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DECISION-MAKING IN THE PROCESS OF IMPLEMENTATION OF OPEN SOURCE PROJECTS

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Abstract. The paper outlines the decision-making process in communities focused on open source projects. The analysis describes advantages and disadvantages of group decision-making models in such projects, and subsequently outlines preconditions that increase the probability of achieving success by open source community, for example, openness of decision-making process and modular structure of an open source project. The author's intention is to outline the specific nature of the decision-making process in open source project, by highlighting the challenges concerning the process and their impact on the project's capability to perform successfully and achieve its goals.

Keywords: Decision-making, WEB 2.0, online community, open source projects
JEL classification: M10, M12.

Introduction

In recent years, open source projects have become more and more popular. A number of spectacular successes of similar ventures, such as Linux, Apache or Open Office have created interest in this subject not only among internet enthusiasts but also among serious business organisations. Implementation of open source projects does not boil down to gaining free access to the software code. Development of new technologies, especially Web 2.0 (Internet based on interactive exchange of ideas, opinions between interconnected entities) has spurred the development of web communities. Open source projects give rise to new models of cooperation, in which open source community is involved in project realisation. The open source community is set up on an *ad hoc* basis. It is self-organising, gathered around a commonly shared goals-ideas-project, in which each member has unrestricted access to information and is able to communicate with any other community member in real time. Community is not restricted with rigid frames or boundaries, instead its activity is based on the use of creative potential of its network entities. Furthermore, community members do not have

to be formally associated with any organisation, they are linked together via commonly shared values, ideas. They often participate in the project on a voluntarily basis. Open source projects and communities gathered around them constitute only an example of a broader phenomenon, which is based on similar mechanisms - emergence of hyperarchical model of an organisation (Mrówka, 2011). Other examples of communities operating in a similar manner comprise: wikipedia community or communities undertaking selected projects of open innovations.

The issues mentioned in above paragraphs point out to a necessity of more thorough analysis of open source communities, which can become an inspiration for modern organisations with regard to the development of new business models based on a community of internet users. The analysis outlined in this paper describes decision-making process within the implementation of open source projects. The author's aim is to: outline the specific nature of a decision-making process in communities implementing such projects, point out the challenges that constitute an inherent part of a decision-making process and describe their impact on the possibility of successful performance of open source projects.

Group decision-making in the process of implementation of open source projects

Specific objectives of open source projects are often volatile, modified in line with the activities currently carried out by community members. Only project mission, understood as a general objective, which integrates the community, may remain constant (Mrówka, 2012). Volatility of open source project objectives and their modification prompted by activities carried out by community members indicate that decisions concerning the directions of organisational development need to be taken collectively. Therefore, it can be expected that decision-making models predominantly applied in open source community will be group-based models, which entail both positive and negative consequences for this type of projects. Within the decision-making process area, open source community resembles traditional interactive groups, in which decisions are preceded by open discussions, disputes, justification of arguments, which substantiate the decisions made (Griffin, 1998). Difference between traditional interactive group and open source community comprises especially the lack of face-to-face contact between members. Discussions underlying decision-making take place via the internet between the members scattered all over the world.

The strength of each group decision-making process comprises in particular the exchange of information between different people involved in the decision process. A variety of the community members' knowledge, credentials, skills, qualifications and experience contributes to better quality of final decisions (better in terms of reasonableness, thoughtfulness) (Sosnowska, 1999; Dennis, 1996). Additionally, owing to this exuberance of skills, credentials, it is possible to work out more decision variants enabling for a deeper look into the problem. Not unimportant is also the fact that collective decision-making, participation in this process by numerous community members can enhance their involvement, improve communication, and increase acceptance level for implemented decisions (Griffin, 1998).

