
RESEARCH PAPERS

The Maturing Concept of E-Democracy: From E-Voting and Online Consultations to Democratic Value Out of Jumbled Online Chatter

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ABSTRACT. Early literature on e-democracy was dominated by euphoric claims about the benefits of e-voting (digital direct democracy) or continuous online citizen consultations (digital representative democracy). High expectations have gradually been replaced with more genuine approaches that aim to break with the dichotomy of traditional notions of direct and representative democracy. The ensuing question relates to the adequate design of information and communication technology (ICT) applications to foster such visions. This article contributes to this search and discusses issues concerning the adequate institutional framework. Recently, so-called Web 2.0 applications, such as social networking and Wikipedia, have proven that it is possible for millions of users to collectively create meaningful content online. While these recent developments are not necessarily labeled e-democracy in the literature, this article argues that they and related applications have the potential to fulfill the promise of breaking with the longstanding democratic trade-off between group size (direct mass voting on predefined issues) and depth of argument (deliberation and discourse in a small group). Complementary information-structuring techniques are at hand to facilitate large-scale deliberations and the negotiation of interests between members of a group. This article presents three of these techniques in more depth: weighted preference voting, argument visualization, and the Semantic Web initiative. Notwithstanding these developments, the maturing concept of e-democracy still faces serious challenges. Questions remain in political and computer science disciplines that ask about adequate institutional frameworks, the omnipresent democratic challenges of equal access and free participation, and the appropriate technological design.

KEYWORDS. Argument visualization, computer, democracy, digital, direct democracy, ICT, intermediation, Internet, IT, representative democracy, Semantic Web, software, technology, voting, Web 2.0

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Far from having reached completion, the common understanding of democracy and its modus operandi is still an arduous work in progress that spans more than 2,500 years of history. The underlying idea of a noncoercive form of government changes with the cumulative nature of human progress. Within these dynamics, political institutions have developed in mutual interplay with technological progress. For example, Aristotle's view that the influence of democracy had to be restricted to a radius of 70 kilometers because a person could not travel further than that in one day has long been rendered obsolete by technological progress.

Information and communication processes are currently being digitized. Over the past 15 years, roughly every sixth human being on this planet has linked up virtually with his fellow citizens over the Internet, and every second inhabitant can be reached through the mobile telephony network (ITU, 2007). It seems intuitive that the digital revolution also bears the potential to reform the way people form and find their common will. The concept of democracy is almost exclusively based on information and communication procedures, and these can be digitized by information and communication technologies (ICT).

A considerable amount of literature has already been published on "e-democracy" or "digital democracy." The first section of this article shows that the earlier generation of relevant literature either focused on the digitization of existing democratic practices, which can roughly be divided into representative democracy (improving the transparency of representative democracy) or called for the forthright introduction of more direct citizen participation using digital channels (such as home-based e-voting). It seems like these approaches have not stood up to their promises. More recent literature calls for the transformation of the dichotomy into more subtle forms of democracy between direct participation and citizen representation. This article explores technologies that have the potential to provide the building blocks for such approaches. The related literature often does not refer to the concepts of e-democracy or politics in general, but rather focuses on information engineering, group decision-making, or social networking.

Over recent years, global connectivity has led to important forms of social networking in the digital realm, which belong under the concept of Web 2.0. At the beginning of 2008, more than 110 million users network through their online MySpace, more than 90 million teenagers spend part of their day hanging out in the form of a virtual avatar in the online Habbo Hotel, 80 million users share and channel videos through YouTube, 70 million maintain and network their personal online Facebook accounts, and 14 million people live a Second Life in the virtual reality online world. In other words, the population of Habbo Hotel is larger than the population of 95 percent of real world nation states, and Second Life counts more residents than two-thirds of today's countries. Social networking is not only expansive, but it also seems to produce quality content. It has been shown that the collective and open effort of 75,000 active contributors to the online encyclopedia Wikipedia achieves quality standards similar to traditional encyclopedias (Emigh & Herring, 2005; Giles, 2005).

These applications make use of various concepts from information engineering, such as automated preference analysis, multimedia content that allows for visualization, and intelligent content analysis through tagging. The first section of this article argues that such techniques bear great potential to revitalize the e-democracy agenda and steer it into a new direction. The second section reviews some lessons learned from communitarian Web 2.0 applications, group argumentation support systems, and intermediation techniques, and also reviews the current state of the Semantic Web and artificially intelligent software agents. The third section shows the potential benefits of those applications for e-democracy. For instance, it is shown that these technologies can be combined to evolve the separation between the traditional alternatives of representative and direct democracy. Notwithstanding, there is no quick fix and no silver bullet for improving democracy, and not everything that is technologically possible is democratically desirable. Criteria need to be developed to guide the digitization of democratic processes. The final section presents some of the many challenges that result from the common research and action agenda for political scientists and information engineers alike.

***THE BASIC TRADE-OFF BETWEEN
GROUP SIZE AND DEPTH
OF WILL EXPRESSION***

Democracy is concerned with two main processes: the constant formation and evolution of the common will, which includes deliberation and discourse, and the decision-making process, which refers to the set of rules that orders the will expressions of the people, such as voting mechanisms.¹ Unfortunately, practical constraints do not allow for the meaningful participation of everybody always, and over the centuries, a large variety of diverse mechanisms and procedures have evolved to foster both aspects. Most of them basically turn around the well-known axis between direct or representative democracy.

Representative democracy reduces the number of citizens directly involved at several stages of the deliberation. A small group is legitimized by the rest and carries out the discourse in representation of the people. The direct democratic alternative does not reduce the number of participants, but simplifies the expression of opinions. Instead of entering into a mutually influencing discourse, a large number of people vote on a restricted set of predefined issues. The important thing to notice here is that there seems to be a natural trade-off between the number of people involved and the depth and breadth of will expression.

In an attempt to intermediate between both extremes of this trade-off axis, today's democracies have developed innumerable intermediate modes of interaction between these two idealized forms. Forms of participatory and deliberative democracy aim to create dynamic interplays and mutual dependencies between representatives and direct citizen participation, be it in the formation and creation or in the identification of the common will. For the sake of analytical clarity, however, it is useful to start with an analysis of the effect of digitization of these two alternatives in their pure forms. The following section reviews some of the literature that has been published about the supposed effects of e-democracy in each form.

Direct Democracy in the Digital Age: The Envisioned Push-Button Democracy

If the number of citizens is kept large, voting usually is carried out as abridged and simplified opinion expressions on predefined issues. This process can be digitized. This vision was promoted early on by the former United States Vice President Al Gore (1994). It has also been claimed that "the old communication limitations no longer stand in the way of expanded direct democracy" (Toffler, 1980, p. 429). Supporters of a digital direct democracy have argued since the 1960s that technological solutions make it feasible to vote on a very wide range of issues quickly, cheaply, and continuously, indeed simultaneously, and possibly several times a day (Berkeley, 1962, p. 169; Krauch, 1972, p. 37). In this "vote-from-home revolution" (Hollander, 1985), "the citizenry [is] sitting before a video and allegedly self-governing itself by responding to the issues in the air by pressing a button" (Sartori, 1987, p. 246). As Brepohl (1974) states, "There would be nothing to hinder the introduction of a direct democracy: citizens could decide on absolutely anything by pushing a button" (p. 268). By simply staging "pushbutton votes on a screen at home" (Eurich, 1982, p. 105), a much more precise and accurate reflection of the popular will would emerge (Budge, 1996, p. 15).

While the reduced organizational workload and the cost-effectiveness of online voting presents opportunities to increase the frequency of voting, the resulting "push-button democracy" cannot overcome some of the longstanding limitations of direct democracy. Three main criticisms include citizen's capacity, missing deliberation, and limited personal expression.

