing combines the phenomenon of the outsourcing of business activities, already existing for some time, with the relatively new phenomenon that outsourcing, in the form mentioned in the text above, consists in an outsourcing to a large group of external contributors (“crowd“) (“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“).

This new quality of user and customer integration is being propagated in the economically-oriented innovation theory within the concepts of “interactive value creation“(Reichwald/Piller 2006), “open innovation“(Chesbrough 2003; Chesbrough et al. 2006) and “democratizing innovation” (von Hippel 2005) as a new innovation paradigm, in which users or customers are attributed an essential role in innovation and production processes in the future. However, the concept of “user” is very broad and unspecific<sup>3</sup> here. Basically everybody is a user who uses a product or a service in boundaries to providers or producers, who produce them with the aim of commercial value creation. Therewith, in principle, user companies are also included, nevertheless, the new quality generally characterises the contributions of private users to product innovations.

However, this new expanded role of users raises new questions: What enables users to such contributions to product development? In which way are collaboration and division of labour organised and what is the exact role of users in this process? And there is finally the question about the organisational, social and institutional determining factors for such an essential role of users in product development. The questions for the knowledge and expertise, which users bring into the development of these products, are answered by the above mentioned authors with reference to the broad knowledge and expertise existing in the knowledge and information society, which should be used for innovation processes (Chesbrough et al.2006). However, as our argument from above states, the question is not about the information about needs referring to one’s own consumption. It is expected that the users possess knowledge and expertise, which are necessary for the specification and individualisation of products and services. To the degree however, to which the users’ role expands to contributions for the development of product features and performance features, it has to be clarified on which inventory of knowledge and expertise these contributions can be based. This question is by all means important in those cases, in which the users are not companies, but private users or customers. Well the scale for readers’ reviews on the Amazon.com website or a hotel assessment on the websites of travel agencies will most probably not be judged as critically as professional contributions – and this is evidently not the claim of those contributions. However, there are precise products in focus of open innovation concepts, the efficiency of which can compete with commercial products, such as Open Source Software (OSS). In these cases, the basis of knowledge and expertise of the high number of private users will presumably not be the same as that of professional users as it was originally the case in the concept of the “innovation by user”(von Hippel 1988).

With the new role of users, not only the idea is linked to use the knowledge of customers and users, but also rather the division of labour between providers and customers/users drastically changes, if the latter act as co-developers. This raises the question how the division of labour and collaboration between users and producers can be organised. In any case, these new forms of the division of labour between customers and providers require their own proper mechanisms of organisation and coordination, according to the advanced argument of Reichwald/Piller (2006: 45) and von Hippel (2005). In other words: It is unlikely that the

---

<sup>3</sup> „ Page: 3 Users, as the term will be used in this book, are firms or individual consumers that expect to benefit from using a product or a service. In contrast, manufacturers expect to benefit from selling a product or a service. A firm or an individual can have different relationships to different products or innovations.” von Hippel 2005:3.

suggested new quality of the customer/user integration in the creation of products and services will take place in the frame of traditional forms of organisation and coordination. This assumption is especially supported by the fact that the most far-reaching participation of users in the product development takes place in those cases in which the forms of organisation and coordination are completely different to traditional forms.

The Open Source Software development (OSS) and Wikipedia are mentioned as paradigmatic cases for “open innovation“ by the authors (Reichwald/Piller 2006, Chesbrough et al. 2006, von Hippel 2005), in which the development of the products is based on the knowledge and contributions of the users to a very high degree. To a certain extent they represent the extreme point of the “customer active” or “customer-centric paradigm”(Reichwald/Piller 2006, von Hippel 2005 and 2005b), because the product development is more or less completely taken over by the users. Von Hippel characterises them as horizontally structured innovation networks, whose actors “are innovative users or, to be more precise, users/self-producers” and “producers are not necessary”<sup>4</sup>. This self-production by users, however, raises the question of the basis of expertise, the division of labour and the forms of coordination in a pointed way. When we at first mentioned the internet-based integration of users in value creation processes of companies, according to the pattern of Amazon, we still dealt with the division of labour between private users and production companies, but now each division of labour between users and producers is vanishing. Everybody involved in the Open Source Software development and Wikipedia is a user and producer at the same time. Yet in this case, what is the basis of expertise and knowledge for this expanded role of users? How is the worldwide distributed collaboration of many users being organised and coordinated? And finally the question follows about the relationship of the users towards the integration in value creation processes or the transferability of the model of the Open Source development to commercial value creation processes which stems from the concept of “open innovation” that is aimed at the integration of the users’ contributions in value creation processes.

Other authors explicitly characterise the Open Source development and Wikipedia as alternative production forms beyond value creation processes (Benkler 2002; 2006; Weber 2004; O’Mahony 2007; Spindler 2006; Osterloh/Rota 2007; Gläser 2007). They emphasise that the production process of these products marks the development of a new innovation and production model, which is not aimed at commercial value creation, but at the creation of public goods. Benkler makes this clear when he qualifies the production model as “commons based peer production“(Benkler 2002 and 2006). He emphasises that in this case it deals with a new step of producing public goods (“commons based”); and that production and coordination follow own specific rules and norms of organised communities (“peer production”). O’Mahony has the same approach with the concept of “community-managed governance” (O’Mahony 2007).

However, the role of users and their concrete contributions remain surprisingly vague in case studies about Open Source projects<sup>5</sup> and Wikipedia<sup>6</sup>. On the one hand, most of the case

---

<sup>4</sup> „Horizontal innovation networks, consisting only of users, are definitely in the condition to develop innovations, to distribute them, supervise them and consume them.“ (von Hippel 2005b: 453).

