

# Governance Structures in Distributed Problem Solving Networks

*working paper in the OII/MTI 'Performance of DPSNs' project*

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## 1 Introduction

The purpose of this workstream is to evaluate the role of governance in Distributed Problem Solving Networks and describe and compare the governance structures of the case studies in the project.

Governance structures emerge as a cross-cutting theme in the case studies of DPSNs. It is perceived to be an aspect of DPSNs where they depart most from traditional problem solving. The potential difference in governance structure in DPSNs from other types of problem solving is implicit in references to the 'wisdom of the crowds', the idea that it may somehow be the 'crowd' that manages the problem solving effort. To some extent this does happen - enough to suggest that the way a DPSN is governed is a key part of its success and performance. In this paper I draw on the findings from the various case studies to investigate to what extent DPSNs use centralised managerial control, and the role of governance structures in DPSN performance. The approach I take is descriptive and the goal only to show that divisions into centralised vs decentralised governance structures are superficial, since the reality is more complex.

What do we mean by governance structure? In the most general sense it can be taken to mean the system that organises the rules that regulate people's behaviour in the context of DPSN projects. The people who are regulated in this case are those that provide the information input to the problem solving effort, the problem solvers. I define governance from the perspective of the problem solvers, as opposed to those that are external to the problem solving effort, such as the company that owns a platform, or the researchers setting up an information market, or the administrators in Wikipedia. Those external to the problem solving may control the governance structure, and be influenced by the actions of the problem solvers, or even also be problem solvers themselves, but the system of rules I will examine is the system that applies to the problem solvers. The governance structure then is the set of rules that control the actions of problem solvers and therefore the flow of information through the DPSN.

## 2 Theoretical perspectives

Distributed Problem Solving Network organisations have by definition some amount of decentralisation. The actors involved in the problem solving effort, those that contribute information to produce the 'solution', are in most cases spatially distributed and are peers. This form of

organisation, in the context of this project, is contrasted with centrally managed and hierarchically structured organisational forms, that are more characteristic of business corporations and public administrative bureaucracies (David 2008). The fact that our case studies show that some DPSN projects display a significant degree of centralised management suggests a need to reconcile this theoretical contrast in governance structures with empirical findings.

Benkler (2002, 2006) calls production that is decentralised in its organisation and dependent on self-selected rather than hierarchically assigned individual action ‘commons-based peer production’. According to Benkler’s framework, this type of organisation is novel and distinct from other forms of economic organisation, the market and the firm. DPSNs, as defined in this project, encompass a broader set of networked organisations, but Benkler’s framework is a useful theoretical starting point for explaining certain properties of the governance structures in DPSNs. Benkler argues that a distributed collaboration will succeed if the task can be sufficiently broken down into modules of small enough size (its granularity) and at the same time the cost of combining the modules into a finished product is low enough. He calls this last cost the cost of integration. The integration task usually demands a higher cost than mere participation does and Benkler argues that the distributed organisation can deal with this either by iteratively peer producing the integration task, or by a ‘limited reintroduction of hierarchy or market to provide the integration function alone.’ In this model a high cost or an unmet need for integration would explain the presence of some degree of centralised managerial control in a DPSN.

However, much of Benkler’s argument is based on the idea that peer production has an advantage over the firm or the market in information about and allocation of human creativity and effort (Benkler 2002). He limits his analysis to situations where participants in the distributed collaboration extract and contribute information to a Common Property Regime (CPR). In a CPR a body of information is open for use to a bounded set of potential participants who can volunteer to use the information to produce a new and valuable product. Because participants self-select based on how well they believe they can perform their chosen task, tasks will be performed by suitable actors, provided they do not misjudge their own ability. DPSNs, however, are not limited to situations where a CPR regulates the information inputs and outputs and therefore the advantages of peer production proposed by Benkler do not necessarily hold. The DPSNs studied in this project include systems where the information output is controlled by a those outside the problem solving process and the integrated end product is not available to the problem solvers (prediction markets and Sermo both have this property).

DPSNs, then, are not limited to commons-based peer production nor are they necessarily without a degree of centralised managerial control. The reality is that governance regimes are on a spectrum of hybrids between central management and distributed self-organisation. In the context of FLOSS, the nature of this spectrum of distributed organisation has been thoroughly examined (for example, by Crowston and Howison (2005)). FLOSS scholars have challenged unquestioning adherence to Raymond’s cathedral vs bazaar dichotomy (Raymond 1999), for example, Bezroukov (1999) cautioning against ‘vulgar Raymondism’ and the superficial centralised vs decentralised division and Lerner and Tirole (2002) noting that a “strong centralisation of authority characterises” open source projects.

