OVERCOMING THE OPEN SOURCE DILEMMA:

HOW COOPERATIVES ENHANCE THE INTERNET COMMUNITY TO DEVELOP OPEN SOURCE SOFTWARE FOR INDUSTRY AND COMMERCIAL USERS

by

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Abstract:

Open source software is developed jointly in an Internet community. It offers many advantages to industry and commercial users; however, its disadvantage to private companies is that the results are available to the general public and not just to the developers. Since they are not excluded from the results of the cooperation, competitors can profit from the developments without any effort on their part. This problem can be overcome by forming a cooperative. As a special form of cooperation, it serves as an enhancement to the Internet community.

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1. Introduction

The Internet has become an integral part of our daily life. The daily routine of many people is defined by modern means of communication. Products and prices are compared online, plane and train tickets are downloaded on the computer, and bank transactions are performed on the computer screen. Interpersonal contacts are maintained through social networks such as Facebook, and votes are cast in general shareholders meetings over the Internet. In addition to individual use, the Internet is host to an increasing number of cooperative efforts. Private individuals and companies work together on the Internet, for example to generate joint content for online reference works such as Wikipedia. Open-source software such as the Internet browser Mozilla Firefox or the Linux kernel has been developed for many years through a cooperative Internet community.

Open source software projects have a cooperative character: Something is provided jointly and with equal rights that is used by the community itself. Two key features need to be cited that distinguish this approach from conventional cooperative efforts. Software is developed through a virtual form of collaboration, that is, the members create and coordinate their joint efforts primarily via online means of communication. Generally, many of the participants do not know each other personally. In addition, the results of the collaboration are freely available to the general public in addition to those who participate directly in the cooperative community. Not excluding third parties from the results of the cooperation is fundamental to the open source philosophy.

The latter is problematic for private companies that want to participate in the development of open source software for specific applications. They are unable to charge for their development costs, and the danger exists that direct competitors will be able to profit from these developments without providing any input. This significantly reduces motivation for the collaborative involvement in and commercial use of open source software. However, there are so many advantages to software that is not linked to specific manufacturers that interested companies are eager to find an acceptable mode of access. One possibility is the cooperative by means of which companies can be

motivated to collaborate. In order for this avenue to be attractive, the positive benefits of the open source philosophy need to be accessible, while at the same time a solution is needed for the problem of non-exclusion. This article will illustrate how the cooperative is suitable for such developmental tasks from both a financial and legal perspective. The linkage of cooperative efforts and the Internet community will be illustrated with reference to a case study.

New cooperatives on the Internet are highly multifaceted, and the term "collaborative environment" covers a very wide range of cooperation. Consequently, after a brief overview of the specific forms of Internet-based cooperation in the following section, collaboration in the area of open source software will be addressed. We will find that the success of the community is essentially based on the large number of participants and the virtual form of cooperation. Although there are many types of collaborative efforts, the development of open-source software is restricted to the traditional cooperative.[1] Regulations that promote mutual awareness and confidence, characterize this type of cooperation. Collaboration in a cooperative and a new type of traditional cooperative that enables open-source software to be developed for private companies will be presented in Chapter 3.

2. Internet-based cooperative models

2.1 Specific forms

Cooperative efforts that use electronic networks are not new in professional and business contexts. This is illustrated by examples such as the Electronic Data Interchange (EDI)[2], Communities of Practice (CoP)[3] or virtual companies[4]. However, it has become very easy in

[1] This type of cooperation is generally termed "new cooperatives" as is the case of our example. However, the following description does not exclude other forms since rules and institutions are found that replace personal trust with systemic trust.

[2] See Mukhopadhyay, T./Kekre, S./Kalathur, S.

[3] See Pan, S./Leidner, D.

recent years for Internet users to develop their own content and present it in a wide range of cooperative efforts and networks. Examples of this are wikis, weblogs, social networks or mashups. These forms of collaboration are enabled by user-friendly Web content management systems that are generally free to the user, or so-called social software. This type of software facilitated the Web 2.0 and social media, that is, a wide variety of applications for managing information, identity and relationships. [5]

In the more recent forms of cooperation on the Internet, the principle of group intelligence (wisdom of crowds) in free and partially public networks is generally assumed.[6] Group decisions that affect user-generated content, organization and allocation are implicitly assumed to produce better results than (centralized) decisions and the knowledge of individuals. Group intelligence is used in a variety of ways in so-called "open innovation." Users are systematically incorporated in research and development such as the programming of open source software.[7]

Another example of incorporating users or customers is social commerce. In this case, personal recommendations (social navigation) and sometimes automated evaluations of recommendations (social filtering) are used to organize electronic interactions.[8] The potential of the Web 2.0 for company internal and cross-organization collaboration and information production is subsumed under the generic term Enterprise 2.0.[9]

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[4] See Schertler, W.