<sup>5</sup> E.g. O’Mahony 2007, 2006, 2003, Jensen/Scacchi 2007, Scacchi 2006, Elliot/Ccacchi 2004, Moon/Sproull 2002

<sup>6</sup> Pentzold 2007, Schuler 2007

studies focus on the aspect of who develops these highly complex products, why the actors do it without any monetary reward and how the highly-divided work is coordinated in these production communities. The case studies do in fact convey a well-founded insight into the structure, working manner and forms of cooperation and communication of the core-developers, project managers and administrators, yet the role of the many users remains unclear. At the same time, the users themselves are “hasty” in a certain way. This “flippancy” of many users is a consequence of the limits of these projects on which everybody can participate according to his own wishes. Thus Weber also concludes with the question “Who Participates in the Open Source Process?”(Weber 2004:65) “It’s not possible to start with a clean number that decently estimates how many people participate in open source development.” It is not clear who belongs to the community: all those who have written the OSS-Code or those who have delivered information about an error of the OSS-Software? Referring to Wikipedia, the question is not easier to answer: are Wikipedians, who are registered on Wikipedia, people who participate in the discussion or who have written a part of an article themselves? In order to clarify the role of the active user, we want to take a closer look at collaboration und division of labour in Wikipedia and OSS projects as a first step. We will do this on the basis of studies about OSS and Wikipedia and with our own research.

### **3. Division of Labour between Roles of Producers and Users on Wikipedia and in OSS Projects**

In the following part we wish to take a closer look at the new forms of collaboration and division of labour on the Internet and take the most far-reaching cases, such as Wikipedia and the big projects of the Open Source Software development (e. g. Linux, Debian, Apache or also Mozilla) as examples, on the basis of studies about these projects and our own research.

#### *3.1 The Mode of Participation*

The participation in the Open Source development and on Wikipedia is generally open for everybody, and everybody is welcome and asked to participate in the work. There are no criteria for admittance, nor do legal or social obligations result from this participation. It is only important that one knows the product from one’s own experience.

A central feature of the mode of participation consists in the fact that everybody decides on his/her own how he/she participates; the norm of free choice of the tasks applies (O’Mahony 2007:145). This allows the realisation of one’s own individual motivations and to select tasks according to one’s own interests. Different dimensions of the forms of participation enable minute contributions, where the effort and time is small and where there are only little requirements on the single participant; on the other hand there are also comprehensive tasks in product development. A condition for this is a “granularity” of the tasks (Benkler 2002), i.e. an extreme finely granulated structure of possible tasks. Smaller contributions are also of great importance for the product development if they are submitted by many persons.

The free selection of the tasks is an essential prerequisite for the participation of many persons. On the other hand, just by submitting a contribution, it has not been decided whether this contribution will be admitted into the future product. The decision on admittance, modification or rejection will be taken *ex post* according to rules, which are institutionalised

and legitimated in the community. The quality of the contributions is decisive. Quality and expertise in product development act as a control principle due to this selection mechanism. Internally there is the development of decision roles and task distributions which are not open to everybody, but which imply responsibilities at the same time which are connected to the completion of certain tasks. Communities of the Open Source development and Wikipedia are no organisations in the usual sense because they have open, flowing borders to the exterior, but internally they develop specific structures that as a rule exhibit meritocratic features (here especially have a look at the studies by Scacchi and O'Mahony).

Essential for the self-determined collaboration of many persons is, that the development process takes place "for the whole world to see". On the websites of this project everybody can follow the current state of processing online and directly participate in it. The transparency of the collaboration process on the Internet facilitates the exchange and coordination among many participating persons. However, this openness presupposes that the finished products are also freely available. This is no problem in the case of public digital goods, but difficult under conditions of private appropriation and intellectual property rights.

We wish to limit ourselves to this short outline of the participation principles and wish to concentrate on the users' roles in the following part of the text. In fact, the persons participating in the development of the Open Source Software or Wikipedia are also the users of the products they have helped to develop. However, this does not exclude the fact that some see themselves as producers, act as such and simultaneously bring their specialised and professional qualifications into the process. The connecting factor for the development of professional producers' roles can especially be found in studies about Open Source Software. Jensen/Scacchi e.g. research the role allocation among Open Source developers (Jensen/Scacchi 2007), O'Mahony describes the development of producers' roles in the Debian project (O'Mahony 2006) and analyses the internal governance of Open Source communities (O'Mahony 2007); Weber refers to the special role of project leaders according to the example of the Linux inventor Thorwalds (Weber 2004: 166). At the same time Wikipedia and the successful Open Source projects have very big communities, whose members participate in the development.

### *3.2 Differentiation of Producers' and Users' Roles on Wikipedia and in the Open Source Software Development*

Approximately 75000 persons are currently participating on Wikipedia as co-authors in 250 languages. Alone the German version has 7000 active cooperators<sup>7</sup>. OSS communities are often only smaller due to the fact that they approach a more specialised circle of users. Many OSS products are utilised by more advanced computer users and they are partly professional users or firms. Mozilla<sup>8</sup> is surely an exception, whose web browser Firefox and whose e-mail programme Thunderbird is used by more than ten million end customers. The Mozilla community comprises several thousands of active participants; from 2006 to 2008, 6300

---

<sup>7</sup> Wikipedia:about; <http://en.wikipedia.org/wiki/Wikipedia:About>, 10.01.08

<sup>8</sup> <http://www.mozilla.org/about/fast-facts.html>



persons informed about errors on Thunderbird, and 11000 persons about errors on Firefox<sup>9</sup>. Other OSS-communities also have several thousand members, e.g. Debian – a non-commercial Linux distribution<sup>10</sup>.

Studies show that the product development itself, if you consider the programme code or the contribution to Wikipedia articles, is concentrated on only a few persons. A few cooperators produce essential parts of the product, whereas many contribute only little. As a rough rule of thumb you could say: 10-20 % of the contributors create 80-90% of the product (Weber 2004:70). The big majority, 80-90% of the community members, however, create only 10 to 20 % of the products.