Since Athens's mob killed Socrates, numerous leading scholars have repeatedly argued that direct democratic methods face public irrationality (among them Converse, 1964; Kant, 1793; Tocqueville, 1835; and Weber, 1918). It has been argued that without expertise and adequate preparation to decide on the issues at stake, the masses lack well-developed attitudes or opinions on most public issues. They tend to favor the needs of the moment for those of the

future and are always susceptible to emotional and ill-informed influences. This can cause major problems for issues of strategic importance, such as budget or foreign policy. E-voting does not change these longstanding challenges.

Furthermore, this kind of direct democracy neglects the idea that the common will does not exist a priori, but rather needs to be created. Democracy is more than a process to intermediate among bundles of existing interests (Benhabib, 1996). Reflective and rational discourse among citizens aims to constantly transform the "I want" into the "we want." It requires one to at least know and take the opinion of the other into account. Mere voting does not account for democratic deliberation.

Besides, even if people would be consistent and rational, and would have deliberated thoroughly, mere voting on a predefined question does not allow people to express their will adequately. The most extreme form of curtailment and simplification is the straightforward "yea/nay" vote. The expression of opinion is standardized, making it possible to aggregate a large amount of uniform options in an unequivocal manner. The downside of the clear-cut result is the straitjacket of opinion expression put upon voters. Plebiscites and referendums mirror one chosen aspect of public opinion, reproducing it with all the contradictions possible (Luhmann, 1990, p. 181). Preformulation restricts the individual citizen, not only because it prevents him or her from expressing his or her opinion in his or her own words and thought schemata, but also because it can impose a perspective. If the individual rejects the type or the wording of the question as such, he or she can, at best, abstain.

In short, the envisioned "push-button democracy" merely focuses on the digitization of existing forms of voting, which might increase its frequency, transparency, and cost-effectiveness, but does not transform the concept of democracy qualitatively. It does not overcome enduring challenges of direct democracy related to public irrationality, missing deliberation, and power concentration with the political elite that formulates the questions.

Representative Democracy in the Digital Age: Between Trustee and Delegate

On the other end of the aforementioned trade-off axis, depth of will expression is enhanced, but time constraints force sacrifice of group size. If each of the 5,000 citizens in a small town were allowed a 30-minute prose speech, it would be almost a year (313 eight-hour days) before every person could speak up, and in the end, the town is very unlikely to be in a position to formulate the common will of the group (Dahl, 1998, p. 107). A small group, on the contrary, allows for the creation of a common outlook and mutual understanding through deliberation and discourse. This is especially effective if deliberators possess a certain level of rhetorical training and comprehension skills in order not to lose the thread in the cut and thrust of such group deliberations (Dryzek, 2001, p. 13). Faced with problems of time-constraints, scale, and capacity, Madison (1787), one of the fathers of representative democracy, recommends "the delegation of the government . . . to a small number of citizens elected by the rest . . . to refine and enlarge the public views by passing them through the medium of a chosen body of citizens whose wisdom may best discern the true interest of their country." The representative filter aims to transform public opinion from its "raw form" and is formulated and expressed by representatives in the name of the citizens who legitimized them. The result of the deliberation might be quite different than the "raw form" of public opinion, and citizens at large might not agree with the outcome. However, given that they did not participate in the in-depth deliberation that led to the final result, the logic of the representative democracy expects them to accept the outcome as the best of all possible solutions. This logic requires the principle of a free mandate for the representative. The representative is a trustee, rather than a delegate, who carries out an imperative order of the citizen. A free mandate implies a moral representation of the people in the very act of deliberation. Most democratic constitutions therefore provide that political representatives, once elected, receive immunity and an independent salary, are free from orders and instructions

from the masses, and are subject only to their conscience. This was at least the reasoning of the founders of representative democracy.

This model of representation has led to a visible degree of an often-lamented distance and remoteness between representatives and citizens (e.g., Nye, Zelikow, & King, 1997). This leads to citizen dissatisfaction, less political involvement, and an increasing call from the public to have more say in politics (e.g., Coleman, 2003a).

At the same time, digital transparency and new forms of interactivity have started to blur the process of political representation in a sense of a free mandate. Given that the institutions of representative democracies have not been designed for a digital age, the result is a strange mix of non-involved citizens dictating the result of supposedly coercion-free deliberations among representatives. One contributing factor is the decreasing information asymmetry, due to the digitization of the activities of political representatives (Clift, 2000; Coglianese, 2004). In a society where people are increasingly accustomed to communicating directly with show masters and to choosing the next music video by mobile short message service in real time, political leaders are very unlikely to escape the digitized verdict of the people. Just as corporate managers track their company's share prices on the stock exchange, day-to-day opinions on a very wide range of issues have started to dictate the stance of the people's representatives and of those who hope to be elected in the near future. "Politicians will be confronted by polls seconds before votes in parliament and then immediately afterwards with voters' initial reactions" (Schmillen, 1997, p. 676).

In this scenario, most successful politicians are constantly informed about public opinion and, in view of the next election, are tempted to reproduce the public mood in as near to real time as possible. They are likely to increase their popularity when exposing their lives to their electorate (Clift, 2002). As this trend develops, future representatives of the people might find themselves forced to play a role similar to that of TV-reality-show candidates, responding in real time to the cavils or praise of the public (Coleman, 2003b).

To spin a message solely in order to snare a majority is, by definition, populism and not political representation of the people. In this scenario, democratic leaders no longer act as they believe right, untrammled by orders and instructions and subject only to their conscience or free mandate, but find themselves forced in practice to move towards an imperative mandate. Politicians who are eager to win elections do not seem to have a problem with this. The former American presidential candidate Ross Perot promised his voters in the early 1990s free phone lines so that, under his potential administration, citizen feedback could be used "to get the White House and Congress dancing together like Fred Astaire and Ginger Rogers" (Fishkin, 1992). Fifteen years later, online feedback is regarded by legislative bodies as a real option for tailoring the deliberations of representatives to the wishes and concerns of ordinary citizens (House of Commons, 2004, p. 20). The tightening of the loops in the democratic feedback cycle between the people and their representatives is resulting in a marionette-like control of representatives by citizens. Some legislative bodies are aware of this trend and are finding arguments to counter it. The British House of Commons states that "the purpose of on-line consultations must be made clear to participants—they are being asked to provide advice and information, not to make policy" (House of Commons, 2004, p. 21). Considering the increasing volume of emphatic views that incessantly patter down on representatives and their inability to ignore these if they want to stay in power, such a statement seems more like a forlorn cry for help than a clarification of the boundary between a limited and a free mandate. The boundary between an imperative and a free mandate is blurring in practice.

In principle, an imperative mandate is not undemocratic. However, existing democratic constitutions have not prepared for it. Madison's fundamental justification in favor of a representative system was the representation of the people in the moral exercise of reason and judgment. This theoretical argument is in need of close scrutiny (at the very least). In the light of the digital reality of communication, the selection of representatives might be determined not by their degree of wisdom and morality, but by

their informatic power over patterns of citizens' preferences, information-negotiating skills, and their individual entertainment potential. The *de facto* imperative mandate must be recognized for what it is in order to prevent possible undemocratic consequences, such as an all-pervading populism.

Summing up, centuries of representative democracies based on the free-mandate have led to citizen detachment and political aloofness, while an imperative mandate in a mediated world faces the risk of converting representation into infotainment and populism.

BUILDING BLOCKS OF NEW APPROACHES TO E-DEMOCRACY

The above scenarios demonstrate that the use of ICTs in conventional democratic systems is not automatically favorable. It might even seem that latent threats, such as mindless push-button voting or mediated populism, could outweigh possible benefits. The major lesson learned from this early e-democracy literature is that the combination of technologies and institutions that were not built for each other does not automatically improve democracy. Given that most of today's ICTs have not been developed in accordance with democracy theory, but rather for academic or commercial purposes, it is not surprising that they do not satisfy democratic ideals. The question therefore turns away from a technologic deterministic view of the effects of given technologies and towards the design of adequate technologies to foster a desired democratic model.