[5] See O'Reilly, T., http://oreilly.com/web2/archive/what-is-web20.html

[6] See Surowiecki, J.

[7] See Raymond, E., http://catb.org/esr/writings/cathedral-bazaar/

[8] See Bächle, M.

[9] See McAfee, A.

The cited forms of cooperation offer a host of possibilities to companies. In particular, they can profit from Internet-based crowdsourcing. Different than outsourcing, a task is not delegated to an outside company but rather to a large number of voluntary assistants, some of whom are recreational users. This enables comparatively efficient access to external resources, external knowledge in particular. The various modes of these appeals on the Internet to generally large and ambiguous groups are crowd wisdom, crowd creation, crowd voting and crowd funding.[10]

The development of open-source software is also based on the interactive and distributed creation of value on the Internet. In comparison to conventional software that is proprietary or originates from a manufacturer, this type of software has additional characteristics that will be described below.[11]

2.2 Open source licenses

The term "open source" describes a specific type of software license. The license holders have an unrestricted right to use, analyze, change and pass on the software. No license fees may be charged. No person or organization may be excluded from the use, adaptation and improvement of the software ("commons-based peer production"). One way in which the different types of open-source licenses differ from each other is the manner in which one's own contributions to the software are treated. With some licenses, the authors are entitled to a place their own developments under a license of their choice. Other licenses require the use of the original license. The latter approach is termed "copyleft". A frequently used copyleft-free license is the Berkeley Software Distribution license (BSD); one prominent example of an open-source license with a strong copyleft is the GNU General Public License (GNU GPL) by the Free Software Foundation. [12]

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[10] See Howe, J.

[11] See Open Source as a special type of Open Innovation by West, J./Gallagher.

[12] Regarding the Free Software Foundation, see http://www.fsf.org/; regarding the

In 1998, the Open Source Initiative (OSI)[13] was founded to improve the profitability of open source software. This institution makes sure that no one identifies a license as open source which does not actually fulfill the above-cited prerequisites. Interestingly, the term "open source" was only introduced and disseminated with the founding of the OSI. This term is not explicitly mentioned in the wording of many open source licenses. The ability to analyze and modify the software without restriction implicitly assumes an open source code.

Open source software may also be distributed for profit. Money is not paid for the license itself but rather only for associated services, such as for the time and expense associated with publication. In addition, it is conventional and also within the spirit of the open-source movement for companies to have an open source business model and offer additional services. These are understood to be the timely creation, adaptation, correction and updating of software, as well as training, warranties of functioning and similar services – all services that are required in a commercial environment but which generally cannot be rendered by the community.

2.3 Motivation underlying open source programming

An open source program is a collective good that is developed by a global community of programmers voluntarily and on their own initiative (by so-called maintainers or project coordinators). The scope and number of contributions by the individual members of the community differs. On average, 10% of the participants create approximately 70% of the lines of code for an open-source program.[14] In the Linux kernel mailing list, approximately one-half of the 175,000

GNU General Public License, see http://www.gnu.org/licenses/gpl.html.

[13] Regarding the Open Source Initiative, see http://www.opensource.org/.

[14] See. Ghosh, R./Prakash, V., http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/769 /678

contributions originate from only 2% of the 13,000 authors.[15]

The motivation for participating varies widely but it is personal and value-oriented; frequently, however, it is also based on business decisions. It has been revealed that active participation in the development of software is essential in many cases when open source software is used in one's own company and especially in one's own products. Generally speaking, employees who are tasked with programming are partially or completely freed from other responsibilities. According to the information provided by the Linux Foundation, only up to 10 % of programmers work without pay in their free time. The great majority work full-time for companies that use Linux for their business activities.[16]