### *Roles of Producers and Users on Wikipedia*

In the case of the German Wikipedia, the relationship between those who contribute a lot and the many other users can be presented in the following way: According to its own statements, the German Wikipedia has approximately 7000 active male or female cooperators<sup>11</sup>. In these figures all those are included who have contributed in some way. About 500 to 700 active persons (Schuler 2007: 108; Pentzold 2007) belong to the hard core of the German Wikipedians, who work on Wikipedia nearly every day and often for several hours. Almost 300 of them are administrators, i.e. they have special rights and responsibilities referring to the total development of Wikipedia (e.g. the right to delete articles and to block users). In the current user statistics<sup>12</sup> (in February 2008) more than 900 active users are listed with at least one contribution in the preceding month (January), 500 active Wikipedians wrote more than 200 contributions in January only, 100 very active Wikipedians wrote more than 1000 contributions in that one month only. These especially active groups are characterised by the fact that they were co-authors of at least some articles and participated in many tasks, which are of common interest. Besides administration these are, for example, the constant monitoring of modifications, the execution of reviews, the inclusion of links, the supervision of portal pages or the participation in internal discussions. The other more than 6000 active Wikipedia users have not participated at all during the last quarter (as of the end of February 2008, last seen: March 21, 2008). They differ from the hard core of the Wikipedians especially in the fact that they participate in a sporadic, much more non-committal and most importantly very selective way. As a rule, they participate with individual contributions about special subjects with which they deal with in a certain way, whether due to their hobby, their place of residence or their professional expert knowledge. Typical users participate less frequently and more selectively referring to the subjects they are interested in or because of an error they have accidentally come across while being online. However, typical for Wikipedia (as it is also the case for other media products) is that also only a few active Wikipedians cooperate as co-authors of articles, above all when they are skilled in certain special topics. Presumably, one of the advantages of an open encyclopaedia lies in the specialisation grade of

---

<sup>9</sup> Own research under <https://bugzilla.mozilla.org/report.cgi>

<sup>10</sup> <http://www.debian.org/intro/about>

<sup>11</sup> Wikipedia:about; <http://en.wikipedia.org/wiki/Wikipedia:About>, 10.01.08

<sup>12</sup> <http://de.wikipedia.org/wiki/Wikipedia:Beitragszahlen>; as well as

<http://stats.wikimedia.org/DE/TablesWikipediaDE.htm>, last considered on March 21st, 08

the co-authors. In reference to the expertise brought into the process, it is helpful to distinguish between specialist knowledge in the content and the skills in writing.

The inner circle of very active Wikipedians and administrators assumes a special (producing) function by assuming responsibility for Wikipedia as a whole. They are not only more active, but they also do different things: e.g. a regular check of new or modified articles even when these do not lie in their special interest profile; or the regular supervision of a theme portal, the fight against vandalism or the internal administration and discussion. They are engaged in the structuring of the encyclopaedias as a whole, or in securing the integrity and quality of the whole product. From our point of view, whether this group has more far-reaching specialist knowledge than less active Wikipedians is open, but it is clear that they possess more product-specific expertise due to their intense dedication.

On Wikipedia, there is certainly a connection between the relatively blurred limitation of expertise between producer and user roles and the basic rule that anybody is allowed to cooperate in writing on Wikipedia (has direct rights of writing). We will make sure that this is regulated in a different way in the Open Source Software development.

#### *Roles of Producers and Users in the Open Source Software Development*

In the Open Source Software development the developers' roles are relatively clearly differentiated and above all institutionalised to a higher degree. Jensen/Scacchi (Jensen/Scacchi 2007:1) describe the inner structure of OSS communities as hierarchical circles with different roles, which are nested into each other. Their classification is oriented in the performance (meritocracy). Here (at least) three role types have to be differentiated; firstly the inner circle around the one or more project "owner(s)" i.e. the core developer(s), secondly another circle of co-developers, who more or less frequently contribute to a code and thirdly an open circle of persons, who mostly do not develop a code on their own, but who point at errors and deficits and contribute ideas for the further development. The volume and type of contributions to product development are different in these three groups<sup>13</sup>.

Most of the development contributions in form of a programme code are delivered by the smaller group of core developers. In an extensive empirical study by the EU, Ghosh et al. (Ghosh/Glott/Krieger/Robles 2002b) have researched how the contributions to the software code in OSS products are distributed among the authors<sup>14</sup>. The results show that 12584 developers or 20% of the research sample have accomplished 85% of the software, but the remaining 20000 developers only developed 15% of the programme code. Furthermore, most of the developers are concentrated on one project, or respectively on one product (in the place cited: 15). This means that developers who deliver important contributions, work on one product, or in other words: they concentrate on *their* project. This corresponds to the role of the project "owners" (whether single persons or a team), an institutionalised role in the OSS

---

<sup>13</sup> The inner structure, role distribution and governance of the collaborative projects is an extremely interesting subject. However, we cannot deal with it here intensively, because we are concentrating on the specific role of active users. For this subject we especially point to the works by O'Mahony and Scacchi.

<sup>14</sup> The investigation is based on five billion lines of the OSS programme code by 31999 developers (pure users have not been considered in this investigation). Due to the indications available about the developers, together with the programme code, a data basis was compiled in which authors and their contributions (in bytes of code) have been compiled for every programme package. (Ghosh/Glott/Krieger/Robles 2002b)

project. As a rule, the project owner is the person who has initiated the project by delivering the first version of the programme. With this contribution he/she (or the team) has already rendered a major service. The “owner” has the right to decide about the content of the product versions. He takes over the role of a project manager, who himself considerably contributes to the programme development on OSS (in contrast to traditional project managers). Even in the larger projects of the study mentioned above, 40% of the software codes were delivered by only one author (in the place cited: 20). The legitimacy of distinguished roles is based on the individual performance in the product development (meritocracy). These create social approval and give the right to controlling and decision-making functions. At the same time, Raymond and others (Raymond 1999/2001; Weber 2004; O’Mahony 2007; Markus 2007), point out that collaborative projects distinguish themselves by a novel management style, characterised by a high degree of integration capacity and attentiveness towards the impulses from the community. With the growth of the projects, the group of core developers is getting bigger in which the new development, conception, integration and control of the products are concentrated. The demands on the expertise of core developers are relatively high. This work demands specialised qualifications, experiences in the Open Source Software programming and intensive knowledge about design and structure of the concrete product.