In this project we see that with DPSN governance structures another theoretical dichotomy may be applied with more success - that of Hirschman’s (1970) ‘exit’ vs ‘voice’. Governance structures can be categorised by what the governance structure allows problem solvers to do if they are unsatisfied with aspects of the conditions of their participation. Under some governance structures it is possible for the problem solvers to exercise ‘voice’, the structure is such that

the problem solvers can influence the rules that regulate the information they produce and that govern their actions. In other governance structures, the problem solvers can only choose to leave the problem solving effort if things are somehow unsatisfactory. As with the cathedral and the bazaar, this theoretical division is of course not perfect: Firstly, in some DPSN governance structures the organisation is very unlike a market where unsatisfied participants can choose to exit - for example much of the work in ATLAS is done by paid employees. Secondly, in some governance structures it is not necessarily of much concern whether or not participants can exercise voice, since they are unlikely to have an interest in changing the governance regime - for example in prediction markets, the ‘problem solvers’ do not have much incentive to change the flow of information through the system, and would rather exit if the benefit to participation is too low. Thirdly, in many DPSNs those that participate in the problem solving network did not find themselves placed in a community, as is often the case in the offline local communities Hirschman wrote about. In DPSN ‘communities’ entry into the group of problem solvers is not automatic and often voluntary (such as in Wikipedia or Sermo). So, potential DPSN problem solvers also have a third option, to ‘enter’. In the cases studies, the incentives to enter have been shown to be a major factor in performance.

Besides the difficulty in classifying governance structures observed at a certain point in time, there is the problem that governance structures change and evolve over time. Some have reached a mature stage and the processes and rules are well defined, while others are still in flux. In the next section I will give a descriptive account of the primary characteristics of the governance structures in the DPSNs studied in this project and reference the theoretical types as applicable.

### 3 Governance in different DPSNs

Several of the DPSNs studied have undergone major structural changes in governance. **Wikipedia** has seen the introduction of administrators to oversee maintenance tasks and take on the enforcement of policy (den Besten and Loubser 2008). The structure of the resulting governance regime is three tiered, with administrators having access to all the features of the WikiMedia platform and registered and unregistered users having less. Forte and Bruckman (2008) describe how policy is being formulated by an increasingly large part of the community of problem solvers, what they see as a process of decentralisation of governance. However, the enforcement of policy is still in the hands of a relatively small number of administrators who have the power to block others from participating in the problem solving effort. Kittur, Chi, Pendleton, Suh, and Mytkowicz (2007) examine the role of these “elite” users versus the role of the “common” user, testing whether Wikipedia success is due to a “wisdom of crowds” effect: Is most content created by a core group, or by participants on the periphery of the community? They find that administrator edits, as a proportion of all the edits in Wikipedia, has declined since mid 2003. At the same time edits by non-registered users have increased. They observe that this “rise of the crowd” is not due to a decrease in administrator activity, but was driven by a growth in the population of low-edit Wikipedia contributors. In addition, den Besten and Loubser (2008) find that administrators are more likely than other contributors to use ‘templates’ as managerial directives to guide the actions of the problem solvers. In spite of the rise of the crowd, the introduction and prominent role of administrators in the Wikipedia community is an interesting evolution, since it is directly opposed to the stated ideal for Wikipedia to be a completely ‘flat’ community where everyone is equal. The ideal of Raymond’s bazaar could not be realised in this case.

Wikipedia community members have different sets of rules that apply to them depending on

their user type, but all problem solvers are also constrained by the technical limitations of the platform. In the case of Wikipedia the platform is open source and can be changed by members of the community. In theory, when someone is dissatisfied with the affordances of the platform, they can exercise ‘voice’ and change it. This property is shared by the **Mozilla** project (Dalle and Matthijs den Besten 2008) - it is an open source platform where those reporting bugs through the Bugzilla system can also change the way bugs are processed. In practice, the overlap between those who report and solve bugs and those who work on the platform is probably small. Even though the platform is open and the exercise of voice is encouraged by the ethos of the community, loyalty to the community will in many cases not be strong enough to result in constructive criticism of the governance structure and ‘exit’ remains as a low cost option for dissatisfied problem solvers.

In the **Swarm of Angels** project a community with ‘voice’ is in place by design, but the governance structure is not mature, as the film production process has not reached the point where there are commercial possibilities for the product (Cassarino and Geuna 2008). The governance structure is not flat and there is a leader with the potential to exercise a high level of control. Matt Hanson defines himself as a “benevolent dictator”. The problem solvers do take part into the decision process (through a web based poll system), the script editing and all other creative/advising process (through a discussion forum), while visitors can assist but they cannot actively collaborate. A rule of “one head one vote” applies.

