

# Top-level decisions through public deliberation on the internet: Evidence from the evolution of Java governance

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## ABSTRACT

This study found internet-enabled public deliberation having a direct impact on top-level decisions and it identified institutional mechanisms by which this occurs. Most government initiatives aimed at promoting online deliberation all short of expectations. The participatory governance model developed in this study presents design and process parameters along which more interactive and engaging online experiences can be modeled. The applicability of the propositions is demonstrated by systematically collecting online data and analyzing public deliberation during the evolution of Java governance. Self-selection of participants and opposing views, mutual adjustment, and high influence combined with incremental decision-making were shown to be critical for institutionalizing a broadly supported governance approach.

## Categories and Subject Descriptors

I.6.5 [Model Development]: Modeling methodologies

## General Terms

Government, Politics, Public administration, Policy making

## Keywords

E-Government, Public consultation, Participation, Innovation

## 1. INTRODUCTION

The idea that public deliberation and civic engagement are vital for democracy is probably as old as democracy. The idea that internet-enabled public deliberation and participation are vital for democracy is probably as old as the internet. For example, studies found that politically active citizens view internet information and communication as encouraging civic engagement [26]. Since the early 1990s, online community networks have formed around broader issues of public interest and local decision-making [32]. Yet, co-evolution of internet and democracy is nowhere near that of internet and business or social life. Political philosophers and computer professionals identify similar objectives: reinvigorating democracy requires commitment to the public sphere [22] [32]. This commitment appears to be lacking, not with the constituency but with those responsible for listening to it [23] [34].

In order to understand better how the co-evolution of internet and democracy can be improved, the present study investigates the following research questions: (1) *does internet-enabled public deliberation have an impact on top-level decision-making* and (2) *are there discernible patterns or mechanisms by which public deliberation is incorporated into top-level decision-making?*

The research presented in this paper demonstrates that internet deliberation and participation does occur and that a direct influence on top-level decision-making can be observed. It developed and tested a novel methodology and ICT-toolset for identifying and tracing processes of public opinion-forming and mobilization on the internet. The methodology and toolset was applied and tested using a real-life and far-reaching case: the fundamental changes to the governance approach of the worldwide software standard Java. It demonstrates how processes of opinion-forming and mobilization on the internet were incidental with changes to the Java governance approach. The case on the governance of an open and public worldwide software standard serves to showcase the potential of internet deliberation and participation for governance in general: arriving at informed decisions and broad buy-in.

This article is structured in four parts, including this introduction. This introductory part briefly outlines existing approaches to internet deliberation and participation and identifies shortcomings of existing approaches. The second part develops the framework of participatory governance based on insights from political science. It defines three institutional design parameters and three process parameters. The third part derives the propositions and defines operationalization. In the fourth part, the methodological approach is outlined with sections describing the field study, the sampling procedures, and the systematic coding approach. The fifth part presents the quantitative and qualitative analysis. The three sections of the analysis cover the three dimensions of the participatory governance framework: Incremental decision-making and impact level, self-selection and opposing viewpoints, and participation in decision-making and mutual adjustment. The final part presents the discussion and conclusion.

## 1.1 Existing Approaches to Online Public Deliberation and Participation

Long before corporations discovered the internet for business, online pioneers used internet platforms for deliberation and participation around issues of public interest and local decision-making. The online community networks of the early 1990s featured the following characteristics [32]:

*Community of interest* – participants are motivated by common goals, so participants have a stake in the process.

*Reciprocal interaction* – content is created by a large number of contributors, thereby decentralizing publishing.

*Equal access* – large numbers of participants are able to participate, thus lowering barriers of entry.

*Modifiable platforms* – users to design or co-design interfaces or services, thus increasing personalization.

How much progress has been made since the early 90s of the last century? Where are the ICT-tools “heralding a new era for democracy” [4, p.40]?

Four stages of internet deliberation and participation can be identified [4]: 1. Convenient tool for disseminating government information and advertisement, 2. Interactive platform for discussing policy issues among informed citizens and for mobilizing support, 3. Strategic resource for involving lay stakeholders and ordinary citizens to legitimate the policy cycle, and 4. Political instrument for decision-making by a large number of lay stakeholders and ordinary citizens.

Blogs contribute to the public sphere enabling ordinary citizens to reflect and discuss policy issues and, in that process, to become empowered and mobilize others [21]. Indeed, blogs have been found influencing the sentiment towards companies, thereby damaging corporate reputation [18], as well as influencing the media agenda, thereby indirectly influencing the political agenda [38]. However, a blog page resembles primarily a monologue and this is its main shortcoming.

## 1.2 Shortcomings of Existing Approaches to Online Public Deliberation and Participation

Blogs, that is web-logs or online diaries, have been promoted as means for participatory journalism, debate and empowerment, and political mobilization [27]. But blogs are based on the classic one-way communication format [15] [30] [40]. Hence, characteristics of political personality marketing and “preaching to the choir” are frequently observed [21, p.156]. This does not mitigate the overall accomplishment of blogging: to ground public opinion within a larger proprietorship compared to centralized media [1]. In addition, blogs in the aggregate provide a snapshot of hot issues and a window into ‘crowd thinking’ [7]. But when compared to highly interactive social network sites, blogging appears in the same league as classic media [28]. The blog itself is fairly immune against intervention by collocutors and communication is fully controlled by a single author [9] [36]. When it comes to public deliberation and participation, blogging often lacks most of the interactive features of dialogue.

A study by the Hansard Society’s eDemocracy Programme concluded that political blogging was unlikely to foster public deliberation and mutual dialogue [13, p.373]:

*Bloggers have congregated around entrenched and static views, rarely stepping into a deliberative environment where their views are exposed to experiences, ideas or information that differ from those they have generated themselves.*

As mentioned earlier, the online community approaches of the early 1990s already featured many of the interactive and dialogic characteristics. Indeed, starting in the late 1990s, the UK government actively promoted their use to improve decision-making but, according to a study, failed to incorporate the inputs or follow-up with feedback [41]. The study also revealed the lack of interactivity with only two (!) percent of consultations offering two-way communication. The study did credit the UK government for leading the way in this field, which suggests the situation across Europe is even worse.

Given these developments, it is not surprising that studies on internet-enabled participation attest a normalization and reinforcement of existing biases rather than a ‘participatory turn’. However, a more differentiated assessment based on a national survey of UK citizens finds a supply-side rather than a demand-side problem [19]. Constituents appear less interested in reading and commenting the endless supply of political blogs. Instead, mostly young citizens with internet-affinity are involved in hands-on political activity, in bringing issues to the front and mobilizing peers. The study also found that barriers keeping interested citizens with lower education or class status out of politics in the ‘real’ world almost disappear when it comes to online political activity. The next section outlines the key parameters along which the degree participatory governance in political information and communication spaces can be assessed.

## 2. PARTICIPATORY MODEL

This part outlines the participatory governance model along three institutional dimensions and defines the key design and process parameters for assessing the degree of participatory governance. In the participatory model, the persons concerned and most informed take part directly in decision-making [3]. In contrast, representative models excel at solving problems of complexity and scale by concentrating political decision-making among elected politicians [8]. But at least in pluralistic societies, the capacity of a minority to fundamentally influence or ‘hijack’ collective choice is low [10]. Hence, representative models in pluralistic societies merely solve a technical – not an institutional – problem that arises from the complexity and scale of political decision-making.