Around this core group, there is generally a bigger group of developers. In the investigation cited above this is true for approximately 90% of the OSS developers. For example on Mozilla the inner core, which meanwhile comprises 250 permanent employees, is surrounded by 800 more developers<sup>15</sup>. Developers either bring their specialised expertise into the process or gain this knowledge during the course of the cooperation. In order to safeguard this, there are admission rules and procedures in OSS communities. Only after a trial and training phase are they admitted as developers and, where appropriate, achieve the right to make modifications on the original programme (write access).

The developers of Open Source Software are indeed also users of the software they co-developed and at the same time they are specialists and professionals. In 2002, Ghosh et al. found out in a survey among 2784 OSS developers, that 83% of them work in the IT sector (Ghosh/Glott/Robles 2002a:12), almost half of them are software engineers or programmers, 20% are students (in the place cited: 13). Simultaneously they spend considerable time on the OSS development, partly in the frame of their working time as employees of a company. One third of the developers works more than ten hours a week on the OSS development, 7% even work forty hours or more (in the place cited). Generally the main developers are not just amateurs from another sector, but specialised users with a high expertise, who write the code because they need the precise programme and find support in the community for the development (Raymond 1999/2001). However, the boundaries here are markedly more open and fluent than in companies.

On the one hand, the concentration of the development of the programme code on only a few competent developers with a relatively intensive commitment in a project answers the question how such highly-professional, powerful software products can be developed in the

---

<sup>15</sup> <http://www.mozilla.org/about/fast-facts.html>

self-organised communities without any producing companies. On the other hand, this perspective conceals the meaning of many users for product development in a certain way.

Most of the contributions, even in OSS projects, are delivered for tests and problem reports<sup>16</sup>. Their number is high in all successful projects. The fault data base on Debian e.g. contains 17300 persons who reported faults<sup>17</sup> – in comparison to approximately 1000 active developers and even much less core developers or maintainers. Users are not obliged to possess specialist expertise in programming, but they must have intensive experience with the product. Many users do not want to be given responsibility as producers and organisers of the product development. This becomes manifest in the much smaller volume of their participation, as well as in the irregularity, which springs from the individual use and which is precisely not oriented in the requirements of product development. The big number of users with their many “small” contributions account for the efficiency of product development in a decisive way – as our assumption will be in the following part.

#### **4. The New Quality of the Involvement of Users: Participation in Innovation and Production as an Improvement Process**

The participation of users in collaborative development processes is first of all directed – according to our argument in the following chapter<sup>18</sup> – at improvement processes and consequently at the continuous optimisation and the further development of the products. Through the organisation of product development as a permanent improvement process, new forms of the division of labour between producers and users are enabled which systematically integrate the expertise of users into the product development and thus make a new quality of user participation possible. Decisive for this fact is that the products are permanently “unfinished”<sup>19</sup> in a certain way and thus open for optimisation. Usually such steps of modification characterise early development steps; here they also shape the character of the development process in a mature phase.

*Permanently “unfinished“ versions:* Characteristically for the initial phase of the Open Source projects, the software already exists as a prototype and can be used in a limited way (Raymond 1999/2001). A project idea with a convincing user value is necessary, but still not sufficient to initiate a community<sup>20</sup>. If the software is already available in an early stage as a free version on the Internet for the use of all, first users can try it in order to see if this is a useful proposal and if they want, they can participate in the further development. If the start is successful, already a (small) user-producer community develops. In this way development and

---

<sup>16</sup> See for example. Bugzilla@Mozilla – Most Frequently Reported Bugs

<https://bugzilla.mozilla.org/duplicates.cgi>

<sup>17</sup> <http://bugs.debian.org/cgi-bin/pkgindex.cgi?indexon=submitter&archive=yes>

<sup>18</sup> In this chapter we strongly base ourselves on Weber (2004) in reference to OSS; in reference to Wikipedia on Pentzold (Pentzold 2007) and Tapscott/Williams (Tapscott 2006); in addition, we have done our own research on the websites of different projects which we are here referring to by indicating the url.

<sup>19</sup> Weber expresses this in the following: “In a real sense open source software is always in beta. The difference in part is the availability of the source code, which empowers continual modification. There is also a collective perception of the open source software process as ongoing research. Open source developers think themselves as engaging in a continuing research project in which bugs are challenges and puzzles.” (Weber 2004:78)

<sup>20</sup> Markus characterises this phase as “Chartering the project—this term refers to statements of vision about the goals of the project, what the software product should look like, etc.” (Markus 2007:158).

production processes merge instead, as it is the usual case, follow one after the other. Also on Wikipedia there was a longer initial phase, in which at first a basis of articles was created<sup>21</sup>, and only after a few years the volume of other encyclopaedias was reached and then quickly got ahead of the others.

Even after the initial phase there is the central principle that the product remains unfinished. The difference to commercial products obviously does not lie in the fact that the collaboratively created products are not ready for use, have a lower functionality, a lower volume or reliability. Raymond described in his paradigmatic article “The Cathedral and the Bazaar“(Raymond 1999/2001) that one of the basic principles for the OSS development is to “release early and release often”. In short time intervals, new versions are released and are provided with the request to send information about errors or bugs in large numbers. Consequently, there are always different coexisting versions: test versions distributed in different steps and in the case of more advanced projects also at least one stable version, which does not contain the latest features.<sup>22</sup>

Wikipedia even takes one more step, because there are no longer any distinguishable versions<sup>23</sup>, but there is a continuous, open editing process. Each improvement is immediately carried out on the public version. The reader of Wikipedia has to anticipate finding unfinished articles in which there is, for example, a lack of the analysis of further sources or no neutral point of view which is advanced. Anyone who informs himself on Wikipedia is asked to pay attention to the quality themselves<sup>24</sup>. Readers, who stick to this rule, will without doubt be more observant. The attention will especially be drawn to contents that one finds necessary to check. Due to this fact there are also, besides occasional dissatisfaction, points of contact for active participation. Mistakes do not (only) provoke complaints, but also the incentive to notify about them or to correct them. In this way the user community considerably influences the further development of the product.