Voluntary contributions enhance the reputation of the programmers and authors within the community and among the users of the software. The individual contributions must be transparent to users in relation to the community and thereby enable a fair distribution of the reputation. Ideally, this recognition generates a leadership structure within the open-source organization that is based on the experience and the contributions of the participants. According to the values espoused by the movement, everyone must be subordinate to a common cause, that is, the improved quality of the software from which everybody profits. It is generally recognized that knowledge can be developed and used within such innovative communities that would be impossible to obtain within formalized organizations or conventional markets

There are a variety of potential benefits to the users of open-source software. The cost of the license, implementation, operation and support (total cost of ownership) for open source systems such as servers or workplace software can in certain cases be substantially less than the cost of proprietary systems offering a similar range of

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[15] See Moon, J./Sproull, L., http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1479/1394

[16] See The Linux Foundation

functions. A dependence on individual manufacturers or the dominant market position of individual manufacturers is not a problem with open source programs. The software can be adapted to one's individual needs, and the company can profit from improvements created by other participants of the community. Open-source software is also considered comparatively reliable and safe since errors are identified and eliminated by a large community. The positive effects of group intelligence are exploited. Numerous software manufacturers have therefore decided to release formerly proprietary software to exclusive cooperative partners or a global community.

The economic relevance of open software is steadily increasing. For the year 2010, the European Commission estimated a market share of 32% among IT service providers.[17] Established IT companies such as IBM, Oracle, Google, Intel, AMD, Red Hat, Hewlett Packard or even Siemens have added open source solutions to their product portfolio or are completely converting to open source. There are a variety of benefits: On the one hand, competing providers of proprietary software can be weakened by involvement in open source software. On the other hand, the IT companies can offer their customers better software and a larger selection of applications. One example is the Linux-based, open-source cell phone operating system Android by Google for which numerous new applications are continuously being published by the global community. Every month, approximately 3,500 new applications are added.[18]

In addition, although there are no more profits from the sale of licenses, business can be shifted to the consultation, service and support of a potentially larger customer group. And the profits in these areas tend to be larger than from programming per se. For example, there are a host of applications arising from the use of Linux as a server operating system in a company. Factors such as the security, stability, performance, currency and adaptability (customization) of these

[17] See European Commission.

[18] Example: the Android market: http://www.android.com/market/.

systems offer a variety of business advantages to companies with medium-size server systems as well as large service providers within the branch.

2.4 Structure and procedure

Open source software is not developed based on a model; the development processes are based on source code. The software needs to be simple enough so that professional, generally graphic and tool-supported modeling is unnecessary. The participants within the project can read the professional requirements directly from the annotated source code and communicate with each other about them. The system is developed through an evolutionary process: Developers make changes to the source code. The community tests, rejects or confirms these changes that, if accepted, are included in the next version of the program.[19] These activities are accompanied by ad hoc communication and spontaneous team formation (bazaar approach) without any reporting or decision-making hierarchies (cathedral approach).[20] The projects are supported through e-mail, mailing lists, newsgroups, Internet relay chats (IRC), project websites and applications for the administration of source code versions (such as "git" developed by Linus Torvalds, or the Apache subversion "svn").

In most cases, an open-source project starts when a developer wants to solve a problem that he encounters in regular interaction with information systems. For example, Linux got underway when, as a student, Linus Torvalds wanted to use the UNIX operating system running on a university computer on his own computer. Furthermore, it is not just the inception but also the development of the project that is primarily driven by the motivation of the collaborators and not by instructions from supervisors or customer orders.

After the project is published, other interested parties participate

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[19] See Brügge, B./Harhoff, D./Picot, A./Creighton, O./Fiedler, M./Henkel, J.

[20] See Raymond, E.

from general (technical) interest, or because they profit directly from the development. Generally, the initiator only plays the role of a project coordinator (maintainer). If the number of participants and hence the complexity of the project increases, a committee is formed to direct the project (core team). Generally those individuals assume a managerial function, who have been strongly involved in the project (meritocracy principle). In many projects, the project contribution is named to identify the community of particularly involved participants. However, such a naming policy is also recommendable for copywriting reasons. Large projects can be divided into modules (packages) that are managed by different maintainers. Up to 100 developers around the world work on the modules. The modules or expansions can only be included in the source code by the core team for the overall project after they are tested and evaluated. The options open for individuals members of the community to participate extend from testing bug reports, fixing bugs, documentation and proposals for new functions (feature requests) all the way up to the large-scale expansion of functions (patches).