It should be taken into account, however, that benefits of collective decision-making mentioned above can be achieved on a condition that community members will be exchanging information with each other. Nonetheless, in multiple cases, exchange of information in traditional interactive groups is very rare. Many members withhold important information for themselves (Stasser, 1992). This can result in the deterioration of quality of decisions made (Gigone, Hastie, 1993; Stasser, Stewart, 1992).

Dennis (1996) notes that usage of information technologies in collective decision-making can have a fundamental impact on information exchange within various groups. Dennis' research proves that groups using IT tools exchange much more information as compared with groups not making use of such tools. This is possible due to: the use of collective memory (entire process is recorded and accessible to all community members), several projects, ideas running in the pipeline and certain sense of anonymity existing in virtual contacts (i.e. lack of face-to-face contacts). Due to the fact that these elements are also typical for open source community, the conclusions arising from Dennis' research can be extended over open source projects. The style of operation of open source projects, discussions carried out in discussions forums, where each member can access them immediately, openness of presented opinions – all of these aspects foster exchange of information between community members and finally increase the quality of decisions made collectively.

Apart from this, however, group decision-making has numerous drawbacks. The literature covering this issue points out to the long time of the decision-making process and losses made in the process, often caused by: ineffective persuasions made by community members who try to convince each other to certain ideas (Griffin, 1998; Sosnowska, 1999), problems with sharing often unique, important information and tendency to devote much time on analysis of information well known to all community members rather than on information known only to small number of members (Dennis, 1996; Sosnowska, 1999), danger of taking not optimal but compromising decisions (Griffin, 1998), danger that the group will be dominated by one of the community members (Sosnowska, 1999; Griffin, 1998) and group thinking (Tyszka, 1999; Sosnowska, 1999; Griffin, 1998; Forlicz, 2008), i.e. the way of thinking which prefers maintenance of cohesion within the group over the quality of the decisions based on facts.

Some of the problems will certainly occur in open source projects, although the specific manner in which these types of projects are operating will rather favour the decrease in importance of such problems. Remarkably, in open source community, which favours collective decision-making process, the time required to make a decision may pose a problem. Discussions, arrangements, consultations may lead to prolonged decision process.

As mentioned in the above paragraphs, the problem of information sharing in open source projects can be at least partially mitigated through the use of IT tools. Similarly, propensity for making compromising decisions instead of optimal decisions can also be reduced. On the other hand, however, in the research carried out by Dennis, referred to in the preceding paragraphs, he states that the use of IT tools for supporting collective decision-making processes does not guarantee that during the information exchange process appropriate attention will be paid to unique information, known to a

narrow group of members only. Some researches (e.g. Arazy *et al*., 2006) state that the diversity of a group (including emergence of scattered, unique information) enhances the quality of final performance achieved by internet communities, thus those scattered opinions must have an impact on final decisions. The research described above was carried out within the Wikipedia community and proved that the number of persons involved in the creation of Wikipedia definitions increased their quality, understood as a decrease in the number of mistakes appearing in the definitions. This phenomenon was described by Surowiecki in his famous book "The wisdom of crowds". Surowiecki concludes his considerations with a statement that "If you put together a big enough and diverse enough group of people and ask them to 'make decisions affecting matters of general interest,' that group's decisions will, over time, be 'intellectually [superior] to the isolated individual,' no matter how smart or well-informed he is." (Surowiecki, 2005, p. XVII). This phenomenon is also specific to open source communities.

Another problem associated with collective decision-making concerns the danger of the group being dominated by one of the community members. Such danger also exists in open source community, however, it seems that in this case limited or even non-existing face-to-face contacts reduce the likelihood of emergence of such a phenomenon. Dominance over the group exerted by one of the members is usually connected with dominating member's charisma (Weber, 2002), in open source community, where members are geographically scattered and do not have a chance to meet regularly, charisma can contribute to building up an authority, however, this occurs rather rarely (O'Mahony, Ferraro, 2007; Wellman, Gulia, 1999).