*Improvement processes, structured in small steps and incrementally*, which are based on a high number of small contributions, facilitate user participation. In this case it does not matter whether they only name a problem on the basis of their own use, combine this with a concrete description of the error or already suggest the solution. We have already explained above, that there are different dimensions and ways of participation; modification processes in small steps are always of a low-threshold, because the time and effort can be very small in some cases and in each case are scalable. Furthermore, they do not imply such a high knowledge (professional and product-specific) as extensive and highly-complex product developments. At the same time, users are not necessarily limited to critical comments, even in the case of rare contributions, but they can suggest solutions or make corrections on their own (e.g. correct mistakes in articles on Wikipedia), subject to their specific expertise. Similar to the

---

<sup>21</sup> At the beginning of 2008, the German edition of Wikipedia had almost 700000 articles, the current Encyclopædia Britannica contains 100000 articles, the Brockhaus encyclopaedia 300000 articles. ([www.wikipedia.de/wikipedia](http://www.wikipedia.de/wikipedia); 10.01.08). Brockhaus wants to discontinue its printed version in the following year and continue the edition on the Internet, financed by advertisements.

<sup>22</sup> You will find examples on Debian: <http://www.debian.de/releases/> ; last checked on March 5, 08

<sup>23</sup> Compare: Pentzold 2007:14ff.

<sup>24</sup> Look here: <http://de.wikipedia.org/wiki/Wikipedia:Tour/4>, last checked on March 5, 08

classical forms of do-it-yourself, users here find new possibilities of developing creative interests and capacities.

*The constant critical examination by the users* shows similarities to the “peer review”, usual in science. However, the feedback is given in much smaller steps, is completely open, transparent and, in contrast to the “peer review”, directed at the participation of many users. In OSS projects the feedback typically consists of test reviews and bug reports. The more responses there are as a reaction to a programme module, the more detailed the description of a problem can be. For these there are websites, uncomplicated and easy to handle. The error reports as well as the further processing are public processes. Naturally, another user may also suggest a solution. If it is found quickly, the user has obviously “profited” directly from the bug report. If it takes longer, everybody can keep himself informed on the respective website or the user can again get involved in the solution process, e. g. with a more detailed description of the error.

Different to OSS, users on *Wikipedia* are able to do corrections immediately in the text themselves, instead of first informing about the error in order to enable others to do the corrections. The corrections themselves often do not require any higher expertise than the recognition of errors or deficits. Anyone who has recognised the typing error or the incorrect information is often able to correct them. The corrections can be easily reversed, for example, if the original author does not consider the corrections to be right.

*The improvements are recursive*; a new product part is followed by the plan of a new piece, be it a new Wikipedia article or a new part of the programme; then another check follows, the results of which are taken into consideration in the next modification step. The specialty lies in the fact that the control is done in a permanent, quick and intensive way, because the new version is immediately available in short time intervals, or in the case of Wikipedia, immediately free for all users. The pure volume of the user community that informs about errors is decisive for the quality and stability of the products. Furthermore, decisions once taken are later reversible, if they prove to be unfavourable or wrong on further checking. Due to this recursivity, the development is open for modifications, for concretions of the design which is still unfinished as well as for innovative suggestions and changes in direction. The incremental improvement does not imply incremental innovations – in contrast to radical innovations. It rather deals with improvements in small, coordinated steps. As a result, it is absolutely possible to achieve far-reaching modifications in the product design. The design itself is also constantly developing and thus, in a special way, is open to suggestions by the users’ practise. Improvements in small steps are suitable to definitely mobilise the expertise of users and to emphasise them in the development process. In the next chapter we will discuss which role users adopt in the innovation and production process.

## **5. The Expertise of Users**

We find that Open Source communities and Wikipedia successfully activate the specific expertise of users in such a way that the solution information immediately enters into the development of products. Here, a lack of professional qualification does not necessarily restrict user participation because, in regard to utility value and functionality of used products,

users are always experts. This user knowledge is to a large degree empirical knowledge and therefore hard to acquire by conventionally-operated companies (von Hippel 2005a). In self-organised user/producer communities, empirical knowledge of users is an integral part of product development.

What does the expertise of users consist of and which role do they take on in comparison to the conventional division of labour in companies or publishing houses?

### *The Role of Users in Open Source Software Development*

It may sound trite: Users test software by using it. In this process they detect errors and deficiencies of products as well as further requirements, wishes and suggestions. To articulate their findings is attractive from their point of view, provided those are taken into consideration in product development. The threshold is low; professional qualification follows from the use. OSS projects offer error report systems that are easy to handle and highly efficient. For each reported bug a website is constructed which informs about the state of revision and facilitates exchange between users and developers (see e.g. Bugzilla).<sup>25</sup> This is quite different to the testing of software in conventional software production which is done by specialists. Here test programmes are usually carried out by the code developers themselves – aided by software routines already integrated in the software development environment – as well as by developers in special testing departments. Occasionally employees of the customer/client are included as well in order to derive test scenarios from the customers' application scenarios for the testing department. Strictly speaking, employees in conventional development processes anticipate the users' conduct in such areas of application, e.g. by basing their test design on the application scenario of the customer. In other words, in conventional innovation processes genuine activities of users (applying, examining, evaluating) are performed (in advance) by the producers yet without "real" users, but instead professional "simulators". This seems to be the only feasible method, as long as the (new) product is not openly available and therefore not accessible to critical examination and improvement.