The core teams vote on the basis of majority decisions without objections. Private businesses generally only have one vote which prevents them from dominating. However, since technical considerations are generally at issue, a consensus is usually found. However, if the project splits because of a conflict that cannot be resolved, two competing developer groups are formed (code forking). Overall, the open source approach focuses less on the product or end result than on the developmental process.[21]

2.5 Initial summary

Internet-based collaboration in the development of open source software has many advantages, especially free availability, fast troubleshooting and independence from individual software manufacturers. The software can also be easily adapted to one's own needs without having to obtain individual approval from an owner. In

[21] See Grassmuck, V.

particular, individuals profit from the contributions and improvements of a global community. In comparison to proprietary software, this knowledge community tends to enable more stable new program versions at generally shorter intervals. "Spontaneously organized" collaboration in a large community of developers and testers yields highly capable software programs that are nearly impossible to create with a different type of developmental model.

Despite the many positive features of global virtual collaboration, the organizational model associated with the open source philosophy has certain limits, in particular when software needs to be developed for specific applications for private companies. On the one hand, even a very large community of developers such as the Internet community can only provide a certain (albeit large) number of "spontaneous" software expansions. There will always be applications in which the development of open-source software needs to be kick-started and developed by a (new) initiator. You can't just buy open source software, you or someone else has to develop it. In short, the open source philosophy lives off of the motivation (of whatever kind) of the maintainers and community of members in the overall project. On the other hand, a problem for (potential) initiators, in particular private companies, is that the open source philosophy dictates that they cannot charge for their costs of development or prevent others from using the software. If the danger exists that a direct competitor could profit from the development, especially without providing any input, it would be preferable to refrain from developing software that is beneficial. This would constitute a failure of the Internet community.

This dilemma of open source software development can be overcome through a different form of collaboration in which the organizational elements of the open source philosophy are retained, and the problem of non-exclusion is eliminated. Since collaboration within the Internet community is cooperative in nature, that is, something is provided to everyone on an equal footing which is used by the members of the group, it would be useful to adopt the legal form of a cooperative to overcome these problems. There are certain basic features of the cooperative that differ from the Internet community and allow the problems associated with open sourcing to be overcome. The cooperative form of collaboration will be outlined below.

3. Cooperatives in the Internet community

3.1 The cooperative

Registered cooperative societies are a cooperative type of business.[22] Private individuals, independent entrepreneurs or legal persons come together in a joint venture to achieve common economic, social or cultural goals. The special feature of cooperatives is hence that the members are directly supported by the efforts of the cooperative. This identity and the resulting purpose of the joint venture are the key features of cooperative efforts. They can be realized by a wide range of business models and sectors.[23]

A registered cooperative is a type of fixed institution in comparison to other types of cooperation. It is not a loosely associated network of individuals but rather a permanent venture with a board of management and board of supervisors. It differs from other types of networks,[24] including the Internet community described under section 2. Nonetheless, each member of the cooperative retains their independence even after joining the cooperative. This feature distinguishes cooperatives from corporations or a franchise system. There is no hierarchical pull relationship between high and low; members are chiefly responsible for the business policy of the cooperative based on subsidiarity. The management of the cooperative is interested in funding business relations and promoting the members in their interests. The special position of the members is also illustrated in that each participant only has one vote independent of their equity participation. In regard to the acceptance of new business partners, the rules of the cooperative are simple, like those of an association; new members only have to submit a statement of participation. Members can leave by quitting.

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[22] For an overview of cooperatives, see Ott. E./Wieg, A.

[23] For a current overview, see DGRV – Deutscher Genossenschafts- und Raiffeisenverband e. V.

[24] An overview of forms of cooperatives, see Wieg, A.

3.2 The (young) traditional cooperative

The position or relationship of the cooperative to its members can vary widely in practice. Cooperatives develop over time depending on the development of the members' affairs as well as the overall market environment. Eberhard Dülfer identifies different types of cooperatives, "traditional cooperatives," market cooperatives," and "integrated cooperatives."[25]

In a traditional cooperative, the members business and business of the cooperative are tightly interrelated. The services and management of the cooperative are exclusively defined by the needs of the members; beyond this, the cooperative does not set its own business policy. If services that are originally provided by the corporative to satisfy market need are not (necessarily) used by the members because there are a sufficient number of alternatives, the cooperative generally offers its services to nonmembers. This is termed a market cooperative. The relationships of members to the management as well as the members to each other are largely independent. There are however developments that can lead the cooperative management to expand its services to the members. For example, in such a case the market image of the members is substantially influenced by the management. In this type of integrated cooperative, the management function of the members is (partially) transferred to the management.