Recent e-democracy literature has claimed that it would be desirable to make use of digital ICTs to transcend the direct-representative dichotomy and to move towards a model of a digitally mediated "direct representation" (Coleman, 2005). It recognizes the practical need for representation, given the above-mentioned limits of traditional direct democracy, and aims for a more intimate and discursive relationship between representatives and their constituents. In line with Pitkin (1972), representing implies an active communication between the citizen and his or her representative, which is constructed

around a balance between independence and responsiveness. The latter must be acted upon in the interest of the citizen, and therefore needs to know it first, while in the case of differences in opinion, the representative must show good reasons for being at odds. Direct representation envisions a more sensitive form of representation. It aims to share responsibility and two-way accounting in order to escape from the current disconnection between representatives and constituents, while at the same time not overwhelming citizens with the high demands on time and capacity to constantly be directly involved in politics (Coleman, 2005).

Another vision that extends on existing practices of "proxy voting" is the delegation to another member of a voting body to vote in one's absence. In visions of a "proxy democracy" (Malone & Klein, 2007) or full-scale "delegated democracy" (Yamakawa, Yoshida, & Tsuchiya, 2007), it is the decision of the each citizen to participate directly or to delegate democratic power to various trusted experts of choice for each single decision. Vast and real-time adjusting of the delegation network would allow the citizen to identify an adequate (and often different) delegate each time for each single decision, without major time and skill requirements.

Those, and related visions, all aim to break with the direct-representative dichotomy. The consequent question relates to the design of adequate e-democratic ICT applications that enable the involvement of a large number of citizens into meaningful deliberation—among themselves and with representatives—while at the same time enabling representatives to identify the ever-evolving mosaic of public opinion in order to check, eventually correct, or defend their stand.

Recent years have seen the development of several applications that bear a large potential to move e-democratic developments into this new direction. Walking the tightrope over the bipolar logic of the trade-off between group size and depth of argument, these applications have shown that it is practically possible to combine both of them. Online social networking platforms, such as MySpace, YouTube, Facebook, Digg News, Wikipedia, and countless blogs²

and wikis,³ combine large group size and depth of will expression by overcoming time-restrictions through multidirectional and massively parallel communication networks. In reference to the evolving World Wide Web, which in its original format mainly consists of hyperlinked Web sites (Berners-Lee, 2001), these new applications are often grouped under the concept Web 2.0 (O'Reilly, 2005). Two of the keys of their remarkable and unforeseen success are user-friendliness and the use of intelligent algorithms to intermediate online content. They provide user-friendly interfaces that allow users to interact online in a more intuitive manner and to contribute content themselves, which can be of any form, including text, pictures, and videos. Users can present, intuitively contribute, and network their personalized worldviews without any necessity to know HTML or any other complicated procedures, which is a significant improvement over most Web 1.0 applications. Web 2.0 applications also intermediate the resulting communication structure through the identification of diverse patterns of interaction, according to specific algorithms. This allows, for example, for the dynamic identification of preference orders, the identification of videos of particular interest to the user, or the detection of long-lost friends through a chain of friends of friends.

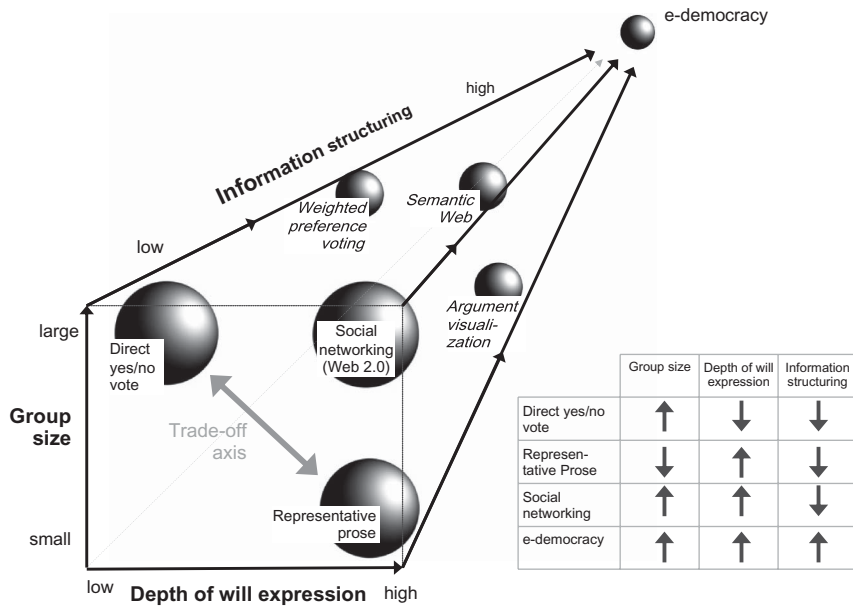
Automatic intermediation of personal content bears much potential for democratic ends, both for a more transparent and effective deliberation as well as for the final decision-making. For now, this digital intermediation is still very incipient and often not efficient enough. As a result, online social networking in Web 2.0 formats resembles a gigantic digital polis of massively parallel online chatter, whereas the common will is lost in a heap of unstructured words, letters, photos, pictures, and videos. A challenge in being able to employ these applications for democratic ends is to design institutional procedures that constantly and dynamically convert the myriad of individual online will expressions into a coherent common will. A variety of ICT applications show a complementary set of ways to address this challenge. The key to a more efficient intermediation process can be found in the effective employment of

information structuring techniques. The method consists of identifying the different opinions expressed in accordance with a classification system lying somewhere between the entangled prose of natural language and the oversimplification of a single statement that is presented to the public for voting. If the provided information (opinions, questions, answers, arguments, counter-arguments, rationales, justifications, reasons, etc.) is provided in a format that is accessible and understandable for machines, digital systems can be designed to intermediate in the entangled opinion jungle of democratic will formation. This is especially useful if the number of participants is large.

Figure 1 provides a schematization of the main ideas behind the concepts that are presented in the following sections. It illustrates the logic of trade-off between the option for a small body of citizens who filter public opinion through convoluted and ambiguous speeches (representative prose), and the alternative to turn to brief and predefined, but unmistakable expressions of the many (direct yes/no vote). Social networking of Web 2.0 applications combines large group size with depth of will expression, but only provides limited means to intermediate among the expressed opinions in a methodological way. The current e-democracy challenge adds a third dimension to this originally two-dimensional logic. Diverse information structuring techniques aim to let more and more citizens participate in the impenetrable tangle of formal democratic deliberations and to constantly ease the straitjacket of simplification around the choices offered for voting. Argument visualization tools and digitally intermediated weighted preference voting will be presented as examples of each technique. Further down this road, artificially intelligent software agents are starting to intermediate in a Semantic Web of will expressions. These rapidly advancing branches of information engineering provide the basis for new approaches to the e-democracy agenda.