The test report of a professional developer in the testing department of a software company may well be more precise and comprehensive than the error report of a single user. However, the user expertise in question here is not mainly the accidental experience of one person, but above all the collected experience of many that make up the specific efficiency of this kind of quality safeguard (Raymond 1999/2001). Conventional, highly-professional (core) activities when testing are particularly efficiently performed when divided among many users.

### *The Role of Users on Wikipedia*

We will focus here on the role of active users of Wikipedia that are not part of the hard core. These active users read and edit articles or they add or write an article about which they have special knowledge. Nevertheless, they do not just work on any article, like the hard core of Wikipedians, but on a few articles that they read out of personal interest. Many of these tasks

---

<sup>25</sup> See e.g. Bugzilla@Mozilla – Most Frequently Reported Bugs <https://bugzilla.mozilla.org/duplicates.cgi>

are usual activities of a lector in a publishing house. In a way the lector is the first reader that checks the author's manuscript from the perspective of future readers. He/she examines whether the text is coherent, whether the language is well readable and appropriate for the target group, and whether grammar and orthography are correct. On Wikipedia this function is observed by active Wikipedia users. Here many readers often see more than one lector and different view points provide a wide range of assessments and corrections which definitely benefits the intention of the encyclopaedia to provide a balanced and neutral depiction. Furthermore, the "editorial office" on Wikipedia is a lasting process in which the formalised division of author and lector no longer exists.

It is true that the role of users is focused on examining and improving products, although only explicitly as a contribution to product development. Because the activities which users perform self-reliantly are qualified producer roles (tester, lector) in conventional development processes, activities that make up an essential part of common development processes. Thus many users considerably contribute to product development. Viewed as a whole, they leave behind the marginal position that individual users commonly hold in product development. This new role is also reflected in exchange and division of labour within the community as well as in the institutionalised community's values and rules.

## **6. The New Role of Users: Prerequisites**

In our opinion, the new role of users lies in a step-by-step, but altogether very far-reaching improvement and optimisation of existing product versions. The new quality results from the input of user experience as well as from the great number of different user contributions. We have shown that on Wikipedia and Open Source Software development, a division of labour between producers and users is developing, where comparatively few producers construct essential parts of the products and many users participate in testing, improving and developing these products. This far-reaching inclusion of many users is an essential part of collaborative product development, where a multitude of active users "relieve" the producers of a considerable part of product development. Thus they contribute substantially to the specific efficiency of Open Source Software development and Wikipedia. The new quality of user participation results from integrating the specific expertise of users as users during the whole product development process. Users are experts at important tasks that hitherto have been activities of professionally qualified producers (such as testers and lectors); they have, for instance, "solution information" that are important for product improvement and development. Because of the openness and step-by-step product development it is possible to integrate this solution information into the process of product development.

Compared to the already discussed integration of the "active consumer", this kind of user participation shows a new quality, as we already stated in the beginning. What exactly is this difference? In the second section we distinguished between co-production and "old kind" of do-it-yourself and emphasised that *co-production* takes place in the domain of the provider's or producer's company, and therefore user participation is also framed by the companies' interests of value creation. In contrast, traditional do-it-yourself takes place in the privacy of (private) users and is therefore not subject to principles of commercial value creation. The Internet now allows a radical extension of user participation, with the result that these activities no longer serve exclusively to personal needs, but also contribute to services for



other persons and can be organised with a high degree of division of labour as well as collaboration. Here, in contrast to traditional forms, division of labour and cooperation including users, take place not on a small but a big stepladder, which makes improvement and optimisation processes particularly efficient. Usually one would expect that inclusion of a multitude of users requires a commercial supplier to coordinate and organise the division of labour and cooperation. In that case, far-reaching user participation would take place in the domain of commercial suppliers, subjugated to their rules. Instead, the new quality of user participation is characterised by a specific form of self-organised division of labour and cooperation. Like in classical forms of do-it-yourself, criteria of value creation do not matter here. But then a further decisive step is taken, because the complete product development or construction does not have to be organised and performed by a few individuals, but can be done within the community by division of labour. Thus it is possible to construct complex and highly-efficient products which would suggest seeing users as co-producers as well. However, co-production in these cases does not take place in the framework of a company as contribution to its process of value creation, but as a non-commercial cooperation with other co-producers in the framework of the community. This way a fundamentally new form of co-production becomes possible, in which private users do not have to enter the domain of companies with its premises of value creation.

Nevertheless, this new quality of user participation has many preconditions in the organisational aspect – referring to the organisation of the product development – and in the social aspect – referring to the social embedding of collaboration. Organisationally, it implies that product development is planned as an open, transparent, and recursive optimisation process in small steps. The development projects have to provide an organisational structure which enables to meet these conditions. The differences between Wikipedia and Open Source show that there are different product-specific solutions which share common features. This form of collaborative product development on a large scale – and especially the specific form of the organisation of optimisation processes – is hardly imaginable without the possibilities that the internet offers. Insofar we are dealing with new forms of *internet-based* innovation processes.

Furthermore, the new quality of user participation has high social preconditions, because it needs a social and institutional framing by a community (O’Mahony 2007: 146ff.). Within the context of the community, rules and norms are established, which deviate from those rules according to which product development is coordinated in the frame of commercial value creation processes. They offer action-orientations for the participators, and legitimise decision processes and roles of the people involved. These rules of collaboration develop within the respective community of users and producers. As far as the rules for the way of participation are concerned, they have similarities with the scientific system of the “ethos of science”, suggested by Merton. Norms of conduct are made explicitly in community-specific codes (e. g. Wikiquote, Mozilla Etiquette).<sup>26</sup> These hold expectations of behaviours, as for example tolerance, avoidance of personal attacks, mutual support, help, consulting, altruism (contributions without direct rewards or returns) and the reference to contributions of others by critical examinations or appreciative approval. The combination of markedly formalised

---

<sup>26</sup> <http://de.wikipedia.org/wiki/Wikipedia:WQ>; <http://www.mozilla.org/about/mozilla-manifesto.htm>

expectations of behaviour and the demand for considerate, non-discriminatory, socially inclusive behaviour towards others facilitate the cooperation of many persons who are usually strangers to each other. Insofar these rules are important for internet-based “mass collaboration”.