Solving complexity and scale in political decision-making processes is largely about solving the tension between quality of knowledge versus the quantity of topics and involved participants. On one hand, only a minority of persons has the required depth of knowledge about a policy topic while, on the other hand, increasing scope of topics and involvement impairs decision-making [8]. The selection and legitimacy of knowledgeable participants is therefore a crucial aspect for solving the tension between quality of knowledge versus quantity of topics and of participating persons. Another crucial aspect is bringing these knowledgeable participants together in political decision-making processes. But these aspects are increasingly addressed by communities using internet-enabled communication channels [16].

### 2.1 Design Parameters: Selection Mechanism, Degree of Engagement, Impact Levels

Design parameters concern the institutional mechanisms that define whether a governance model is more or less participatory. Particularly in complex and disjointed decision-making processes, upfront planning is not only impossible but also undesirable, as it leads to suboptimal outcomes [29]. Design parameters are important signposts that guide the trajectory and/or the evaluation of the policy-making process. Based on previously defined parameters [17, p.67-69], a participatory approach can be distinguished along three dimensions of institutional design: selection mechanisms, degree of engagement *who participates*, *how to collaborate*, and *what impact* it has on policy. This section discusses the three dimensions in more detail.

*Selection mechanisms – Who participates?* Five main selection mechanisms exist that define the eligibility for participation in collective decision-making processes. The least restrictive approach involves *self-selected participants* with the commitment and legitimacy to influence the collective decision-making processes. The next two approaches either specifically or randomly select participants from a large population. A fourth approach involves selecting *lay stakeholders* based on a track record of public engagement in the relevant area. Typical examples are neighborhood boards or school councils. Finally, *professional stakeholders* representing organizational interests can be selected for large-scale initiatives requiring the support of multiple organizations or associations. Typical examples are regulatory negotiation or infrastructure planning.

*Degree of engagement – How to collaborate?* The second dimension concerns the degree of engagement in processes of collective decision-making. In particular, five degrees of engagement are noteworthy. The first two approaches either involve disseminating information or inviting constituents to public hearings. The third, *aggregation and bargaining*, involves participants building a consensus based on joint preferences. Next, *deliberation and negotiation* requires substantial knowledge about and arbitration between conflicting interests. It involves outlining principal parameters of agreement, identifying persisting disagreements, and developing a majority coalition based on joint preferences. A fifth approach may involve *expert judgment*. Regarding complex technical issues, experts with relevant training and professional specialization are often better equipped to solve a decision-making problem.

*Impact level– What is the outcome?* This dimension identifies to what extent the participatory engagement translates into policy-making and political action. Corresponding to a low degree of engagement, the political outcome may at best be either a better informed constituency or a communicative influence capable of shaping public opinion over time. If it evolves into a formal advisory role of the constituency or mandatory consultation, a third level of political outcome can be asserted. The fourth impact level is *co-governance*, when authority is shared between members of the public and officials. For example, some high schools are jointly co-governed by a body composed of parents and a body composed of school officials. Finally, in *direct governance*, decision-making authority rests with members of the public and the political outcome of the participatory approach directly influences policy-making.

## 2.2 Process Parameters: Opposing Views, Mutual Adjustment, Incremental Decisions

Process parameters trace the *actual* characteristics of deliberation and participation at certain points in time. The degree of the participatory governance can be evaluated based on how far it exhibits opposing views, mutual adjustment, and incremental impact. The assumption here is that the participatory approach is best suited in situations where problem solving is complex and multiple viewpoints optimize outcomes. In these cases, mutual adjustment among stakeholders is superior to central coordination in achieving optimal outcomes [29]. Based on previously defined parameters [29], a participatory approach can be distinguished along three process dimensions: opposing views, mutual adjustment, and incremental impact.

*Opposing views.* In order to gain broad legitimacy and support of decisions, participants in collective decision-making processes must have the following characteristics: be representative of important interests or perspectives, knowledgeable and competent in relevant matters, and responsive and accountable to those who are not participating. Multiple decision makers with varying attitudes and interests ensure that most of the adverse consequences are considered in the process by at least one decision maker. If decision makers complement each other so that their decisions appropriately reduce, counterbalance, or outweigh adverse consequences of other decisions, then this set of decisions is coordinated. In this sense, multiplicity and diversity facilitates coordination whenever decision-making is characterized by disjointed preferences and incremental problem-solving [29, p.151-154].

*Mutual adjustment.* In mutually adjusted coordination, there is no hierarchy of control and participants interact with each other on the same ‘level’. While conflicts constitute barriers to agreement in central coordination, in mutual adjustment they do not. Here, participants are free to seek agreement on terms that are acceptable to each of them. Moreover, they are more likely to reach lasting agreements than do central coordinators who may recur on authoritative power to enforce agreement on a contested view. In addition, participants in mutual adjustment are more likely to seek allies and to attract them by partly modifying their own demands, if it appears feasible. Finally, because in mutual adjustment participants acknowledge, more so than in central coordination, that decisions are tentative and can be altered the next ‘round,’ they are more likely to agree [29, p.219-223].

*Incremental impact.* When the problem appears to be complex and not to be solved any time soon, decision makers may attempt only serial steps and evaluate their immediate outcomes before attacking the problem further. Trajectories and implications of decisions remain probabilistic and uncertain, because the outcome of the ‘next round’ of decision-making cannot be anticipated, which is why participants pursue only incremental moves [29, p.144].

## 3. Propositions and Operationalization

This part first develops propositions reflecting both the design and process parameters for each of the three institutional dimensions: *Who participates? How to collaborate? and What impact ensues?* It then defines how the propositions are operationalized. The underlying assumption is that the participatory approach is most suited when problem-solving is characterized by disjointed preferences and ambiguity over future developments. Key characteristics of such a problem-solving process are:

- (1) lack of commonly accepted criteria for agreement,
- (2) existence of latent or open conflict, and
- (3) endurance of disagreement.

In the terminology used earlier, decision-making would be less characterized by *aggregation and bargaining* and more by *deliberation and negotiation*. That is, decision-making is not merely the venue for striking the final deal between largely consensual viewpoints. Rather, the decision-making process itself becomes the vehicle for unearthing latent issues and incrementally developing options that accommodate opposing viewpoints.

### 3.1 Propositions: Who Participates? How to Collaborate? What impact ensues?

The propositions employ the term ‘yield better outcomes over time’ to reflect that in the ‘best possible outcome,’ participants “move to a new state of affairs,” where no one loses and some gain [29, p.223]. That is, the ‘best possible outcome’ is one where stakeholders *jointly agree* that the adopted solution benefits at least one without harming any other. Consequently, a ‘better outcome’ is one where *more* stakeholders endorse the adopted solution compared to cases where the condition is not met. The following paragraphs develop the three propositions along the design and process parameters of each dimension.

*Who participates?* Concerning the *design parameter*, the key differentiator is whether the process is primarily driven by self-selected participants or by participants selected by officials. The participatory approach is most suited when central coordinators lack the knowledge about the best possible outcome. Here, the participatory approach attains superior outcomes because it involves participants with varying attitudes and interests to ensure that most of the adverse consequences are considered by at least one decision maker [29]. Regarding the *process parameter*, neither self-selection by participants nor selection by officials guarantees that multiple opposing viewpoints are indeed voiced in the process. For example, self-selection approaches may be dominated by wealthier and better educated participants or driven by particularistic interests [14]. A key process characteristic therefore is the existence of multiple opposing viewpoints.