The last of the disadvantages of collective decision-making referred above concerned the danger of emergence of group thinking. However, Forlicz (2008) observed that group thinking can be propelled by certain conditions, which comprise: increased integration, fondness between group members. In open source community, limitation of direct contacts and replacing them with virtual ones does not foster integration. Secondly, group thinking process is facilitated by isolation from the environment and lack of possibility to confront one's ideas with the environment. This phenomenon also applies to virtual social networks, which is confirmed by Hinds and Lee (2008), nevertheless, they emphasize that this applies to closed virtual social networks. Nonetheless, the specific characteristics applicable to most open source projects comprise: its openness, flexibility of boundaries, volatile composition of the community. The above characteristics hinder group thinking. Thirdly, group thinking can be propelled by severe stress resulting from the importance of decisions made, pressure of time. This phenomenon occurring in open source projects cannot be fully eliminated. Lastly, strong leadership fosters group thinking. It should be pointed out, however, that leadership in open source projects is often scattered and difficult to associate with only one person, which also hinders rather than fosters group thinking.

It seems that the likelihood of occurrence of group thinking in open source projects is rather low as compared to most traditional organisations. This is also confirmed by Arazy *et al.* (2006), who notes that diversity of population, typical for open source community, reduces the destructive aspects of a group decision-making process, such as group thinking or conformism.

In summary, it seems that in open source projects advantages of group decision-making surpass its drawbacks, which are inherently connected with the process. Nevertheless, it does not mean that such threats cannot become real problems in this type of projects. The question that should be put is how to increase the likelihood of success of decisions taken by a community.

Openness of the decision-making process

The basic prerequisite of a successful group decision-making process in open source projects is the openness of the whole process. Openness is also one of the basic characteristics typical for open source projects. This is related with unrestricted access to all sources of information collected by the community, obtained symmetry in information (Mrówka, 2011). However, certain pathological situations restricting access to information may arise. As observed by Goldman and Gabriel (2005, p. 145), "The health of any community is likely to become poisoned when its members believe that there is a group of people who are secretly making the important decisions." All community members, irrespective of their motives substantiating their involvement in the community work, or position held outside the community, should have equal access to information and should have influence on decisions made. All decisions should be made in an open, transparent manner, with the use of mailing lists, discussion forums or tools enabling both to maintain group memory and to provide each member with unrestricted access to historical and current information. Additionally, as observed by Goldman and Gabriel (2005), writing down decision proposals also contributes to their particularity and enhances their quality.

The openness of decision-making process which in effect leads to an increase in involvement of community members, contributes directly to enhanced quality of decisions taken. In accordance with the analysis carried out by Heckman *et al.* (2007, p. 82) "that greater participation in decision-making would be associated with more effective projects". However, according to that analysis, in the initial phase of the open source community lifecycle, formal administrators of the project hold an important role in the decision-making process – only along with project development, the role of community members increases, thus leading to an enhanced involvement in the decision-making process.

This leads to a subsequent phenomenon. Transparency and openness of a decision-making process does not preclude its formalisation to a certain degree. Formalisation may be a remediation of certain drawbacks of group decision-making. Due to this, in the initial stages of open source community lifecycle, engagement of formal administrators is important, as they facilitate formulation of standards and principles with regard to the decision-making process (Heckman *et al.*, 2007). Numerous researches point out that organisations applying direct democratic forms of participation in decision-making process have problems with coherence of undertaken activities and making decisions in the phase of rapid growth (Rothschild, Whitt, 1986; Whyte, Whyte, 1988). According to observations made by O'Mahony and Ferrero (2007, p. 1081), "the need to coordinate interdependent member activities and integrate member contributions in a production context is likely to exacerbate the need for a shared basis of authority".