Throughout this section, a concrete example will be used to demonstrate the different approaches and to illustrate the possibilities that arise when such means are combined with democratic ends. Let us assume that five citizens

FIGURE 1. Summary schematization of e-democracy challenge. (Source: Author's presentation.)



discuss whether public spending on education should be increased and whether a tax adjustment might be necessary for this purpose. Citizen A claims to “favor education spending, but preferably from existing resources.” Citizen B is rich and answers that “education spending must certainly come first, and it is right that taxes should increase accordingly.” Citizen C is not so sure and argues that he prefers “to keep the status quo, but if anything is to change, then education should be given priority.” Citizen D has “no strong feelings about education, but change is definitely needed, especially in the way public spending is currently shared out.” Citizen E claims to have “no strong opinion on education but feels, because of personal health problems, that other sorts of public spending, such as health, should not be discriminated against.” In an idealized democratic setting, citizens would deliberate on the issue and then make a decision regarding education spending and tax adjustments. Deliberation is possible among five people, but not if the number of people is growing. For a growing number of deliberators, the logic of the trade-off axis would suggest either to elect

a small number of representatives of the group to figure things out in representation of the rest, or to formulate clear-cut questions for direct voting, such as “Do you want more education without tax increases?” or “Do you want to maintain the status quo?,” implying a certain degree of opinion-coercing manipulation through the formulation of the question. On both ends, information structuring becomes important, be it to be better informed about the opinion of the people, or to enable more meaningful discourse.⁴

From Unintelligible Prose to Structured Argumentation

Information-structuring techniques can help to untangle prose through methodological approaches to argumentation. The theory of argumentation is at the heart of deliberative democracy and can be defined as a social activity of reason aimed at increasing or decreasing the acceptability of a controversial standpoint by putting forward a constellation of arguments intended to justify or refute the standpoint before a rational judge (Van Eemeren,

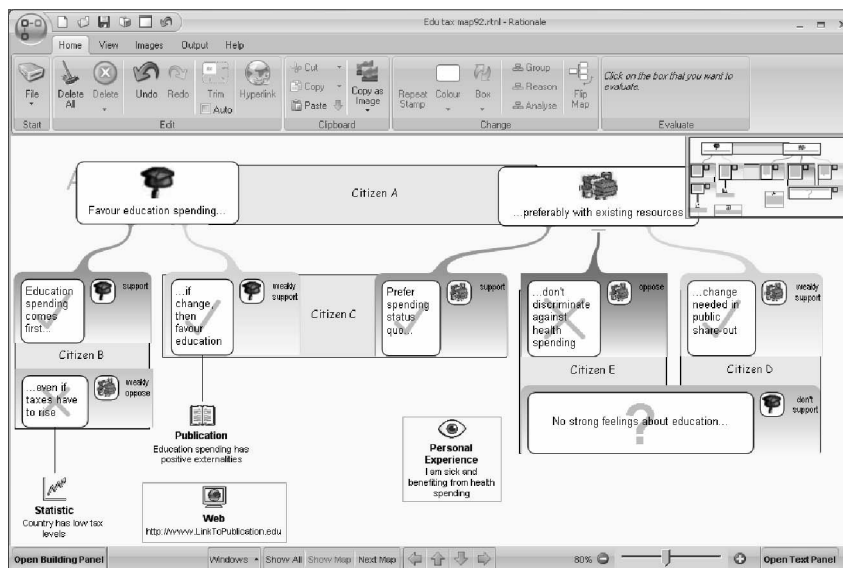
Grootendorst, & Henkemans, 1996, p. 5). It is a rich, longstanding, and multidisciplinary area of research, encompassing philosophy, linguistics, and psychology. Recently, important new research results have been presented in the field of computer science (ASPIC D1.1, 2004; ASPIC D2.1, 2004; Bench-Capon & Dunne, 2007).

Since Horst Rittel's pioneering work on "wicked problems" and the "Issue-Based Information Systems" (IBIS), a framework that enables groups to break problems down into questions, ideas, and arguments (Rittel & Webber, 1973), the aim has been to arrive at a transparent way of laying out arguments and their constituting claims and to illustrate how arguments relate to each other. Considering that a picture can famously say more than a thousand words, arguments can be presented in a much clearer and intuitive way with the help of meta-information that is embedded in their visualization (Kirschner, Shum, & Carr, 2003). Text and argument visualizations present the network of different contributions in the form of what are known as argument maps. "The paradigmatic argument map is a visual display, much like the familiar paper maps of towns, subway systems, treasure islands, etc." (Van Gelder, 2002, p. 4). The visualization of

argument assists in the exploration and rearrangement of an unknown, impenetrable, complex, rapidly changing environment, namely the tangle of opinions held in a group. Argument maps do for deliberation what a chess board does for chess. Deliberating without one is like playing chess without the help of a reference tracking chess board. This is possible, and a small group of highly skilled experts is able to play chess blindfold, but it is an additional complication of a complex task. Visualizing the constantly changing combinations prevents the participant from going around in circles unnecessarily, allows changes to be dynamically integrated, to look on the same issues from different perspectives (Li, Uren, Motta, Shum, & Domingue, 2002, pp. 4–6), and makes it possible to choose various alternative routes to potentially shifting destinations without having to start the orientation process all over again (Monk & van Gelder, 2004, pp. 5–8). Each new contribution or link between contributions can dynamically change the entire argumentation structure of the deliberation.

A common way to map deliberations is to depict contributions as circles or boxes and the relationships between contributions as arrows. Figure 2 is an example of an argument map,

FIGURE 2. Argument visualization from the perspective of "Citizen A." (Source: Author's presentation, based on Austhink Rationale Software, with slight adjustments. Original is colored.)



based on a version of Austhink's Rationale Software. It depicts the relationship between Citizen A from our example and the arguments of his fellow citizens. The information classification chosen separates their views about education from their related views about tax and classifies the relationships with a neutral, positive, or negative polarity (i.e., don't support, support, or oppose, marked with differences in colors in the original software, such as green and red), and a strong or weak weighting. When looking at such visualization for the first time, it might appear a little unconventional. But once one is used to the logic of argument visualization, a short glance at the software screen is enough to see that Citizen A's opinion is more supported than opposed. The image also reveals the relation of the other citizens with respect to Citizen A, which might not have been as obvious in the prose-based presentation of the five distinct sentences from above. A major benefit of visual presentation is that similar opinions can be quickly spotted and then categorized under a single argument, such as is done with Citizens E and D in Figure 2. This becomes important as the number of participants grows. The aim is to structure vast amounts of information and to combine identical and similar contributions so that system clarity does not suffer but instead benefits from a large number of participants. Grouping identical arguments in the same category means that the heterogeneity of opinion is defined by the number of different categories, not by the number of participants (Pingree, 2004, p. 16). Besides, additional parameters can be introduced, such as explanations of the individual stand or personal experience, or links to outside background information such as publications, statistics, or Web sources. An ever-present design concern, however, is finding a balance between overwhelming users with subtly different categories and straitjacketing them with a frustratingly small vocabulary in which they cannot adequately express themselves (Shum & Selvin, 2000, p. 10).

This presented example is quite simple and small in scale. More refined argument maps, connecting hundreds of arguments, are much larger and more sophisticated than the one

presented in Figure 2.⁵ Positions with an above-average number of links can be spotted very easily in the resulting spider webs of arguments. The user can zoom in to a certain argument, and deeper insights can be obtained by exchanging ideas interactively. This allows the user to situate individual arguments in relation to the others and to consider how others' arguments are related to their own. The obligation to classify arguments in categories can be educative for the deliberator. With increasing granularity of classification, it becomes more and more difficult to conceal personal opinions behind rhetorical tricks of prose articulation or behind coarse black-or-white options. The user has to opt for one of the clearly distinguishable gray tones. The deliberator gradually and systematically moves towards an ever more concrete argument, "making up his mind" step by step (Shipman & Marshall, 1999, pp. 3–4, 14–16).

The precision with which text can be classified increases with the options made available to users for describing a text or a relationship between contributions. As precision improves, complexity rises (Bowker & Star, 1999, pp. 6–7). In this sense, we move along the trade-off axis between a fine-grained information classification system that is as diverse as rhetorical prose, where each word is a category, towards the clarity of very broad categories of ultimately binary logic, such as pro and contra.

A challenge for most of the currently available computational support software for structured argumentation is the provision of an intuitive and user-friendly platform. The implied learning curve has turned out to be much steeper than initially expected (Shum et al., 2005). This skill requirement has prevented widespread use of such sophisticated applications. The lessons learned from successful Web 2.0 applications will surely be helpful in tackling this challenge.