**Proposition 1:** When problem-solving is characterized by disjointed preferences and ambiguity over future developments, self-selection of participants and multiple opposing viewpoints yield better outcomes over time.

*How to collaborate?* The key differentiator of the *design parameter* is whether or not the degree of engagement entails direct participation in the decision-making process. If the participatory approach entails nothing more than informing or consulting the public on already established proposals, then central coordinators confess their ability to determine the feasibility of the proposals. When the feasibility of proposals can only be determined by constituents, public engagement involving aggregation and bargaining or deliberation and negotiation is necessary to improve decision outcomes. Regarding the *process parameter*, broad participation in processes of collective decision-making and opposing viewpoints do not *per se* enhance problem-solving. The condition for exploiting the full potential of the participatory approach is that participants recognize opposing viewpoints and mutually adjust their stances over time [29]. A key process characteristic therefore is the evidence of mutual adjustment over time.

**Proposition 2:** When problem-solving is characterized by disjointed preferences and ambiguity over future developments, direct participation in decision-making processes and mutual adjustment yield better outcomes over time.

*What impact ensues?* Concerning the design parameter, the key differentiator is the level of impact that collective decision-making attains through a participatory approach. Keeping ultimate decision-making authority with officials implies that central coordinators are able to identify the optimal solution. The focus of this study is on cases where ambiguity and complexity of

the problem requires bargaining or negotiation among multiple stakeholders. In these cases, participants must be able to make decisions at levels of impact needed to reach agreement. Regarding the process parameter, the high degree of ambiguity and complexity of problem-solving requires an incremental process of decision-making where the level of impact can be extended as needed in order to reach agreement among participants. Decisions are reached incrementally through mutual adjustment and remain tentative and open to alteration in the next ‘round’ [29]. A key process characteristic therefore is the prevalence of incremental decision-making.

**Proposition 3:** When problem-solving is characterized by disjointed preferences and ambiguity over future developments, potentially high influence combined with incremental decision-making by stakeholders yield better outcomes over time.

### 3.2 Operationalization: Access/Themes, Inclusion/Centrality, Decision Sequence/Reach

*Suitability of participatory approach.* The section on the participatory model stated that it would be most suited if problem-solving is characterized by disjointed preferences and ambiguity over future developments. Three key characteristics of such a problem-solving process were defined and are now operationalized. First, the lack of commonly accepted criteria for agreement is evident in the prevalence of an initially irreconcilable contradiction between opposing viewpoints. Second, latent or open conflict is evident in the discursive expression of opposing viewpoints. Finally, the endurance of disagreement is evident in the time lag between initial discursive expression of opposing viewpoints and agreement reached.

*Best possible outcome.* The ‘best possible outcome’ was defined as a jointly endorsed solution where stakeholders agree that it benefits at least one without harming any other. The operationalization of what constitutes the best possible outcome reflects the discursive nature of the problem-solving process. Consequently, the lack of discursively expressed opposing viewpoints is understood to indicate that participants indeed reached the best possible outcome.

*Core propositional concepts.* The three propositions each feature two core propositional concepts reflecting the design and process parameters, which are now operationalized.

Concerning the first proposition, self-selection of participants is evident when no or low barriers exist for concerned individuals to join the problem-solving process. The key indicator here is the ease of accessing relevant information and of contributing own arguments. Multiple and contested viewpoints are evident when the range of arguments and topics expressed reflect the fundamental differences that exist among participants. The key indicator here is the existence of initially irreconcilable and antagonistic positions in the thematic pattern of participants’ arguments.

Concerning the second proposition, direct participation in decision-making processes is evident when participants with opposing interests and goals are ultimately responsible for reaching agreement. The key indicator here is the absence of a lasting agreement as long as opposing interests are insufficiently recognized. Conversely, reaching a lasting agreement only after opposing interests were recognized indicates that their recognition was needed for reaching agreement. Adjustment to opposing

viewpoints is evident when participants routinely engage with opponents on the same issues. The key indicator here is centrality of themes, which is defined by the number of ties through which the theme is linked to other themes [11]. One theme is linked to another theme whenever the set of participants referencing this one theme also reference the other theme in their statements. The centrality degree of a theme thus expresses to what extent a theme is addressed by participants.

Concerning the third proposition, incremental decision-making is evident when participants reach agreements first on peripheral or less contested issues before reaching agreements on more central issues. The key indicator here is the level of impact of a decision reached at one point and the level of impact of a decision reached at a later point in time. The level of impact is determined by the extent to which a decision extends over a number of individuals as well as over space and time. High levels of impact are evident when the jointly reached decision influences many individuals (number) across boundaries (space) over an extended period (time).

## 4. METHODOLOGY

This part presents the quantitative and qualitative methodological approach adopted for the study. In particular, the methodology falls under a branch of discourse analysis using content analysis to identify major events and participants in combination with qualitative coding techniques to assess how and why arguments and thematic patterns developed over time [24]. Recent work using multi-dimensional framing analysis on internet blog content also employed content analysis and qualitative coding [5]. However, this research developed the multi-dimensional codes based on the six dimensions used in grounded theory which were subsequently populated via an open coding approach [33]. The systematic methodology for collecting internet data has been fully described and tested in previous work [25].

### 4.1 Field Study on the Evolution of Java Governance

The field study investigates the deliberation and mobilization around opensource Java software behind the backdrop of fundamental changes to the Java governance approach. In the introductory part, a case was made of the shortcomings of existing approaches to online public deliberation and participation. Government initiatives on internet-enabled political engagement often fall short of considering the entire scope of public deliberation and participation in online spaces. The aim of the present research is to show how these spaces interact to coalesce into something that constitutes the ‘public sphere.’ The evolution of Java governance provided a unique setting to investigate internet-enabled public deliberation and mobilization for three reasons: (1) worldwide common standard exemplifies the governance problem, (2) internet-affinity of stakeholders shifts discourse online, and (3) fundamental changes to the governance model can be observed.

The field study on Java governance starts in 1998, the year in which opensource application servers entered the market, and ends in August 2006 when Java governance officially shifted from a proprietary to the opensource model. The *opensource players* include consulting firms Microstate and Lutris and startup JBoss. The *incumbent players* primarily include Sun, BEA, and IBM. Around the time that Microstate announced opensourcing

its application server, BEA introduced its proprietary application server. In May 1998, IBM introduced its proprietary application server but collaborated with opensource group Apache to add new functionalities. The formation of the Java application server field thus started in 1998 with both opensource and proprietary solutions shaping the field from the very beginning. By the end of the field study, all major players endorsed opensource Java software. In between, conflict and fierce contestation of competing paradigms characterized online deliberation and mobilization. Content of top-level decisions can be directly linked to online discourses.

### 4.2 Open Sampling Retrieves Source Documents

First, *defining the population* involved establishing the types of content applicable for analysis. For the present study, the population comprised internet-accessible statements of individuals on opensource Java software. The population was sampled using a comprehensive and systematic procedure for collecting online data as outlined below. Relevancy of data was established based on the following two criteria: Content must inform about Java application servers or opensource Java software in general *as well as* about who (actor) did what (action) in a defined context [6]. The second criteria ensured that the sample contained argumentative statements. For the initial query, Google was used because it has been repeatedly found to yield more relevant rankings [2] and the perceived relevancy of resulting web pages was found to be high [35].