Guidelines that can be followed with regard to this issue may comprise actually operating communities gathered around IT open source projects, which have developed formal procedures describing decision-making process. As observed by Goldman and Gabriel (2005), although open source communities often comprise hundreds of participants, usually, there is a group consisting of less than 10 persons (*core group*), which holds the highest status and coordinates informal communication within the community. This group works as a standard group managing the project, but is geographically dispersed and receives immediate feedback about all decisions made. Additionally, being significant in size in open source projects, the groups can be divided into subgroups, each of which can have its core group.

Similar formal procedures concerning the decision-making process occurring in open source communities were described by Shah (2006). Admittedly, the whole community owns the rights to the code of the project, however, there is a separate subgroup – a committee – which makes the decisions concerning the project.

In open source projects, final decisions can be made by a single person – a decider who navigates the activities carried out by the community, a so-called benevolent dictator (Howe, 2008). Nevertheless, even in this case, the dictator can make a final decision and take responsibility for that decision but the whole process preceding the decision, i.e. consultations, discussions are carried out by the whole community. In practice, detailed procedures applicable to various projects can differ from each other significantly.

Modularised form of open source projects

Multiple open source projects have one common feature: modular structure. This modularity facilitates the decision-making process. One of the major drawbacks of collective decision-making is that this process is time-consuming, which prolongs along with the size of the community. Modularity of the project can naturally limit the size of groups gathered around particular modules of the project. However, in this case a certain formal element can occur, which is concerned with occurrence of a formal position of *module owner*, responsible for making decisions concerning the shape of particular module, implementing changes into this module (Goldman, Gabriel, 2005). Module owner function can be held by one person, or, as already mentioned in this paper, by the group of people, a committee. Each of the committee members can implement small changes; however, decisions about major issues are usually made collectively.

The power held by the module owner, as well as the power held by benevolent dictator in terms of the possibility to make decisions still remains very constrained, as the module owner or benevolent dictator can make decisions only as long as they maintain the trust of community members. Dictator's authority is based on substantive issues. If numerous members do not agree with decisions made, such a leader can be dismissed from his position or the project can be separated (*forked*), i.e. the members can embark on a new project, defined by them (Goldman, Gabriel, 2005). The solution to this problem might encompass involvement of all community members into the decision-making process, which may take the form of broad consultations. When people feel that they are involved in the process, and if their opinions are taken into account and

appreciated, then the community will be more inclined to accept decisions made. On the other hand, if the community members consider that their opinions are not taken into account, then they will oppose the decisions.

According to observations made by Shah (2006), every constraint in democratic mechanisms within decision-making process and enhancement of controlling and restrictive procedures, including formalisation of decision making process, increases the probability of non-compliance with community members' expectations and might entail decreased involvement of the members in activities carried out. It is crucial, as remarked by Shah, to ensure that each community member carries out their activities in accordance with their own expectations or plans. On the other hand, however, they should be free to express various opinions and points of view. This underlines the importance of unrestricted access to information within open source projects and possibility to exchange opinions by all community members.

According to the above arguments, it is nevertheless important, despite certain formalisation of the decision-making process, to achieve and maintain consensus with regard to decisions taken. This enhances the importance of ability held by particular community members, to convince others to one's ideas, opinions. In theory, each member has an equal right and possibility to initiate changes, including strategic changes, however, in practice, not every member will be able to convince other members to accept his or her ideas and build the group of followers around his or her project. The position within the community is thus based on knowledge, experience (but only with regard to the activities that have been previously carried out in the community), but also on persuasive skills.

Scheme of a decision-making process – group meritocratic model

A decision-making process typically involves the following steps (Figure 1):

1. Proposal – any community member can make a proposal for consideration by the community. Proposal can be submitted in a form of an idea concerning directions for growth of the project or in a form a ready-to-use module, which can be implemented to the general code. Usually, such a proposal is communicated in a mailing list of the project or in a discussion forum.
2. Discussion – submitting a proposal in a public mailing list or in a discussion forum provides each community member with a possibility to express their own opinion about the submitted proposal. In many cases, the proposal can give rise to a fierce discussion.
3. Decision – a decision can be made in two ways, depending on the course of the discussion and the importance of the problem.