Otherwise the communities also establish rules for the product. On the one hand, these concern the character of the products as public goods and the protection of the producer community against private acquisition of the products, developed by them. This includes a specific modification of licences, as well as a formal organisation, in most cases a non-profit-making foundation. On the other hand, they affect the formation of the product itself. These are precisely not defined by a company’s taking them into account and are not hierarchically imposed, but are as a rule formulated as a guiding principle that comprises the goals and use of the product and the development processes (e.g. in the basic principles of Wikipedia)<sup>27</sup>. In the course of the product development these are concretised and modified by the community. In the discussions about single contributions and the criteria for good (or bad) contributions, the community also always looks into the subject of the next goals of the project. The clearance of the question of what makes out a project could qualify as a process of (successful) institutionalisation of a guiding principle and central theme, following Lepsius (1995). It is presumably not accidental that Wikipedia and the successful Open Source projects have a central theme with which the project positions itself in contrast to the already established commercial products (in the case of Open Source software: against commercial software, especially against Microsoft; in the case of Wikipedia: for the unlimited, free and unhindered distribution of information). And in the same way, we do not consider it a coincidence that the broad participation of users is concentrated on a few, especially prominent projects. The successful institutionalisation of a central theme is of vital importance for the motivation of users. Obviously it is not only important for the massive participation of users what they do, but also in which product and which community they are involved.

#### *Going beyond the Cases: About the Compatibility of Newer Forms of User Integration with Commercial Value Creation*

Products developed in collaborative innovation processes have the potential to compete with established, commercially created products and even to partly “squeeze them out of the market”. At the same time it is evident that the efficiency of collaborative development processes and the potential of work and knowledge, which lies in the participation of many users, is also an interesting resource for commercial value creation processes. Last but not least also because the access to non-paid contributions of the users is alluring. The question is therefore: Is it possible to combine this far-reaching form of massive user participation with value creation processes of companies, and if this is the case, under which preconditions?

We cannot answer the first question and do not want to, mostly because the empirical basis is currently still missing. From our point of view, many of the examples used in the discussion about the “interactive value creation” and “open innovation” for the far-reaching integration of users in commercial value creation processes are no sufficient evidence. In these cases it

---

<sup>27</sup> [http://de.wikipedia.org/wiki/Wikipedia: Basic principles](http://de.wikipedia.org/wiki/Wikipedia:Basic_principles)

largely deals with the integration of customers into the commercialisation of products. Customers here contribute “needs information”, but no contributions to the product development (“solution information”). With this, the possibility of a far-reaching integration of users in commercial product development processes as well should in no way be ruled out. It would be especially interesting to see in which way mixed forms could result in, which take up some, but not all features of collaborative development processes. Our suggestions for the debate and, above all, for the empirical research is aimed at dealing with the question for the forms of user integration in a more differentiated way than it has been the case up to now and to pick out the different features relevant for collaborative innovation processes, and the preconditions as a central theme. On the one hand, it has to do with the organisation of innovation processes, which is open for incremental improvements in small steps by users who choose the tasks they work on on their own. On the other hand, there is the question for the adequate (social) frame for user participation. The cases discussed here support our view that an adequate frame is not – or not alone – determined by a commercial company, but by a community with its own rules and legitimate roles which are transparent and where its members can exert influence on (in case of need, if they just “go”).

***Literatur:***

- Benkler, Yochai, 2006 : The Wealth of Networks – How social Production transforms Markets and Freedom. New Haven: Yale University Press.
- Benkler, Yochai, 2002: Coase’s Penguin, or Linux and The Nature of the Firm. In: The Yale Law Journal 112 (2002)
- Bessen, James, 2001: Open Source Software: Free Provision of Complex Public Goods. In: Paper on MIT/opensource; 08-2004.
- Chesbrough, Henry, 2003: Open Innovation: the new imperative for creating and profiting from technology. Boston: Harvard Business School Press.
- Chesbrough, Henry/ Vanhaverbeke, Wim/ West, Joel, 2006: Open Innovation: Researching a New Paradigm. Oxford: Oxford University Press.
- De Laat, Paul B., 2007: Governance of open source software: state of the art. In Journal of Management and Governance (2007) 11: 165-177.
- De Laat, Paul B., 2007: Introduction to a roundtable on the governance of open source software: particular solutions and general lessons. In Journal of Management and Governance (2007) 11: 115-117.
- Demil, Benoit/ Lecocq, Xavier, 2006: Neither market nor Hierarchy nor Network: The Emergence of Bazaar Governance; In: Organisation Studies 27(10): 1447-1466.
- Elliott, Margaret S./ Scacchi, Walt, 2004: Mobilization of Software Developers: The Free Software Movement. Paper on MIT/opensource; 08-2004.
- Frost, Ingo, 2006: Zivilgesellschaftliches Engagement in virtuellen Gemeinschaften? Eine systemwissenschaftliche Analyse des deutschsprachigen Wikipedia- projectes. München: Herbert Utz.
- Gläser, Jochen, 2007: The Social Order of Open Source Software Production. In: Kirk St.Amant and Brian Still (eds.), Handbook of Research on Open Source Software: Technological, Economic, and Social Perspectives. Hershey, PA: Idea Group Inc., 168-182.
- Gläser, Jochen, 2006: Wissenschaftliche productionsgemeinschaften. Die soziale Ordnung der Forschung. Frankfurt/ Main: Campus.
- Güntheroth, Horst/ Schönert, Ulf, 2007: Wikipedia - Wissen für alle. Stern.de vom 25.12.2007 URL: <http://www.stern.de/computer-technik/internet/606048.html>
- Ghosh, Rishab A., Glott, Ruediger, Krieger, Bernhard, Robles, Gregorio (2002a): Free/Libre and Open Source Software: Survey and Study FLOSS, FINAL REPORT, Part IV: Survey of Developers.