Summing up, the idea behind information structuring is to make the expression of an individual opinion as unrestricted as possible and as structured as necessary to group and relate opinion pieces. The meta-information embedded in the symbols used in argument

visualization facilitates orientation in the often opaque jungle of deliberations. Visual presentation introduces clarity in the relationship among the various arguments. The increasing clarity does not only facilitate deliberation, and therefore the process of democratic will formation, but also enables a larger number of participants in the deliberation. For example, such applications have the potential to enable citizens to follow parliamentary deliberations and the stands of their representatives in a more clear-cut manner. It would also allow constituents to deliberate among themselves and with their representatives, thereby fine-tuning differing aspects around a common opinion. However, these applications need to be learned, which has prevented large-scale usage to date.

From Superficial Yes–No Voting to Deeper Expressions of the Will

On the other side of the trade-off axis, a large group size is maintained, and the goal is to fine-tune the will expression of each individual in order to reach a decision. Social choice and negotiation techniques enable users to construct an amicable agreement by negotiating the maximum information content behind the different wills. Most of today's democracies consider some kind of intensity of the expressed opinion, such as the option of a first and second vote. However, these simplistic practices only reveal a small portion of the complexity of the information structure behind the will of the people.

The longstanding impediment of the adoption of more sophisticated techniques is the difficulty of processing the exponentially increasing amount of information that comes with every additional preference rank or pairing of results. A manual tally and calculation procedure would take too long, and the likelihood of error would be too high. Entered through a digital user interface, however, detailed preference structures can be relayed to information processing software in the same digital format and evaluated in real time (Schlifni, 2000, Ch. 1.5). The vast capacity of digital systems renders worries about the number of alternative choices

obsolete. In short, digital interfaces make it possible to register the deeper compositional structure of pluralistic preferences, and computers make it possible to process the large amount of registered information.

The ultimate goal of these techniques is to shift the conflicting attitudes of a heterogeneous group in such a way as to arrive at a more acceptable solution for everybody, strengthening the stability of the democratic outcome.⁶ The opinions of minorities, preference orders, and the intensity of opinions can be taken into account, resulting in a more stable democratic agreement. Social choice approaches offer a variety of techniques designed to provide mathematical solutions to the problem of conciliating minorities without undermining the ultimate decision-making power of the majority. Two well-known methods date back to two 18th century mathematicians, Condorcet and Borda. The so-called Condorcet winner of an election is the one who would win the election if paired against all alternatives, as in a run-off vote. Borda devised a scale that ranked preferences according to the strength with which they were held.

The choice of procedure is crucial in such solutions. It can lead to completely different results. This can be exemplified by our simple example. Table 1 shows the preference structures of our five citizens in accordance with a selected classification scheme. A simplistic "one man, one vote" procedure would favor the existing tax level while lowering education spending—the preferences of Citizens D and E. The right-hand columns show that this option is the second to last preference of the majority formed by Citizens A, B, and C. A direct comparison of two options at a time, as in a run-off vote, shows that the combination of stable taxes and higher education spending would be the winner under the Condorcet method. Opting for a Borda count with simple increments in the preference scale, with the first preference being 5 points and the fifth preference being 1 point, increased taxes and increased educational spending receive the broadest consent ($[Citizen A: 4] + [Citizen B: 5] + [Citizen C: 3] + [Citizen D: 3] + [Citizen E: 4] = 19$). This option is among the first three preferences for all five citizens.

TABLE 1. Intermediation of Revealed Preference Structures

	1 st preference	2 nd preference	3 rd preference	4 th preference	5 th preference
Citizen A	tax ↔ edu ↑ ⁵⁰	t ↑ e ↑ ²⁵	t ↔ e ↔ ²⁰	t ↔ e ↓ ⁰⁵	t ↓ e ↓ ⁰⁰
Citizen B	tax ↑ edu ↑ ⁵⁰	t ↔ e ↑ ²⁵	t ↔ e ↔ ²⁰	t ↔ e ↓ ⁰⁵	t ↓ e ↓ ⁰⁰
Citizen C	t ↔ e ↔ ⁸⁵	t ↔ e ↑ ¹⁰	t ↑ e ↑ ⁰⁴	t ↔ e ↓ ⁰¹	t ↓ e ↓ ⁰⁰
Citizen D	t ↔ e ↓ ²²	t ↔ e ↑ ²¹	t ↑ e ↑ ²⁰	t ↓ e ↓ ¹⁹	t ↔ e ↔ ¹⁸
Citizen E	t ↔ e ↓ ²²	t ↑ e ↑ ²¹	t ↔ e ↔ ²⁰	t ↓ e ↓ ¹⁹	t ↔ e ↑ ¹⁸

Source: Author's presentation. Note: Horizontal, up and down arrows indicate preference for unchanged, higher and lower taxation (t) or education spending (e).

Instead of completely satisfying as many citizens as possible (simple majority vote), it satisfies all citizens as much as possible.

When preference weighting is also allowed for by distributing 100 points among the five preferences (consider the numbers in upper right-hand corner of Table 1), asymmetrical interest intensities are often exposed. The outcome of a “weighted Borda count” of intensities is that the status quo is favored for both taxes and education (163 points). The preference weighting also shows that Citizens D and E (the potential winners of a simple “one man, one vote” majority rule) have relatively mild feelings about the different options. They give between 22 and 18 points to all five of the available alternatives. This is in contrast to Citizen C, who feels very strongly about the issue (dedicating 85 of her 100 available points to one single alternative). This shows that Citizen C might not be satisfied with the result of the “one man, one vote” majority rule, because it seems like an unconcerned majority (Citizen D and E) would overrule a concerned minority (Citizen C). As a result, Citizen C might take to the streets in protest, boycott the outcome, and, in the most extreme case, use

violence to make his voice heard. In this sense, the identification of deeper preference structures bears the potential to lead to more stable democratic results.

As can be seen from the example in Table 1, the choice of procedure is crucial. Four different decision-making mechanisms lead to four different outcomes: (a) simple majority rule: stable tax and lower education spending; (b) Condorcet method: stable tax and increased education spending; (c) Borda count: increased tax and increased education spending; and (d) weighted preference voting: stable tax and stable education spending.

A practical application that already makes use of such quantitative methods is online information markets for the purpose of forecasting the future, both for public events, such as political outcomes and sporting, or for internal corporate events, such as whether a project deadline will be met (Bray, Croxson, & Dutton, 2008). The logic of online information markets is similar to gambling. The participant can weight his personal opinion by assigning a distinct (monetary) value to each bet. The fine-tuning of the amount of the wager presents a scheme of weighted preference voting. The

result is a very efficient mechanism to aggregate vast amounts of precisely weighted opinions. Often the aggregated predictions made by a vast amount of rather uninformed participants are much more precise and successful than individual foresights of recognized experts (Sunstein, 2006; Surowiecki, 2004).

Summing up, digital ICTs make it feasible to reflect the will of the people much more truthfully than through the opinion-coercing simplifications involved in preformulated questions and simply majority rules. For example, these and related applications bear the potential to allow representatives to explore and understand the current opinion of their constituents more thoroughly. Potential conflicts can be identified and worked on, while alternatives that might not have otherwise been considered might turn up to reveal the most stable common ground. As the method defines the result, much attention needs to be dedicated to the adequate design of the relevant procedures.

From Tangled Online Chatter to Semantic Information Intermediation

Going one step further, some of the recent digital applications have shown that even prose text can be made accessible by digital tools and therefore automatically mediated. A very ambitious initiative with great potential for e-democratic applications refers to this computerized intermediation of natural language communications. In 2001 the creator of the World Wide Web, Tim Berners-Lee, together with some colleagues, laid out a vision of intelligent software agents that intermediate between digitally expressed sentiments, converting them into a flexible and meaningful Semantic Web (Berners-Lee, Hendler, & Lassila, 2001). Serious and plentiful research along these lines has been done around the world during recent years, mainly through the World Wide Web Consortium (W3C). Today the Semantic Web is no longer simply an aspiration.