Young cooperatives can generally be identified as traditional cooperatives. They are characterized by a close connection of the members between each other and the management. New cooperatives are primarily sustained by the personal trust between the founders of the cooperative or from the opportunities for social control. Generally, the first members know each other well. Holger Bonus has identified this relationship as an explanation of the success for the early Raiffeisen banks.[26] Loan associations can use their knowledge against

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[25] In regard to the following, see Dülfer, E.

[26] See Bonus, H.

real estate agents or banks from the city since the members, that is the farmers of a village, know each other very well. They can assess the personal conditions and hence the creditworthiness of a farmer looking for credit which has an immediate, positive effect on the conditions of credit. Proximity and knowledge also promote a sense of camaraderie and trust as well as social control. These features of a traditional cooperative promote the development of open-source software by private companies. This relationship will be illustrated below with reference to a case study.

3.3 The cooperative as a catalyst for open-source projects

Open source software, especially Linux, is of great interest to machine manufacturers and the automation industry, especially for embedded systems for controlling, regulating and monitoring machines. The branch requires specific enhancements to operating systems such as real-time capability. For these expansions to be adopted by the branch, compatibility needs to be certifiable. In addition, standardized software interfaces need to be available, and the participating companies are responsible for developing and monitoring them. Finally, these expansions need to be updated in the future, software errors need to be eliminated quickly, and important software features need to be ensured over the long-term. Consequently, the use of open-source software is predestined in the industry given its advantages of fast troubleshooting, reliability, individual adaptability and independence from individual software manufacturers. The community by itself is not capable of meeting the specific requirements of the software. An independent open-source development process needs to be initiated for such projects. One can ask, however, why a machine manufacturing company, for example, should assume the cost of development for the entire industry.

To further the success of open source software in the cited fields and make it easier to overcome investment hurdles, OSADL eG (Open Source Automation Development Lab) headquartered in Schopfloch was founded in 2005. The founding members were well-known companies in the machine manufacturing and automation industries in the Black Forest such as TRUMPF GmbH & Co. KG and Homag Holzbearbeitungssysteme GmbH, as well as hardware and software

manufacturers and Linux service providers.[27] When the cooperative was founded, it was oriented around American open source development labs. These "laboratories" promote the general development and propagation of Linux. OSADL eG in contrast focuses on machine building and the automation industry. Correspondingly, OSADL maintainers focus especially on the real-time capabilities and other features related to the automation industry in the Linux kernel. The development of software is promoted in this specific field through the cooperative.

By jointly developing open-source software and offering a series of additional services relating to open source software and Linux[28], OSADL eG solves the dilemma associated with open source software. In order to request a software project, membership in OSADL eG is required. If a majority is in favor, the project will be financed from the funds of the cooperative.

In contrast to the Internet community, the decision to pursue a project is not left to a spontaneous evolutionary process in virtual space. Members that know each other come to agreements and initiate projects. Instead of a core team, there is a group of members that are interested in a particular project. Several drivers and other components

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[27] Over the five years after its founding, the number of members increased from 11 to more than 30. The member companies are from seven different countries, employ more than 100,000 employees and have combined sales of more than €100 billion.

[28] The major services that are used by the members are the development and updating of software components required in the machine building and automation industries, assistance in certifying safety-critical software, the collection of long-term data on the reliability of hardware and software components, the provision of jointly useful marketing activities, help with legal advice on the license management of open source software, setting up a database with responses to frequently asked questions associated with open-source software, the organization of seminars and conferences, collaboration with academic institutions and performance and arrangement of in-house consulting to troubleshoot software problems.

that are needed for industrial applications have thereby been incorporated in the Linux kernel. The investment funds for open source software are distributed by the cooperative.

The source code that is financed by the cooperative is always published, that is, the collective nature of the software is retained, and no one is excluded from using the development. The open source philosophy therefore remains unaffected by the activities of OSADL eG. The cooperative has to perform a commercial balancing act, however. On the one hand, the members are offered as many exclusive services as possible to provide individual motivation to become a member; on the other hand, the open source rules must be strictly observed in order for the collaboration between OSADL eG and the community to function smoothly. The open source dilemma is overcome not by restricting consumption or passing on the cost of development to individual (unknown) users, but by having the cooperative companies pay less for the desired development. Publishing is more or less factored in as a cost of business. In one sense, public disclosure is desirable because the software can be tested, developed and updated by others, that is, beyond the membership of the OSADL group.