- International Institute of Infonomics, University of Maastricht, The Netherlands, June 2002; [http://www.infonomics.nl/FLOSS/report/Part 4: Survey of Developers](http://www.infonomics.nl/FLOSS/report/Part%204%20Survey%20of%20Developers),
- Ghosh, Rishab A., Glott, Ruediger, Robles, Gregorio (2002b): Free/Libre and Open Source Software: Survey and Study FLOSS, FINAL REPORT, Part V: Software Source Code Survey. International Institute of Infonomics, University of Maastricht, The Netherlands, June 2002; [http://www.infonomics.nl/FLOSS/report/Part 4: Survey of Developers](http://www.infonomics.nl/FLOSS/report/Part%204%20Survey%20of%20Developers),
- Hanekop, Heidemarie/ Wittke, Volker, 2005: Der Kunde im Internet, in: Jacobsen, Heike; Voswinkel, Stefan (Hrsg.): Der Kunde in der Dienstleistungsbeziehung; Wiesbaden: Verlag für Sozialwissenschaften, S. 193-217.
- Hertel, Guido, 2007: Motivating job design as a factor in open source governance. In: Journal of Management and Governance (2007) 11:129–137
- Holtgrewe, Ursula/ Brand, Andreas, 2007: Die projectpolis bei der der Arbeit: Open- Source- Software- development and der „neue Geist des Kapitalismus“. Wiesbaden: Verlag für Sozialwissenschaften.
- Jensen, Chris/ Scacchi, Walt, 2007: Role Migration and Advancement Processes in OSSD Projects: A Comparative Case Study. Paper on MIT/opensource; 05-2007.
- Lepsius, M. Rainer: Institutionenanalyse and Institutionenpolitik, in: Brigitta Nedelmann (Hrsg.): Politische Institutionen im Wandel, Kölner Zeitschrift für Soziologie and Sozialpsychologie, Sonderheft 35, Opladen 1995, S. 392-403.
- Markus, M. Lynne, 2007: The governance of free/open source software projects: monolithic, multidimensional, or configurational? In: Journal of Management and Governance (2007) 11: 151–163.
- Moon, Jae Yun/ Sproull, Lee, 2002: Essence of Distributed Work: The Case of the Linux Kernel. In: Hinds, Pamela/Kiesler, Sara: Distributed Work, 381-404. Cambridge, MA: MIT Press.
- O'Mahony, Siobhán, 2006: Developing Community Software in a Commodity World. In: Fischer, Melissa S. /Downey, Greg: Frontiers of Capital, 237-266.
- O'Mahony, Siobhán, 2007: The governance of open source initiatives: what does it mean to be community managed? In: Journal of Management and Governance (2007) 11 :139–150
- O'Mahony, Siobhán, 2003: Guarding the commons: how community managed software projects protect their work; In: Research Policy 32 (2003) 1179–1198.
- Osterloh, Margit/ Rota, Sandra, 2007: Open source software development – Just another case of collective invention? In: Research Policy, 36, S. 157-171.
- Pentzold, Christian, 2007: Wikipedia: Diskussionsraum and Informationsspeicher im new Netz. München: Reinhard Fischer.
- Piller, Frank/ Reichwald, Ralf / Ihl, Christoph, 2007: Wie eine production nach Open-Source-Prinzipien in andere Bereiche übertragen werden kann. In: Lutterbeck, Bernd et al. (Hg.): Open Source Jahrbuch 2007. Berlin: Lehmanns 2007, S.87-102.
- Piller, Frank, Stotko, Christof, 2003: Mass Customization and Kunden-Integration: neue Wege zum innovativen product. Düsseldorf, Symposion Verlag.
- Piller, Frank, 2000: Mass Customization. Ein wettbewerbsstrategisches Konzept im Informationszeitalter; Wiesbaden, Gabler.
- Raymond, Eric S., 1999/2001: The Cathedral and the Bazaar. In: The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary, 19-63. Sebastopol: O'Reilly & Associates, Inc.
- Reichwald, Ralf/ Piller, Frank, 2006: Inter activee Wertschöpfung: Open Innovation, Individualisierung and neue forms der Division of labour. Wiesbaden: Gabler.
- Scacchi, Walt, 2006: Free/Open Source Software Development: Recent Research Results and Methods. <http://portal.acm.org/citation.cfm?id=1295019>
- Schuler, Günter, 2007: Wikipedia inside: Die Online- Enzyklopädie and ihre Community. Münster: Unrast.
- Spindler, Gerald, 2004: Rechtsfragen bei Open Source. Köln: Otto Schmidt
- Stern-Test: Wikipedia schlägt Brockhaus; 05. Dezember 2007. <http://www.stern.de/computer-technik/internet/604423.html?q=Wikipedia%20Brockhaus>
- Tapscott, Don/ Williams, Anthony D., 2006: Wikinomics: how mass collaboration changes everything. New York: Portfolio.
- Von Hippel, Eric, 2005: Democratizing Innovation. Cambridge, MA: MIT Press.

- von Hippel, Eric, 2005b: user-Innovationsnetzwerke: Hersteller entbehrlich, Open Source Jahrbuch, Download unter: [http://www.opensourcejahrbuch.de/portal/article\\_show?article=osjb2005-07-04-vonhippel.pdf](http://www.opensourcejahrbuch.de/portal/article_show?article=osjb2005-07-04-vonhippel.pdf)
- Von Hippel, Eric, 1988. The Sources of Innovation. Oxford, Oxford University Press.
- Von Hippel, Eric, 1978: A customer-active paradigm for industrial product idea generation. In: Research policy . Bd. 7.1978, 3, S. 240-266, Amsterdam, Elsevier.
- Weber, Steven, 2004: The Success of Open Source. Cambridge, MA: Harvard University Press.