In order to make it possible for the Web to understand and satisfy the requests of people and machines, Web content needs to be set in context, meaning that it needs to classify and relate pieces of information logically to other

pieces of information. Today's Web is meant for human consumption, with machines being able to capture and manipulate it only at the syntactic level. That is, machines can recognize the symbols that represent letters, but not the meaning of the content. The central idea of the Semantic Web initiative is to make the meaning of Web content machine accessible. The applied logic is basically similar to the functionality of search engines in libraries. Any kind of information and text can be classified into different categories of meta-information, adding "information about information." These additional layers of meta-information enable searches and the establishment of relationships. For example, a library search engine is able to retrieve all books with a specific publication date, length, or description of the book's content (branch of science, keywords, etc.). Of course, the machine does not automatically "know" that a book with the title "democratic theory" belongs to the category "political science." The machine does not "understand" the title of the book in a traditional sense. It is the additional tag of meta-information that allows the machine to "understand" where this specific book title belongs. This logic can, potentially, be applied to every single word in a Web content page, providing descriptions about "what each word means." This allows machines to "understand" certain aspects of the meaning of the classified words.

While the book catalogs of library search system are already very large and complex, setting up a system that extracts the meaning of each single word and statement surely sounds very ambitious. However, major steps have already been made. A cornerstone is the Resource Description Framework (RDF) of the W3C. It is a metadata model that provides the structure to make statements about Web resources in the form of "subject-predicate-object" expressions called "triples." The subject identifies the resource about which the statement is made. The predicate expresses a relationship between the subject and the "targeted" object. For example, one way to represent the notion "Citizen B prioritizes education" in RDF is as the triple: subject = "CitizenB"; predicate = "priority"; object = "education."

Semantic Web technologies are already being used to introduce meaning and intelligent information intermediation to Web 2.0 social networks (Feigenbaum, Herman, Hongsermeier, Neumann, & Stephens, 2007). For example, more than a dozen more or less successful tools already exist to extract meaningful information from Wikipedia (Buffa, Gandon, Ereteo, Sander, & Faron, 2007). DBpedia is one such tool that enables users to “query Wikipedia like a database” (Bizer, Sören, Kobilarov, Lehmann, & Cyganiak, 2007). Metadata models describe persons, places, and characteristics of the words and concepts referred to in Wikipedia articles. For example, a Nobel Prize winner could be classified by age and educational background, while educational institutions could be characterized by their public or private funding mechanisms. This would enable Wikipedia users to send queries like “List all Nobel Prize winners younger than 50 who have received publicly financed tertiary education.” Without Semantic Web technologies, this kind of intelligence is lost in the unintelligible chatter of the rather primitive current Web 2.0.

Additional ontology languages⁷ have been built upon the RDF syntax. W3C’s Web Ontology Language (OWL), for example, enables users to describe the types of relationships (“property assertions”) between a set of individuals (“classes”).⁸ The relationships are axioms that provide semantics by allowing systems to infer additional information based on the data explicitly provided. For example, an ontology describing opinions on public spending priorities might include axioms stating that a “HasSamePriority” property is only present between two citizens when “HasDifferentPriority” is not present, and individuals of class “HasEducationPriority” are never related via “HasSamePriority” to members of the “HasHealthPriority” class. If it is stated that the individual “CitizenB” is related via “HasSamePriority” to the individual “CitizenA,” and that “CitizenB” is a member of the “HasEducationPriority” class, then it can be inferred that “CitizenA” is not a member of “HasHealthPriority.” Machines will “know” this because the ontological framework enables them to make this intelligent inference. While this example is very simple, it shows

how machines can make intelligent inferences about things they have not been told directly. A similar logic is behind the Google algorithms that “know” what the searcher is looking for, or the Facebook algorithm that “knows” which individuals might be long lost friends. Here, a large amount of input information is not damaging. The opposite is true; the more input, the better the result.

The above descriptions would make it easy to search a democratic deliberation platform for “all citizens that support Citizen B’s public spending priority” or “groups of arguments against education as spending priority.” In this sense, the Semantic Web is a powerful tool for democratic purposes. It introduces transparency and efficiency to the process of deliberation and will formation. Of course, the available tools are still in a very embryonic stage, and much more powerful successors will need to be developed to face the complexity of natural language. But it can already be seen that machines have a key role in sorting things out in the entangled opinion jungle of democratic will formation, especially if the scale of participants is large.

A current challenge is that the introduction of semantics to the Web is an arduous task. Semantic Web tools like the above-cited DBpedia include billions of RDF triples. Their classification requires expertise and is subject to the subjectivity of the classifiers. The only way to register the myriad of relations and descriptions in a meaningful way is to benefit from a massive collective effort (Auer et al., 2007). Web 2.0 applications have shown the way. Just as Web 2.0 made it possible for millions of people to create Web content without knowing HTML, the idea is to provide intuitive and user-friendly interfaces that enable the masses to create classifications and relations in RDF and OWL. Once created, these relations can be read and intermediated by machines. The combination of grassroots publishing features of Web 2.0 with Semantic Web technologies is one of the recently declared goals of the Semantic Web community (Heath & Motta, 2008).

Summing up, serious efforts are underway to make digital content understandable for machines. This results in unprecedented opportunities to

intelligently intermediate among vast amounts of natural language contributions. The consequences for democratic processes are still to be seen, but it can be expected that semantic intermediation of prose through digital systems will provide a vast array of opportunities for representatives to intensify deliberation with their constituents and for citizens to deliberate among themselves.

BENEFITS OF A SCALABLE AND INTELLIGENT E-DEMOCRACY PLATFORM

The presented techniques are complementary. A combination of rather qualitative approaches to deliberation, such as argument visualization, and rather quantitative approaches to decision-making, such as weighted preference voting, enables the building of a digital bridge between will formation and the ordering of existing preferences in a group, assisting both the internal republican transformation from the “I want” into the “we want” and the liberal negotiation of conflicting interests. In democratic discourse, it is essential to combine methods that facilitate internal reflection (in the sense of republican “ethical self-communication”) with liberal “interest compromises” through external negotiations (Habermas, 1999, pp. 277–279, 285). Information structuring provides inputs for the republican ambition to work out a common will best suited to the community at large, thereby satisfying every citizen as much as possible by identifying common stands. At the same time, it allows for the liberal drive to reconcile conflicting, pluralistic interests as satisfactorily as possible, thereby satisfying the greatest possible number of citizens. ICTs can contribute to a method of discourse that takes up elements of both sides and facilitates their integration.

In this sense, e-democracy has the potential to narrow the existing gap between the political class and its constituents. The revelation of the information structures underlying the will of the people shifts power from the political class that controls the wording of the discourse to the individuals who express their opinion (Barber,

1984, p. 181). This can lead to more democratic stability, or at least to a better common understanding. Various experiments have shown that exposure to each other’s thinking changes citizens’ willingness to move away from their individualistic standpoints towards opinions that favor the group as a whole (Fishkin, 2004, p. 22). This suggests that the very process of dealing with others’ opinions about shared public problems will “produce a greater susceptibility to the public interest—or at least to considerations beyond narrow, short-term self-interest or immediate personal gratification” (Ackerman & Fishkin, 2003, p. 27). Technologies that help to provide a better understanding of the opinions of others can facilitate a movement from the *volonté particulière* to the *volonté générale*, converting the instinctive focus on the “I want” into the republican focus on the “we want” (Barber, 1984, p. 200).

The presented applications have shown that the nature of digital information processing brings some special characteristics to democratic discourse. The following is a summary of five of the most important ones.