Second, *conducting the search* required identifying accurate query terms and executing the query. Potential query terms were derived from the research description [37]. Based on the case description, I ran Google queries using the term ‘open source’ in combination with the following: ‘java’ and ‘server’. Excluding results omitted by Google, the number of actually retrieved results for the query ‘open source java’ was 688, 495 for ‘open source server java’, and 504 for ‘open source java server’. Based on the relevancy criteria outlined earlier, I compared the accuracy of query terms based on their precision ratio, which I defined as the proportion of relevant results among the top 10% of retrieved results. For the query ‘open source server’, the precision ratio was 1/71 or 0.01%, it was 40/69 or 58% for ‘open source java’, 12/50 or 24% for ‘open source server java’, and 17/50 or 34% for ‘open source java server’. Hence, the query term ‘open source java’ was used in the Google and the subsequent website queries.

Third, *retrieving the data* involved executing the query in Google and website search engines and retrieving the web pages. Data retrieval involved a two-step iterative process. First, Google was queried using the query term ‘open source java.’ Relevancy for each web page in the entire Google result list (excluding omitted results) was then attributed whenever a web page met the relevancy criteria outlined earlier. *For each relevant web page, its parent website was accessed and also queried* using the same query term as in the initial Google query. 95 queries were thus performed. Finally, for each URL in the result lists, meta-information (HEAD) and web page body (GET) was obtained. A data corpus of 38286 web pages was thus established. For all of the retrieved records, a title, a valid URL, and the body text were available. Provided that Google retrieves the most relevant web pages, the two-step iterative process systematically ‘covered’ the prominent websites of the field.

### 4.3 Discriminate Sampling Identifies Relevant Statements

First, *extracting relevant sources* involved querying the 38286 records of the local database for the terms ‘open, source, application, server’ or variants thereof with the condition that all four words appear within two sentences. The database query retrieved 1226 records with at least two appearances of the query terms. The relevancy of each record retrieved from the database was manually assessed against the sampling criteria defined earlier. With only 283 or 23 percent non-relevant records, the relevancy of the retrieved set is relatively high. However, 178 records were excluded because they featured primarily adverts while a further 217 records were excluded because they featured duplicate content. The remaining 548 records constituted the initial sample of relevant source documents.

Second, *identifying key participants* required manually assigning the names of individuals mentioned in each of the 548 web pages to their respective records in the local database. If a person’s name was mentioned in the web page, his or her name along with role and organizational affiliation, if mentioned, was assigned to the record. Key participants *for each phase* were then identified based on the frequencies with which they were mentioned in one of the three phases. The thresholds were chosen so as to include between 15 to 20 participants *per phase*, thereby mitigating the fact that more data was available for later than for earlier phases.

Third, *retrieving statements* of participants involved querying the 38286 records in the database for the first and last names of the participants. Based on sampling criteria as well as participation in the respective phase, relevant records featuring the participant’s statements were collected in a data set. The final data set used for analysis comprised 642 web pages containing 1349 statements by 36 participants. These statements, with a typical length of a few sentences to a paragraph, constituted the unit of analysis.

Overall, about two thirds of the 642 source documents were published by five technology news services, CNET Networks, IDG Network, CMP Media, vnu business publications, and Jupitermedia. About 15 percent of source documents were self-published content, such as blog, forum, or publicly accessible e-mail communications. A handful of major media outlets thus played an important role as communication brokers in shaping opinions in the field.

### 4.4 Systematically Assigning Themes to Statements

Themes were assigned to statements along three coding dimensions: (1) *environment*, defined by the situation in which the referenced issue occurs; (2) *action*, defined by the expressed interest and rationale; and (3) *ideology*, defined by the adopted rhetoric and viewpoint. Previous work was used to establish the environmental and action dimensions [33] as well as the ideological dimension [24]. Coding rules specify precisely the criteria for assigning a code to one of the three coding dimensions. For example, coding rules specify that statements under the theme *Incumbent OSS move*, refer to a situation where commoditization or innovation pressure led to the adoption of the opensource model (environment). These statements express an interest to increase competitiveness by adopting opensource projects (action). The rhetoric employed highlights the benefits of opensource software; participants thus express a view

characterized by competitive rivalry (ideology). The methodology has been fully described in previous work [25].

Four groups of themes – or perspectives – emerged from the iterative coding process: the commercial opensource model, Sun’s Java governance, opensource Java governance, and general themes. The perspective supporting the commercial opensource model includes the four themes *OSS exploitation*, *Incumbent OSS move*, *OSS delivers*, and *Services model*. The perspective supporting *Sun’s Java governance* includes the three themes *Java stewardship*, *Java competitiveness*, and *OSS shortcomings*. The perspective supporting *opensource Java sponsorship* includes the three themes *Open-up Java*, *OSS promotes Java*, and *Control stifles OSS*. Finally, the perspective comprising general themes includes the two themes *OSS paradigm* and *Incumbent strategy*. Coder reliability testing achieved 96 percent congruence using a subset of 120 statements.

### 4.5 Pre-Analysis: Reference Volume and Centrality of Themes

Of the 1349 statements in the sample, 1183 statements were themed representing 88 percent of all statements. Subsequent analysis focuses on the subset of themed statements. The support behind each of the three perspectives – commercial opensource model, Sun’s Java governance, and opensource Java governance – is based on statements endorsing the respective themes. The prominence of a theme is based on reference volume, that is, the amount of statements assigned to that theme. The centrality of themes is defined by the number of ties (connections) through which the theme is linked to other themes [11]. The tables in the Analysis part report reference volume and centrality.

The themes *OSS exploitation* and *Incumbent OSS move* are by far the most prominent themes representing over a quarter of all themed statements. Overall, the perspective supporting the commercial opensource model is by far the most prominent across all phases, representing 44 percent of all themed statements. The perspective supporting Sun’s Java governance represents 24 percent of all themed statements. Finally, the perspective supporting opensource Java governance represents 17 percent of all themed statements. Contrary to expectations, incumbent firms were overall most vocal in shaping the discourse on opensource Java software in the field. Regarding participants and organizations, JBoss founder Fleury and Sun executive Schwartz are by far the most prominent participants accounting for over 35 percent of all statements of the 36 participants in this study.

## 5. ANALYSIS

The present study investigates the following research questions to understand better how the co-evolution of internet and democracy can be improved: (1) *does internet-enabled public deliberation have an impact on top-level decision-making* and, if so, (2) *are there discernible patterns or mechanisms by which internet-enabled public deliberation is incorporated in top-level decision-making?* In order to address the research questions, the analysis first establishes whether or not internet-enabled public deliberation had an impact on top-level decision-making. It then investigates whether thematic patterns and institutional mechanisms are evident and how they can be characterized. Based on the overlap between content of prominent themes and of top-level decisions, the analysis finds internet-enabled public deliberation having a direct impact on top-level decision-making.

In addition, except for direct participation in decision-making, all of the design and process parameters are evident. In other words, a direct impact of public deliberation on decision-making was observable, but that impact depended on top-level decision-makers incorporating the inputs.

In addition and as operationalized, *suitability of participatory approach* is evident in an (1) initially irreconcilable contradiction between opposing viewpoints, (2) ongoing existence of opposing viewpoints, and the (3) time lag between first appearance of opposing viewpoints and final agreement. First, free opensource Java software created an initially irreconcilable contradiction because it would allow Microsoft to derail the Java standard [105] and also undermine Sun's Java royalties derived from *sold* Java products [110]. At the same time, Sun supported Apache's opensource Java software. The contradiction surfaced whenever these conflicting strategic objectives clashed. Second, ongoing deliberation on opensource Java software exposed latent conflict and led to fierce contestation. Third, eight years between conflict exposure and solution suggest that the underlying problem could not be easily solved. Overall, this suggests that the participatory approach is suitable in the present case.