The first mechanism of decision-making involves the so-called 'lazy consensus'. In general, as long as no one explicitly opposes a proposal, it is recognised as having the support of the community. Those who have not stated their opinion explicitly have agreed with the proposal implicitly. For lazy consensus to be effective, it is necessary to allow some time (e.g. 72 hours) to elapse before assuming that there are no objections to the proposal. This requirement ensures that everyone is given enough time to read,

digest and respond to the proposal. This time period is chosen so as to be as inclusive as possible of all participants, regardless of their location and time commitments (Gardler, Hanganu, 2012).

The second mechanism of a decision-making covers a situation where a consensus cannot be reached or the decision concerns issues of crucial, strategic importance. In this case, it is possible to apply the procedure of voting. During voting procedure, each of the members can take the floor and express their opinion. However, there can be restrictions with regard to the voting right – the voting right may be held only by the most active, involved community members or members of the steering committee. Various types of problems, issues may require various mechanisms of decision-making – sometimes a simple superiority in votes is enough, in other cases, unanimous consensus is necessary.

As an example of an interesting case, the Apache project can be outlined. Each of the community members cane vote, by choosing one of the following possibilities:

+1 - ‚yes', ‚agree': also willing to help bring about the proposed action

+0 - ‚yes', ‚agree': not willing or able to help bring about the proposed action

-0 - ‚no', ‚disagree': but will not oppose the action's going forward

-1 - ‚no', ‚disagree': opposes the action's going forward and must propose an alternative action to address the issue (or a justification for not addressing the issue).

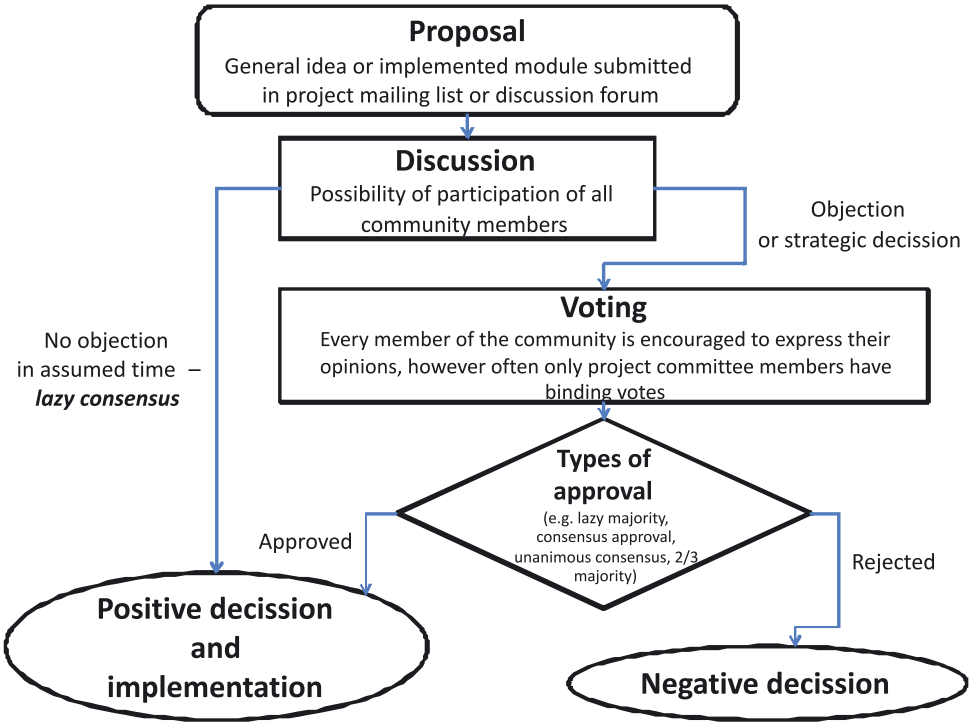
Different actions require different types of approval, ranging from lazy consensus to a majority decision by the members of a management committee (Table 1).