In the **Digg news aggregator** community the problem solving platform cannot be changed by community members. If the ‘problem solvers’ in this project do not like the conditions, they can not change the way Digg works. Their only choice is to leave, and take their news aggregation elsewhere. But even in this seemingly simple case the governance structure is more complex: During the ‘Blu-Ray code incident’ Digg ‘problem solvers’ showed that they do hold some power in the governance structure, in that they control the content input and can affect change to the flow of information if they organise their protest effectively (Richter, Escher, and Bray 2008).

In the case of **Sermo** (Bray, Croxson, Dutton, and Konsynski 2008b), the problem solving platform is also controlled by centralised management using proprietary code. In this case the centralised control is key to the financial success of the project, since the owners can withhold the aggregate result of the distributed efforts of the problem solvers, making it temporarily more valuable to paying customers. The problem solvers do have influence over the flow of information in some ways other than providing the input to the problem solving effort: They create the dynamic parts of the platform ‘on the fly’ by posting questions and appending options to the multiple choice answer mechanism.

In **information markets**, governance is very much centralised and the management of the aggregated information is a sensitive matter not left to the problem solvers (Croxson and Bray 2008). Problem solvers likely do not feel a sense of community comparable to the community based platforms such as Bugzilla and Wikipedia and engage more with the central system than with other problem solvers. However, in some systems the market participants, rather than the market organiser, can specify which futures will be traded on. Even in this case the central market organiser will still control the size of positions that traders may take and also who may participate in the market.

**Seriosity Attent**’s governance structure is also based on a platform where problem solvers do not have access to the aggregated information, but is different from Sermo and information markets because of the presence of an additional layer of governance between the controllers of the platform and the problem solvers. Seriosity controls the platform and provides it to

a customer company and the company cannot influence the workings of the platform, but the managers in the customer company have control over some rules that control the participation of the problem solvers, their employees (Bray, Croxson, Dutton, and Konsynski 2008a). They can set the number of Serios that can be spent and also control the release of aggregated information created by the Attent game.

A more mature governance structure is in place in the **ATLAS** project, it has been running since the early 1990s (Tuertscher 2008). Although the project is mature, its structure is unlike the other DPSNs in the large number of layers in the governance structure - integration of the work of the problem solvers happens at various levels, the inputs into each sub-module integrated before being passed up to the higher level. When conflicts arise a review panel is set up for evaluating the different options and finding a common ground between the competing groups. At the end of the review process, the impartial review panel makes a recommendation to the ‘problem solvers’ as to which design seems to be the best option from the point of view of the project as a whole. Even if this review panel has significant influence over the outcome of the decision, it is still the problem solvers themselves who make the final decision. ATLAS, then, is the single example of a governance structure that is completely ‘flat’ in the distribution of power.

The differences described above are compared in Table 1.

Table 1: *DPSN governance properties*

DPSN	Governance properties		Problem Solvers	
	<i>Centralised or hierarchical properties</i>	<i>Maturity</i>	<i>Work on aggregated information</i>	<i>Change collaboration platform ('voice')</i>
Wikipedia	administrators	evolving	yes	yes
Mozilla	some, certain users' reported bugs need not be verified by a third party	mature	yes	yes
Swarm of Angels	some (Matt Hanson)	evolving	yes	yes
Digg	centralised control of platform	mature	no	not directly
Sermo	centralised control of platform	evolving	after 2 weeks	some dynamic aspects
Information markets	centralised control of platform	mature	no	no
Attent	centralised control of platform	mature	no	no, but client managers can customise the platform
ATLAS	none	mature	yes	yes

## 4 Conclusion

For governance structures in DPSNs a categorisation into cathedral and bazaar, centralised and decentralised is not sufficient and potentially misleading. From the evidence in the cases, it is clear that the ‘wisdom of the crowd’ depends on various degrees of centralised control to aggregate, integrate and resolve conflict. The DPSNs in this project almost all display unique governance structures, and only on an abstract level can they be compared and classified based on who controls the information flow through the system. A separation between DPSNs where the problem solvers can modify the way the problem solving platform works and those where intermediaries set the rules is useful when looking for patterns across cases, but in this project does not explicate the link between governance structures and performance. In those DPSNs that rely on a community to formulate policy and enforce governance, the protection of the ability of the community to exercise ‘voice’ is important for performance, as seen in Wikipedia and Mozilla/Bugzilla. In those where the platform cannot be influenced by the problem solvers, the role of centralised management is that of rule setting, to affect the desired integration of the information inputs from the distributed problem solvers. Finally, we saw that in some of our case studies the governance structure has not reached maturity and it was not possible to tell what role management will play.

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