Translated to the present case, reaching a possible outcome is evident in Sun's agreement to opensource the Java standard. The agreement reflects the demands of almost all major stakeholders, including protagonists within Sun. As operationalized, the *best possible outcome* is evident when, absent major force, opposing viewpoints cede to be voiced. The virtual absence of opposing viewpoints at the end of the study suggests that the decision to opensource the Java software standard closely approximates a best possible outcome.

This Analysis part is structured in three sections, each investigating one of the three propositions along the Emergence, Disruption, and Consolidation phases. In order to provide an overview over outcomes of each phase, this part starts by investigating the third proposition about incremental decision-making and impact levels of decisions. The second section analyzes the first proposition about self-selection of participants and opposing views. The final section investigates the second proposition about collective decision-making and mutual adjustment.

## 5.1 Incremental Decision-Making and Impact Level

This section investigates the third proposition about incremental decision-making and impact levels of decisions for the Emergence, Disruption, and Consolidation phases. When problem-solving is characterized by disjointed preferences and ambiguity over future developments, better outcomes over time are expected through incremental decision-making by stakeholders and potentially high impact levels of decisions. The analysis demonstrates that final agreement on the community-led approach to Java governance was achieved via a series of incremental decisions characterized, in general, by increasing scope of impact over time. Overall, the analysis presents evidence suggesting that problem-solving was primarily characterized by incremental decision-making of stakeholders and eventually high impact levels of decisions.

Two of these decisions, Sun allowing opensource Java software and IBM and Sun adopting opensource application servers,

separate the three phases from each other and are outlined in more detail. But these particularly outstanding events are embedded within a series of related antecedent decisions with lower impact levels. For example, in June 1999, Sun already allowed Apache to distribute a small portion of proprietary Java source code under an opensource license [109]. By August 2000, Sun publicly disparaged opensource newcomers [114]. Within a year, at least one opensource newcomer withdrew its opensource application server citing Sun's Java restrictions [104]. These micro events demonstrate that decisions were tentative and subject to alteration in the next 'round.'

### 5.1.1 Impact Level in the Emergence Phase

Sun's (proprietary) Java governance was framed around the threat that freely available opensource application servers were posing to profits and licensing revenues of incumbent firms. For example, industry reports found that, between 1998 and 2000, high-end but often unused features of incumbent application servers were amounting to US\$ 1 billion in excess expenditures with price differentials of up to 80% [115]. At the same time, Sun demanded Java royalties for sold Java products while opensource newcomers Lutris and JBoss were giving their Java application servers away for free. Sun then invoked Java specifications prohibiting opensource Java software, which prompted Lutris to withdraw while JBoss remained preempted from Java certification [104]. As a consequence, opensource advocates mobilized public opinion on the internet pressuring Sun to allow opensource Java software.

On 22 March 2002, Sun agreed to 1) "allow independent implementations under open source licenses," 2) make the Java compatibility tests available to non-profit opensource initiatives, and 3) support these initiatives in performing the Java compatibility tests [117]. The first point is critical for both commercial and non-commercial opensource projects. It means that software developed with the Java software language can be distributed under an opensource license. The second and third points highlight the conflicts that arose between commercial opensource firm JBoss and Sun. Because JBoss' services and support business was for-profit, JBoss was not able to access Java compatibility tests for free [120]. Sun's decision to allow opensource Java software thus continued to preempt small firms from Java certification. But overall, Sun conceded to the demands by opensource advocates and Sun's move, as shown in the next section, can be directly linked to successful online deliberation and mobilization.

### 5.1.2 Impact Level in the Disruption Phase

During the Disruption phase, the commercial opensource model extended from Java application servers into other areas of enterprise computing. For example, JBoss acquired US\$ 10 million in venture capital funding [102] for "taking that methodology and model and replicat[ing] it to a new market" [103]. Meanwhile, incumbent firms BEA, IBM, and Sun increasingly adopted the opensource model. BEA announced opensourcing its development tool [116] and IBM followed by opensourcing its database [101]. Sun then opensourced its entire Java Enterprise System infrastructure, claiming the move "will define Sun as the only company that is truly committed to open source as a means of driving innovation" [107].

On 10 May 2005, IBM acquired the small startup founded by developers who were working on an opensource application

server and announced offering it as entry model to its application server line. In June 2005, Sun also introduced an opensource version of its application server. These two decisions mark the adoption of opensource application servers by major incumbent firms. During 2004, JBoss was able to fund Java certification thus further eroding the differentiation advantage of incumbent firms. The decision by IBM and Sun attests to the competitive threat that JBoss posed to incumbents and paved the way for competition based on the commercial opensource model in the field. Again, as the next section demonstrates, the radical decisions taken by IBM and Sun are directly linked to online deliberation and mobilization in support of opensource as a viable category.

### 5.1.3 Impact Level in the Consolidation Phase

On 16 May 2006, Sun announced opensourcing the Java software standard. One of the main reasons for opensourcing the Java standard was its growth not only in enterprise computing but in other areas, such as mobile devices, which outgrew the capacity of the proprietary and rather closed Java governance approach. For example, Sun's new CEO Jonathan Schwartz explained why open source is critical [108]:

*The 'cheap revolution' is winning out in high performance computing ... general purpose systems and operating platforms have emerged as fast enough to displace proprietary and specialized systems*

However, the 'revolution' did not just 'emerge'. It was the product of online deliberation and mobilization, aimed at exposing incumbents' anti-competitive behavior and at promoting the opensource model within the larger business context.

## 5.2 Self-Selection and Opposing Viewpoints

Along the Emergence, Disruption, and Consolidation phases, this section investigates the first proposition about self-selection of participants and opposing views. When problem-solving is characterized by disjointed preferences and ambiguity over future developments, better outcomes over time are expected through self-selection of participants and exposure of opposing viewpoints. Because internet-enabled communication channels provided publicly accessible and relevant information, of which about 15 percent constituted self-published content, stakeholders were able to participate in deliberation and mobilization around opensource Java software. In addition, the thematic pattern reflects the opposing viewpoints with both proponents and opponents prominently represented by the major themes. Overall, the analysis presents evidence which suggests that in the present case, problem-solving was primarily characterized by self-selection of participants and vivid exposure of opposing viewpoints.

### 5.2.1 Opposing Views in the Emergence Phase

The following analysis shows that during the Experimentation phase, perspectives endorsing the commercial opensource model and opensource Java governance are most prominent, with the perspective endorsing Sun's (proprietary) Java governance remaining marginal. This suggests that in the early deliberations on opensource Java software, opensource proponents are the dominant force shaping opinions in the field. This can be attributed to Sun's unpopular move to prohibit opensource Java software. Table 1 specifies the source reference volume of themes with themes endorsing Sun's (proprietary) Java governance in italics and those endorsing opensource sponsorship in bold. The

reference volume demonstrates the momentum behind pro-opensource perspectives (in plain text for the commercial opensource model and in bold for opensource Java governance). The themes promoting opensource Java governance (in bold) directly represent the community pressure that led Sun to allow opensource Java software by March 2002.