When seeking an appropriate legal form for cooperation, the initiators of OSADL eG weighed various options such as the association, corporation, GmbH or foundation. The founders finally chose the registered cooperative since it best fits the concept of community underlying the open source philosophy. The basic democratic structure of the cooperative business structure is key to the collaboration between the companies producing the collective property of open source software. OSADL eG enables cooperation on an equal footing as in the Internet community. The projects are selected on the basis of majority vote. Joining and leaving the cooperative is also comparatively uncomplicated and flexible; for example, a notary public is not required. This consideration was a decisive factor in rejecting legal forms such as the LLC. The focus on dividends and the potential dominance of individual shareholders led to the rejection of the corporation as an option.

In contrast for example to a foundation or registered association,

OSADL eG is designed for commercial activity and to operate as a business. Five figure development projects are frequent. The profits associated with the development orders exceed the limits permissible for associations. Due to the financial importance of development to the participating companies, the cooperative is therefore a more suitable legal form than an association or foundation.[29] In any case, the reputation of the maintainers is less important to OSADL eG than the financial advantages to the members.

Cooperative collaboration functions well within OSADL eG because individuals come to know each other personally on equal terms (through the cooperative). A sense of trust and esprit de corps between the companies developed from their participation in OSADL eG. The more formalized organizational framework in comparison to unrestricted communities offers security and promotes trust, and the democratic approach fosters collaboration. The characteristics of a traditional cooperative are realized in OSADL eG: Mutual familiarity and trust. This is another reason that motivates individuals to participate in open-source projects. The problem of non-exclusion is also attenuated by the fact that no one is discriminated against in development, and this produces a community experience. In addition to sharing the cost of investment, the experience is one of reaching a common goal.

Although the developed software does not contain any critical competitive information of the member companies, it is the traditional characteristics of OSADL eG that promotes cooperative exchange and initiative. OSADL members are partners in the development of software through the cooperative model while remaining competitors in the market. Without the legal form of the cooperative, it is questionable whether advantageous programs would be developed.

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[29] OSADL eG focuses on cooperation between companies. In Internet communities, companies are represented in addition to free programmers.

4. Summary

The open source philosophy and cooperative collaboration (according to the traditional model) have many things in common: Something is created jointly that is used individually. The participants in the cooperative work together on an equal footing. There are, however, a few differences. New forms of cooperation on the Internet are designed to accommodate a very large number of anonymous members. It is not necessary for the members to personally know each other, and this is generally not the case. Internet-based forms of cooperation such as crowd wisdom, crowd creation, crowd voting and crowd funding all employ virtual forms of cooperation and exploit the collective intelligence of a group that is unlimited in principle. The development of open-source software is also based on the interactive and distributed creation of value on the Internet. The cooperative is in contrast more formalized, and the traditional type in particular draws its strength from the mutual familiarity and trust between members.

Both forms of cooperation enhance each other the best when the development of open source software is initiated by private companies. The investment hurdles to developing open-source software for specific applications can be overcome by a strictly formalized form of cooperation such as the cooperative which distributes the cost of development among its members. The dilemma associated with developing open source software is resolved by the fact that cooperatives promote a spirit of cooperation and initiative through personal familiarity and democratic collaboration. The cooperative distributes the cost of development, retains the open source philosophy and promotes a special community of developers.

The combination of both types of cooperation is also conceivable for other areas of open innovation, especially research activities that cannot be handled by a single company and can only be mastered by a large group of specialists from different companies with different types of expertise. This includes the development of semiconductors, mechatronics, photovoltaics, energy stores and other future

technologies.[30]

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[30] See for example the mechatronics expert network (http://www.photovoltaik-anlagenpass.de). The cooperative was not chosen in this instance partially due to the lack of familiarity with this legal form in fields of technical innovation. Many open innovation projects are located in the USA or Far East and are traditionally initiated by large companies such as IBM. In regard to the beginnings of open innovation, see the example by IBM chronicled by Chesbrough, H.. In addition, confidence in open innovation has only increased in recent years, which makes it conceivable for small businesses, and cooperatives can also be initiators.

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