Table 1. Types of approval of proposals in Apache Project

Type	Description	Duration
Lazy consensus	An action with lazy consensus is implicitly allowed, unless a binding -1 vote is received. Depending on the type of action, a vote will then be called. Note that even though a binding -1 is required to prevent the action, all community members are encouraged to cast a -1 vote with supporting argument. Committers are expected to evaluate the argument and, if necessary, support it with a binding -1.	N/A
Lazy majority	A lazy majority vote requires more binding +1 votes than binding -1 votes.	72 hours
Consensus approval	Consensus approval requires three binding +1 votes and no binding -1 votes.	72 hours
Unanimous consensus	All of the binding votes that are cast are to be +1 and there can be no binding votes (-1).	120 hours
2/3 majority	Some strategic actions require a 2/3 majority of PMC members; in addition, 2/3 of the binding votes cast must be +1. Such actions typically affect the foundation of the project (e.g. adopting a new codebase to replace an existing product).	120 hours

Source: Hanganu (2012).

Figure 1. Scheme of a decision-making process in open source project – group meritocratic model



Source: author.

Conclusions

To summarise the considerations concerning the methods of a decision-making process in open source projects, it should be emphasised that those decisions are mostly taken collectively or at least with the significant acceptance of the community members. The degree of involvement of community and influence of its members on the final decision may be, however, different, similarly to the scope of formalisation of the decision-making process. Additionally, the methods of decision-making differ, depending on the type of decision, its strategic importance and change in line with the community expansion. Decisionmaking system evolves during the project lifespan. In the early stage of the project lifecycle, the role of the manager holding major decisive power can rest with the project initiator, whose role can gradually weaken against the power of the whole community and democratic mechanisms developed by the community (O'Mahony, Ferraro, 2007; Heckman *et al.*, 2007). Further expansion of the community can result in implementation of certain formalising, bureaucratic elements. After some time, there should be a balance between democratic and bureaucratic mechanisms.

This evolution can also concern the involvement of certain people and their groups. This can be observed in successful open source projects, in which at various points in

time different people and groups are involved. Their role changes over time – limitation of their role does not necessarily mean a failure, but completion of a certain stage of the project, resolving certain issue. Communities emerge, disappear, and often they are subsequently reactivated (Goldman, Gabriel, 2005).

Despite all this, the prerequisite for success in activities undertaken by open source communities is the ability to use the potential of its members, which entails the necessity of involving in the decision-making process as many members with unique skills as possible, even if such an involvement will comprise only consultations of decisions or listening to critical voices. It should, however, be emphasised that the final criteria against which decisions should be evaluated is the degree to which members identify themselves with their community, which has an impact on their active participation in further stages of the project lifespan.

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SPRENDIMŲ PRIĖMIMO PROCESAS ĮGYVENDINANT ATVIROJO KODO PROJEKTĄ

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Santrauka. Straipsnyje apibūdinamas sprendimų priėmimo procesas bendruomenėse, orientuotose į atvirojo kodo projektus. Analizė apibūdina sprendimų priėmimo grupės modelių privalumus ir trūkumus tokio tipo projektuose, o vėliau aprašomos prielaidos, kurios didina tikimybę pasiekti sėkmę atvirojo kodo bendruomenei, pavyzdžiui, sprendimų priėmimo proceso atvirumas ir atvirojo kodo projektų modulinė struktūra. Autoriaus tikslas yra atskleisti specifinį sprendimų priėmimo procesą atvirojo kodo projekte, atkreipiant dėmesį į proceso problemas ir jų poveikį atlikti projektą sėkmingai ir pasiekti savo tikslus.

Reikšminiai žodžiai: sprendimų priėmimas, WEB 2.0, internetinė bendruomenė, atvirojo kodo projektai.