Particularly prominent are the opensource-supportive themes *OSS delivers* and *Open-up Java* on one side and the oppositional theme *Java stewardship* on the other. The themes *OSS shortcomings* and *Control stifles OSS* represent how opensource opponents highlighted shortcomings of opensource software while opensource proponents blamed existing barriers for these shortcomings. The former theme represents statements that sustain or accept barriers to opensource adoption by questioning the credibility of the commercial opensource model. In contrast, the latter theme represents statements that link opensource adoption to Java innovation while casting Sun's Java control as innovation barrier. The theme *OSS promotes Java* represents statements that link opensource adoption to Java innovation and competitiveness. Finally, the general theme *OSS paradigm* represents statements endorsing opensource approaches by highlighting general innovation benefits of opensource software.

In sum, the most prominent perspective was one that endorsed the commercial opensource model, which threatened not only incumbents' application servers but also Sun's Java licensing fees. This is surprising for a field that was still dominated by incumbents who extracted hefty profit premiums from their Java investments [115]. Equally prominent was the perspective that endorsed more open Java governance, which had also the potential to undermine incumbents' revenues. The perspective that endorsed Sun's proprietary Java governance was least prominently referenced. This suggests that online deliberation on opensource Java software started as grassroots mobilization driven by peripheral players in the field. These peripheral players used internet-enabled communication to shape opinions and perspectives in the field. They were able to successfully mobilize support for the opensource model, which led Sun to allow opensource Java software by March 2002.

**Table 1. Reference volume and centrality of themes in the Emergence Phase**

| Themes                      | Volume    | Connections | Centrality  |
|-----------------------------|-----------|-------------|-------------|
| <i>OSS delivers</i>         | 40        | 6           | 0.67        |
| <b>Open-up Java</b>         | <b>25</b> | <b>9</b>    | <b>1.00</b> |
| <i>Java stewardship</i>     | 20        | 6           | 0.67        |
| <b>OSS paradigm</b>         | <b>19</b> | <b>5</b>    | <b>0.56</b> |
| <i>OSS shortcomings</i>     | 17        | 6           | 0.67        |
| <b>OSS promotes Java</b>    | <b>14</b> | <b>9</b>    | <b>1.00</b> |
| <b>Control stifles OSS</b>  | <b>11</b> | <b>4</b>    | <b>0.44</b> |
| <i>Java competitiveness</i> | 6         | 5           | 0.56        |
| Services model              | 6         | 7           | 0.78        |
| Incumbent OSS move          | 5         | 7           | 0.78        |



### 5.2.2 Opposing Views in the Disruption Phase

Analysis of the Disruption phase shows that the perspective endorsing the commercial opensource model is most prominent, followed by the perspective endorsing Sun's (proprietary) Java governance. Surprisingly, support for the commercial opensource model increasingly came from incumbent players. In contrast, the perspective endorsing opensource Java governance – represented by the themes *Open-up Java* and *Control stifles OSS* – is least prominently represented during the Disruption phase. This suggests that Sun was able to regain opinion leadership regarding the governance of the Java standard. Table 2 specifies the source reference volume and centrality of themes. The reference volume demonstrates the momentum behind the commercial opensource model (in plain text), the increased support behind proprietary approaches (in italics), and the decreased momentum behind opensource Java governance (in bold).

**Table 2. Reference volume and centrality of themes in the Disruption Phase**

| Themes                      | Volume    | Connections | Centrality  |
|-----------------------------|-----------|-------------|-------------|
| OSS exploitation            | 91        | 11          | 1.00        |
| <b>Open-up Java</b>         | <b>85</b> | <b>11</b>   | <b>1.00</b> |
| <i>Java stewardship</i>     | 84        | 11          | 1.00        |
| <i>Incumbent strategy</i>   | <i>70</i> | <i>11</i>   | <i>1.00</i> |
| Incumbent OSS move          | 58        | 11          | 1.00        |
| OSS delivers                | 47        | 11          | 1.00        |
| <i>Java competitiveness</i> | 38        | 11          | 1.00        |
| <i>OSS shortcomings</i>     | 32        | 11          | 1.00        |
| Services model              | 28        | 11          | 1.00        |
| <b>Control stifles OSS</b>  | <b>17</b> | <b>11</b>   | <b>1.00</b> |
| OSS paradigm                | 16        | 11          | 1.00        |
| <b>OSS promotes Java</b>    | <b>12</b> | <b>11</b>   | <b>1.00</b> |

Particularly prominent are the opensource-supportive themes *OSS exploitation* and *Open-up Java* on one side and the oppositional themes (proprietary) *Java stewardship* and *Incumbent strategy* on the other. As in the previous phase, the theme *OSS exploitation* represents statements that seek to enhance competitiveness by addressing and exploiting opensource dynamics in the field. Initially, these statements were made by newcomers but were increasingly adopted by incumbents seeking competitive advantage through opensource software. The themes *Open-up Java* and *Java stewardship* remained particularly prominent, with the former theme endorsing a more open approach to Java governance and the latter theme endorsing Sun's (proprietary) Java governance. These two themes prominently represent the conflict that increasingly divided the field into proponents and opponents of opensourcing the Java standard.

In sum, most prominent was the perspective that endorsed the commercial opensource model, with major support now coming from incumbent firms. Initially, support came primarily from opensource newcomers, but incumbents and industry analysts

increasingly attended to the competitive advantage of opensource software. Less prominent – but stronger than previously – was the perspective supporting Sun's (proprietary) Java governance citing Java compatibility concerns. The perspective supporting opensource Java governance was least prominently referenced in this phase, despite its momentum during the previous phase and backing by some powerful incumbents. This suggests that Sun was able to regain opinion leadership regarding the Java standard and its governance. But overall, the momentum behind opensource Java software accelerated, with incumbents outrivaling each other on adopting opensource Java projects.

### 5.2.3 Opposing Views in the Consolidation Phase

The analysis shows that the commercial opensource model and opensource Java governance are by far the most prominent perspectives in this phase. The perspective endorsing Sun's Java governance is noteworthy because its premises shifted fundamentally from endorsing a proprietary to an opensource approach. That is, Sun and its supporters started to view Sun's role as facilitator, rather than controller, of a broad community-owned approach to Java governance. Sun's rather stark change regarding Java governance relative to statements of the previous phase demonstrates that internet-enabled deliberation and mobilization led to a convergence of formerly opposing viewpoints. Table 3 specifies the source reference volume and centrality of themes. The reference volume demonstrates the momentum behind the commercial opensource model (in plain text) as well as behind opensource Java governance (in bold) while support behind proprietary approaches (in italics) waned.

**Table 3. Reference volume and centrality of themes in the Consolidation Phase**

| Themes                      | Volume    | Connections | Centrality  |
|-----------------------------|-----------|-------------|-------------|
| Incumbent OSS move          | 96        | 10          | 0.91        |
| OSS exploitation            | 91        | 10          | 0.91        |
| OSS paradigm                | 45        | 11          | 1.00        |
| <b>Java competitiveness</b> | <b>32</b> | <b>10</b>   | <b>0.91</b> |
| <b>Java stewardship</b>     | <b>31</b> | <b>11</b>   | <b>1.00</b> |
| OSS delivers                | 31        | 11          | 1.00        |
| Services model              | 29        | 10          | 0.91        |
| <b>OSS promotes Java</b>    | <b>25</b> | <b>11</b>   | <b>1.00</b> |
| <i>Incumbent strategy</i>   | <i>24</i> | <i>10</i>   | <i>0.91</i> |
| <i>OSS shortcomings</i>     | 20        | 10          | 0.91        |
| <b>Open-up Java</b>         | <b>15</b> | <b>11</b>   | <b>1.00</b> |
| <b>Control stifles OSS</b>  | <b>2</b>  | <b>5</b>    | <b>0.45</b> |

Particularly prominent are the opensource-supportive themes *Incumbent OSS move* and *OSS exploitation*. As in the previous phase, both themes represent statements that seek to enhance competitiveness, with the former theme emphasizing specific opensource projects and the latter theme addressing general opensource dynamics in the field. These two themes thus

prominently demonstrate that newcomers were able to establish a new category within the field and that internet-enabled deliberation and mobilization was instrumental to this end. Also noteworthy are the themes *Java competitiveness* and *Java stewardship*. The framing continued to be around Sun's Java governance, alone the rationale for maintaining it completely changed. For example, Sun allowed individual developers to participate in its Java governing body and later opensourced the Java software standard under the most popular and far-reaching opensource license. Sun thus redefined the meaning of its Java governance by emphasizing the need to innovate in the Java standard and by endorsing an opensource Java approach.