First, digital information leads to the fact that scale is positive, not negative. While offline deliberation is restricted to a small group, information structuring allows online deliberations to scale up. A positive effect of a massive number of entries is that it facilitates mutual information verification through automated processing of the entries. Internet tools such as Google’s PageRank search algorithm, which ranks reciprocal quotations and references, have shown in practice that the law of large numbers provides a pretty good sense of what people see as useful and meaningful information and what is online humbug.

Second, digital information management allows for synchronous and asynchronous coordination mechanisms. Real-time communication is one of the most obvious innovations of digital networks. Asynchronous information management enables citizens to participate 24 hours a day, 365 days a year. This should reduce barriers to democratic participation. Real-time processing makes the deliberation Web dynamic. If a user changes an opinion, classification, or relation, this transformation is dynamically integrated

and immediately changes the structure and logic of the network. Google has shown that stable patterns emerge along with the continuous real-time adjustment of hyperlinked content. The emerging network provides deep insight into collective opinion at each instant.

Third, digital information management introduces transparency to the reputational record of representatives. It enables ordinary citizens to analyze past records of representatives and forces representatives to continuously build up their reputational status. The related possibilities might even eventually rearrange the entry barriers of who becomes a representative of the people. Practices and assignments of credits are not always very transparent when conventional political parties select eligible candidates. It can be made more transparent and participatory with digital systems allowing for “no-name” or “alternative candidates” to build up reputation. Wikipedia, for example, uses such a system to identify its “representatives.” The editing rules of Wikipedia assign dissimilar weights to contributions and opinions, according to the gained reputation and degree of expertise of the respective user (den Besten, Loubser, & Dalle, 2008). At the beginning of 2008, there were about 1,300 administrators, also known as admins or sysops, in the main English Wikipedia. Anyone can gain administrator status, as long as the individual shows a certain degree of expertise, has been an active and regular contributor for several months, is familiar with and respects Wikipedia policy, and has gained the trust of the community. They are registered users with authority for special maintenance tasks, such as to make decisions in “edit-wars,” where users continually change each other’s contributions. The main incentive for administrators is to gain reputation with continuous contributions of high quality. This provides them with a representative status that allows them to guide the crowd. The transparent ranking of trust and status indicators, for example through peer evaluation or the historic registration of interactions, is common with many Web 2.0 applications. This might even reshuffle the barriers of entry that decide on who might be eligible as a representative of the people.

Fourth, digital systems of structured information allow for automatic search algorithms, and these cannot only be used to facilitate semantic searches, but also to improve information quality. For example, the use of so-called “bots” in Wikipedia—machine editors that carry out small repetitive edits such as spell checks and interlinking of articles—grows naturally as the number of articles increases (den Besten et al., 2008). Human editors increasingly rely on the collaboration of their more or less intelligent digital assistants, and it is expected that artificial intelligence will continue to become better and better in its cognitive abilities to “understand” natural language.⁹ Its effectiveness is shown by the fact that “obscene” edits in Wikipedia have a median lifetime of only 1.7 minutes (Viégas, Wattenberg, & Dave, 2004). Sufficiently advanced artificial intelligence bears the long-term potential to improve the performance of human intermediaries and moderators in deliberations, helping to make sense of discourse by automatically identifying relations, communalities, and differences between opinions.

In a way, the use of computational discourse intermediaries to guide procedures is institutionally similar to the carefully defined rules governing deliberations in parliaments. If a computer system can evaluate the contents of texts, it can intermediate the discourse in parliaments or with larger groups of society. With the help of digital procedures, Habermas’s discourse theory of “subject-free communication forms, which regulate the discursive flow of opinion- and will-formation . . . [and which] neither concentrate sovereignty with the people, nor exile it to the anonymity of constitutional competences” (Habermas, 1999, p. 291), would be implemented using digital means. As long ago as 1968, it was noted that in the era of superintelligent computers, it might no longer be the role of politicians to identify the optimum decision in the sense of a given value system in the light of the prevailing situation (Steinbuch, 1968, p. 172). In this sense, it seems plausible that a significant part of human intermediation will gradually be replaced by digital systems. For now however, most successful applications opt for a hybrid approach between collective responsibilities, selected authority, and machine monitoring.

Fifth, in contrast with human information intermediation, computers have the additional advantage of neutrality and “valuefree correctness” (Steinbuch, 1968, p. 174). By definition, interpreting a piece of information implies taking a perspective on its content and discriminating against a certain parameter. In contrary to traditional procedures, computer programs provide an independent means of intermediating divergent interests. The procedural rules that guide information flows through intelligent software programs can be objectively disclosed in open-source software codes and publicly checked for procedural fairness and any ideological bias. When software is channeling information flows, the subjective selection power of traditionally subjective gatekeepers is reduced.

A few decades ago, such ideas would have been unimaginable. The realization of such vision would have involved heaps of paper boards and index cards, hordes of card sorters, and swarms of bustling messengers, while creating unrealistic requirements for citizens’ time and abilities. The digitization of democratic discourse moves such a vision from the realm of science fiction to a concrete science research agenda. Digital systems allow contributions to be analyzed, categorized, and reorganized as much as needed, while argumentation can be flexibly adapted to take account of real-time developments in the deliberation process (Gordon, 2003, p. 3). Some authors argue that these possibilities might soon result in some kind of “World Wide Argument Web” (Rahwan, Zabliith, & Reed, 2007). Web 2.0 applications have demonstrated that intuitive and user-friendly interfaces can be developed that make it possible for millions of citizens to contribute meaningfully to computer-intermediated discourse without specialist skills. These tangible experiences provide the building blocks for a scalable and intelligent e-democracy platform.

CHALLENGES FOR THE CURRENT E-DEMOCRACY AGENDA

Thoughts about intelligent intermediary software systems that help to blend individual opinions of the masses into the democratic

formulation of the common will may sound quite fantastic. While Arthur Clarke famously stated that any sufficiently advanced technology is indistinguishable from magic (Clarke, 1973), there are serious limitations to the presented approaches. Important challenges still remain on the research and action agenda. Four broad fields of interest are identified. The first three are concerned with the other side of the e-democracy coin: the adequate institutional framework to guide the new technological tools in the desired direction. The last one returns to adequate technological design.

The first resulting research question throws a new (digital) light on the oldest criticism of democracy: Are decisions of the many really superior to decisions of the few? That is, are they more stable, of higher quality, more sustainable, or more satisfactory for everybody? Since Athens’s mob killed Socrates and Plato, and since Aristotle characterized Athens’s democracy as being full of disorder and instability, emphasizing that democracy was, at most, not the worst form of government—two millennia have passed with countless arguments in favor of the “madness of crowds” (Mackay, 1841) or “the wisdom of the crowds” (Surowiecki, 2004). In light of today’s technological possibilities, support has been gathered in favor of the second vision (e.g., Sunstein, 2006), emphasizing benefits of group diversity for decision quality (e.g., Page, 2007). Nevertheless, aside from all optimism and enthusiasm (Tapscott & Williams, 2006), real potential and hype can easily be confused and do not help in confronting the longstanding criticism of collective decision-making. The unpredictable dynamics of crowds have led to countless undesirable, or even horrible, historical events. Digital mass communications deals with a very delicate and historically loaded field. Possible negative effects of crowd behavior and crowd psychology need to be considered when advancing e-democratic practices. Not everything that is technologically possible is also normatively desirable.