In sum, by far most prominent (almost completely dominant) were perspectives that endorsed the opensource model, with support from virtually all players in the field. The momentum behind opensource approaches accelerates as incumbents are outrivaling each other on adopting opensource projects. The adoption of opensource projects by incumbents thus emerges as the key driver in deliberations on opensource Java software. Consequently, the premises behind the perspective endorsing Sun's Java governance fundamentally changed. By emphasizing the need to innovate, Sun redefined the meaning of its Java governance and eventually endorsed an opensource Java approach. The analysis thus demonstrates that internet-enabled communication and mobilization was instrumental in shaping top-level decisions and actions thereby establishing a new category within the larger context.

### 5.3 Collective Decision-Making and Mutual Adjustment

This section investigates the second proposition about collective decision-making and mutual adjustment during the Emergence, Disruption, and Consolidation phases. The analysis demonstrates that reaching a lasting agreement required recognizing opposing viewpoints. For example, Sun's decision to allow opensource Java software in March 2002 continued to preempt small firms from Java certification. Hence, conflict between Sun and opensource firms only intensified after the agreement. In contrast, the decision to adopt a community-led approach to Java governance in May 2006 was endorsed by virtually all participants suggesting that a lasting agreement was found. In addition, deliberation and mobilization were increasingly characterized by participants routinely engaging with opponents on the same issues. Overall, the analysis presents evidence suggesting that problem-solving was primarily characterized by mutual adjustment and, at least indirectly, by collective decision-making.

#### 5.3.1 Mutual Adjustment in the Emergence Phase

Regarding *participation in decision-making processes*, not all participants who engaged in deliberation and mobilization were directly involved in the key decision to allow opensource Java software. This authority rested with the Sun-led Java-governing body JCP. But pressure on Sun mounted after prohibiting opensource Java software. For example, an influential editor commented: "*I'm not referring to the terrorist attacks. I am referring to Sun Microsystems' opposition to open source*" [118]. To maintain its credibility with developer communities, Sun had no choice than to accept the terms that Apache set forth.

Regarding *mutual adjustment*, noteworthy is the shift of former supporters of Sun to some of its most vocal critics. But ongoing

deliberation also brought Sun's concerns to the fore, namely to maintain Java compatibility and avoid single-vendor lock-in. Reaching the agreement involved first recognizing and considering opposing viewpoints. Here, the key indicator on the field-level is the centrality of themes.

The themes *Open-up Java* and *OSS promotes Java* exhibit the highest possible centrality degrees among themes in the Emergence phase. That is, the set of participants who is referencing one of the themes also references – in other statements – all remaining themes. In contrast, the relatively low centrality degree of the theme *Java stewardship* means that the group of participants who is referencing the theme is not engaged in many of the other themes, which suggests a peripheral positioning of this group in the discourse on opensource Java software. Both, the source reference volume and the centrality of themes, thus suggests that the commercial opensource model and opensource Java governance dominate the thematic pattern in the Emergence phase. The number of connections by which a theme is linked to other themes and its overall centrality degree are reported in Table 1. Themes endorsing proprietary approaches have on average the lowest centrality degrees demonstrating their peripheral positioning.

In sum, the *key decision* concerns Sun allowing opensource Java software. The analysis demonstrates how peripheral players were able to mobilize support using internet-enabled communication channels to shape opinions and perspectives in the field. Examples show how proponents of opensource Java software influenced not only deliberations in the field but also decision-making within the Java-governing body JCP. The centrality degrees of themes suggest a strong level of dialogue among opensource proponents but a peripheral position of opponents. The shift of former supporters of Sun as well as Sun's agreement suggests that mutual adjustment occurred in the *decision-process*. However, the relatively low centrality degrees of opensource-skeptical themes suggest proponents and opponents were not deeply engaged over the same issues. Overall, the analysis presents evidence of mutual adjustment indirect evidence of participation in decision-making processes, in the sense that top-level decisions were a direct result of online deliberation and mobilization.

#### 5.3.2 Mutual Adjustment in the Disruption Phase

Regarding *participation in decision-making processes*, not all of those who were advocating opensource Java software were directly responsible for the key decisions made by IBM and Sun on adopting opensource Java application servers. However, the broad online mobilization in support of opensource Java software propelled pro-opensource organizations and individuals within organizations into power. Prime examples are opensource newcomer JBoss and incumbent firm IBM. Formerly dependent on the Sun-led JCP, IBM successfully established an alternative development framework for Java driven by the opensource community. JBoss is a success story on its own. In terms of market penetration, the JBoss application server was tying for No. 1 with IBM by the end of 2004 [121]. JBoss CEO Marc Fleury proclaimed "*the year that JBoss captured No. 1 in market share*" [124]. Analysts largely agreed, arguing that "*they're changing the way the rest of the industry plans to make money off of software*" [113].

*Mutual adjustment* is most evident in the gradual adoption of opensource Java software by incumbent firms. Indeed, even former market leader BEA adopted opensource initiatives “to officially get our innovations into more developer hands”, as a BEA executive noted [116]. Meanwhile, after equating open source with going from “capitalism to the commune” [123], Sun’s CEO McNealy announced that “we think open source is great” [112]. Similarly, after ensuring “that any opensource efforts don’t impact the viability” of Java [119], former Sun executive Tegan-Padir acknowledged that “the speed in innovation enabled by the opensource model is unprecedented” [122]. These and similar statements suggest that adjustment towards the opensource approach occurred gradually.

The high centrality degrees of all themes suggest that deliberation around specific issues involved both proponents *as well as* opponents. In other words, the set of participants referencing one theme also reference all of the other themes in their statements. While this does not imply that participants share the same view on an issue, it does imply that both proponents and opponents were talking about the same issues. This, of course, is an important prerequisite for reaching lasting agreement over time. Both, the source reference volume and the centrality of themes, suggests that opensource-supportive as well as opensource-skeptical views were prominent, but that pro-opensource views remained dominant. The high centrality degrees are reported in Table 2 and demonstrate a strong level of inclusiveness and dialogue.

In sum, the *key decision* concerns IBM and Sun adopting opensource application servers. The analysis demonstrates that the decision is a result of online deliberation and mobilization among multiple players at different levels, such as within the organization as well as with the field. Examples show how pro-opensource firms and individuals gained power by successfully advocating the new model. The high centrality degrees of themes suggest a strong level of dialogue among participants. The *decision-process* is characterized by mutual adjustment, with both proponents and opponents deliberating and negotiating about the same issues. Overall, the analysis finds at least indirect evidence for participation in decision-making processes. In addition, mutual adjustment is evident in the high centrality degrees of themes and the convergence towards a consensus around the commercial opensource model.

### 5.3.3 Mutual Adjustment in the Consolidation Phase

Concerning the key decision to opensource the Java software standard, *participation in decision-making processes* was initially limited to the Sun-led Java-governing body JCP. But again, deliberation and mobilization was driven by pro-opensource momentum sustained by almost all participants during the Consolidation phase. Commenting its move into the opensource application server market, IBM argued it would “accelerate Java adoption in the opensource community” [100]. A few weeks later at the JavaOne conference, Sun announced opensourcing its application server. With opensource Java software now a mainstream business category, the decision to opensource the Java software standard was widely anticipated.

Regarding *adjustment to opposing viewpoints*, the convergence towards the opensource approach is most evident in the Consolidation phase. For example, despite experiencing market share losses due to opensource application servers, BEA urged

Sun to opensource the Java software standard. BEA executive Bill Roth explained [111]:

*For two years we’ve been stuck, and we’ve had to innovate around the JCP. ... The process they’ve [Sun] set up for development doesn’t work anymore.*

On 16 May 2006, amid mounting requests from powerful incumbents BEA and IBM and the opensource community, Sun announced opensourcing the Java software standard. Sun justified the decision by adopting the argument of opensource proponents: “the Java community will see an increase in innovation thanks to the move towards opensourcing the code” [106].

Similar to the previous phase, the high centrality degrees of all themes suggest that issues were considered and negotiated among multiple groups representing multiple interests. That is, deliberation on specific issues did not splinter into subgroups but continued to engage all stakeholders in the field. This is an important prerequisite for reaching lasting agreement over time. With Sun opensourcing the Java software standard, the formerly opensource-skeptical themes *Java stewardship* and *Java competitiveness* were redefined compatible with the opensource model. Consequently, the high centrality of themes suggests a strong level of inclusiveness and dialogue. The high centrality degrees are reported in Table 2. Noteworthy and further evidence of the field-wide opensource consensus is that the theme *Control stifles OSS* became peripheral. The control problem waned with the decline of proprietary approaches.

In sum, the *key decision* concerns Sun opensourcing the Java software standard. Overall, the analysis demonstrates that the decision is the result of online deliberation and mobilization around opensource Java software that date back to the beginning of the case study. The high centrality degrees of all pro-opensource themes other than *Control stifles OSS* suggest that proliferation of the opensource approach mitigated the control problem inherent in proprietary approaches. The process of mutual adjustment is evident as multiple and formerly opposing interests converged around the opensource approach. Overall, the analysis finds at least indirect evidence of participation in decision-making processes, because key decisions were direct results of mobilization by opensource proponents. In addition, mutual adjustment is evident in the high centrality degrees of themes and widespread agreement on the opensource approach.

## 6. DISCUSSION AND CONCLUSION

The research presented here investigated whether internet-enabled public deliberation has an impact on top-level decision-making and whether there are discernible patterns or mechanisms by which this occurs. The analysis identified a comprehensive overlap between content of prominent themes and of top-level decisions suggesting that online deliberation had a direct impact on top-level decision-making. Analysis further presented comprehensive evidence that, except for direct participation in decision-making, all of the design and process parameters were evident. In particular, the present research provides evidence that problem-solving characterized by

- (1) self-selection of participants and multiple opposing views,
- (2) mutual adjustment between positions, and
- (3) high influence combined with incremental decision-making

at least approximates the best possible outcome. The adoption of a participatory and community-led governance approach combined with the virtual absence of voices opposing such an approach suggests that the best possible outcome was at least approximated.

However, direct participation in decision-making was not evident suggesting that the present case cannot be characterized as participatory governance approach. In other words, a direct impact of public deliberation on decision-making was observable, but that impact depended on top-level decision-makers incorporating the inputs. This carries important corollaries for government initiatives on internet-enabled consultation and participation. First, the present study suggests that online political engagement is not only popular but that it also accomplishes tangible results. It thus confirms other findings suggesting that the internet in general – as a *public sphere* – provides incentives for political engagement [19]. But political engagement occurs across the internet, not necessarily on government websites. Second, the present study suggests that if top-level decision-makers listen to and engage with constituents on an equal level, as the executives of global corporations did, lasting and optimal decision outcomes can be reached. Decision-makers must therefore actively seek what their constituents are saying and then incorporate inputs back into the policy cycle.

In the present case, deliberation and mobilization not only had an indirect impact on top-level decision-making by shaping the agenda and mounting supporting pressure. Even more importantly, *internet-enabled deliberation and mobilization led to the adoption of a participatory and community-led governance approach*. If the present case is more than an exotic exception and, rather, an early example of what is yet to come, the implications for existing governance models are noteworthy. Increasing internet-affinity is likely to further move the *public sphere* from TVs, billboards and magazines into social network sites embedded in gadgets as people move around their physical environments. In these environments, government can be as close as participating in a local policy session or sending inputs via distributed access points. Governments need to be present and actively constructing the emerging public sphere as one among other integral parts of it.

At least two limitations apply to this study. First, common to all single case or field studies, no generalizations can be made. Whether the present case is the exception rather than the norm cannot be established. However, the research questions were interested whether an impact on top-level decision-making can be observed as well as in discernible patterns or mechanisms. To this end, the present research is qualified to draw valid conclusions. A related concern is the reliability of the findings, that is, whether the research would arrive at similar findings if repeated. The reliability hinges on following closely the coding criteria and the relevancy criteria established in the methodology part. Given the detailed specification of the coding criteria for each theme and definition of relevancy criteria, and the high results in coder reliability testing, it is rather likely that the underlying premises of the findings will be confirmed. For example, an underlying premise is that a majority of statements endorsed opensource Java during the first phase, which was incidental with the subsequent decision to allow opensource Java software.

Another limitation concerns the relatively low amount of self-published content in the sample, which impairs the self-selection

parameter. Google's PageRank algorithms broadly involve three steps: finding internet pages containing the query term, computing their relative importance, and ranking them accordingly [12, .63-5]. This suggests that self-published content fares generally lower in terms of relative importance vis-à-vis content from central media outlets. Conversely, it suggests that *if* self-published content makes it into the result lists, it must be highly popular. Indeed, particularly forum discussions appear to be crucial in opinion leadership and agenda-setting. That is, in the absence of more reliable yardsticks to gauge public sentiment, forum discussions appear to influence the reporting bias of news services [38]. This is confirmed by the fact that pro-opensource mobilization first occurred in forum and e-mail communications before it engulfed the media. While self-published content accounts for just about 15 percent of source documents, these 15 percent appear to influence the remaining 85 percent.

In conclusion, the present research demonstrated that internet-enabled public deliberation had an impact on top-level decision-making and it identified the underlying design and process parameters. It outlined existing approaches to internet deliberation and participation and identified their shortcomings. The participatory governance model was developed based on previous political science work. The model described three institutional design parameters (selection mechanism, degree of engagement, and decision impact) as well as three process parameters (opposing views, mutual adjustment, and incremental decisions). Based on the participatory governance model, three propositions were developed and operationalized. The methodology used a quantitative and qualitative approach and outlined the sampling procedures and a systematic coding approach. The analysis was based on statements made by participants, which were quantified using reference volume and centrality degrees of themes assigned to statements. Further research may include first-hand interviews of participants in order to include more 'inside information' and should investigate other cases and perhaps a large-scale study to further test under which conditions the propositions hold.

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