A second field of research is extremely wide and complex: What is the adequate institutional design to integrate and benefit from e-democratic processes? The initial part of the article showed that ICTs do not automatically favor

the democratic principle (see also Hilbert, 2007). Visions about “direct representation” (Coleman, 2005) or other forms that break with the direct-representative dichotomy must consider that the citizen–representative channel is a two-way street. If the representative side of the channel is too powerful, features of the much-cited Orwellian Big Brother state might emerge (Orwell, 1948). Of course, in the information society, there can be no disputing that it is technologically possible to record and analyze large amounts of citizen data. The questions are who may use it, how, for how long, and for what purpose. Beyond that, Juvenal’s challenging question remains: *Sed quis custodiet ipsos custodios?* (But who will watch the watchmen?). In a democracy, supervisory institutions ought to be legitimated and controlled by the people and ought to be required to balance public and individual interests. The rule of law is faced with tasks that range from safeguarding the informational separation of power and upholding independent media coverage to the control of the source codes used to channel digital information in democratically relevant applications.

This revision of established institutional frameworks also must evaluate where, how, and which kind of digital tools are needed to integrate into existing democratic processes. One alternative would be to assign a rather informal role to digital discourse (the so-called “weak public sphere”). Methodological online deliberation would focus on informal ways to increase “the inclusion of the other” (Habermas, 1999). This aims at fostering a better understanding among the members of the same group, following the republican principle *audi alteram partem* (listen to the other side). As psychological studies on virtual worlds, such as SecondLife, show that virtual interaction affects real world behavior (Yee, Bailenson, Urbanek, Chang, & Merget, 2007), it can be expected that methodical online deliberations can foster common understanding and eventually democratic stability. Another, more ambitious approach would be to make digital communications an integral part of established democratic procedures, such as in parliaments or plebiscites (the so-called “strong public sphere”). As a first step, experience has shown that the right

combination of online and face-to-face mechanisms is essential for success.¹⁰

The third field of research related to the institutional environment of e-democracy concentrates on how to assure equal access and force-free participation. “A public from which assignable groups were excluded *eo ipso*, is not just incomplete, it is in fact not a public at all . . . a public is guaranteed when the economic and social conditions give everybody equal chances of fulfilling the entrance criteria” (Habermas, 1962, p. 156). The idea of a digital public sphere without equal access to ICTs is highly questionable. ICTs constantly evolve towards ever-greater bandwidth and functionality. Constant technological progress reopens the so-called “digital divide”¹¹ with every innovation, following the well-known S-curve shaped diffusion pattern (Everett, 2003). As a result, the digital divide will never be “closed.” It could be bridged, however, meaning that every member of the information society could have sufficient resources to continuously maintain minimum connectivity with all fellow citizens for democratic participation on a basis of equal entitlement. This is a constant challenge, and much depends on how the terms “sufficient” and “minimum” are defined for the time being. Conventional wisdom would suggest that the State, guided by the combined requirements of “liberté, égalité, fraternité” should ensure that every member of society has sufficient means to participate equally. According to estimates for Latin American democracies, subsidizing home-based ICT access for citizens not connected to the Internet would, in 2005, require some 25% of Latin America’s gross domestic product on an annual basis (Hilbert, 2005). This level of fraternity among citizens cannot realistically be expected in practice. This socioeconomic reality questions the practicality of home-based e-democracy solutions for now.

Besides, in the democratic sphere it needs to be ensured that the voting citizen is free from coercion by any fellow citizen who might wield some kind of economic or social power over the elector. In practice, the secret ballot is therefore a constitutional criterion for elections in most democracies. Votes are cast in publicly accessible election booths, but in secret. Direct coercion,

control, influence, or manipulation by third parties cannot be ruled out through home-based computer interaction. There is a probability that the voter will not be sitting alone at the computer but can be observed, manipulated, or influenced by another citizen upon whom the voter is dependent in some socioeconomic way (Wagner, 2002, p. 145). While the same problem arises with postal voting through the traditional mail, which is accepted in some democracies for exceptional cases, the mass scale of home-based participation questions the applicability of an analogy. The valid alternative until now is to opt for electronic voting booths, as Brazil, the world's fifth largest country, did in its 2002 presidential election. While this certainly speeds up vote counting, the mobilization of citizens to vote in public booths of this kind for continuous and repeated voting on an unending series of issues several times a day is just as impractical as with paper-based public booths. Theoretical reasons behind the secret ballot turn out to be some of the trickiest challenges to reaping the benefits of a real e-democracy.

The last broad field of research returns to the design and modus operandi of digital systems to serve democratic ends. This is not merely a challenge for computer engineers, but foremost for political scientists. Software is basically a seamless set of procedural rules and flexible regulations that channels information through formalized paths. The same accounts for democratic processes. The design of relevant applications has to follow democratic ideals. Computer engineers are in need of theoretical guidance in this challenge.

A myriad of alternatives exist. The right design can be chosen from synchronous and real-time communication; open and closed discourse modularization; and text-, voice-, and visual interfaces. Furthermore, besides all the excitement about "flat-hierarchies" and "networked peer equality," it shows that the role of leaders and central managers turns out to be indispensable to continuously creating high-quality digital content. Practical research on Web 2.0 applications, such as Wikipedia, online information markets, and open source collaborations, has found that "the wisdom of these networks lay primarily in the intelligence

behind the management of these collective networks," and that the more complex the collective challenge, the more centralized are the collaboration efforts (Dutton, 2008, p. 6). The silent majority of lurkers enjoys being led and coordinated by emerging leadership structures (Lerner & Tirole, 2002). Lerner and Tirole's (2002) study of collaborative open source software efforts, for example, found that even these much celebrated examples of seemingly "flat-production" are actually characterized by "strong centralization of authority." In contrast to traditional hierarchies, ICTs, however, enable the maintenance of dynamic leadership structures. It was already mentioned that Wikipedia's system of direct participation also counters with important tradeoffs of representative delegation by distinguishing between unregistered users, registered users, and administrators (see Note 33). The result reminds us of the dynamics among local political party members and leaders, just in real-time and without geographic limitations. The experience and established procedures of political parties are very useful in finding the right design of online mass deliberations.

One of the main challenges in software design is to advance Semantic Web and artificial intelligence applications for democratic ends. Until now, Web 2.0 applications have not been collective intelligence, but rather "collected intelligence" (Gruber, 2008). The Semantic Web has the potential to retrieve some meaning out of this online chatter, but requires special skills. The Semantic Web community is starting to pay attention to the creation of interfaces that allow regular Web users to contribute to the Semantic Web, while Web 2.0 applications are increasingly integrating information structuring techniques in the related social networks (Greaves & Mika, 2008). Similar solutions will have to be found for argumentation support tools. The necessary skills impose high entry barriers. It appears unnatural for participants to break up arguments and preference structures into discrete units, and complex user interfaces do not make things easier. Software has to be programmed in a way that participants can quickly grasp and handle the content, such as is done in Web 2.0. Creativity has no limit in this

challenge. Three-dimensional argument maps or even immersive virtual reality fly-through environments for the organizations of democratic deliberations are part of this exploration. Virtual worlds have shown to be extremely intuitive and have attracted large numbers of users in a very short time, such as the aforementioned Habbo Hotel or Second Life. Just as today's virtual worlds replicate commercial systems or school and leisure environments, they can be exploited to create digital public spheres with democratic value.

Of course, as the choice of method determines the result, the process of defining any digital procedures with relevance for real-world democratic processes will need to be transparent and open to the public (open-source) and must be made subject to public debate.

More than technical or theoretical constraints on the rapid development of appropriate solutions, the willingness to invest in the field might be a limiting factor. Software research and development is expensive, and it is more lucrative to invest in video games and e-business applications than in digital systems that foster e-democracy. Democracy-enhancing applications are given only sporadic and minimal support.¹² Given the importance of democracy in a modern State, increased public funding seems justified.

A long and winding road lies ahead before we might eventually integrate the "e" into democracy. More recent Web tools are showing the possibility for a more genuine e-democracy to emerge. Methods have been presented that enable us to collate, aggregate, and rework raw mass opinion into a more concentrated but substantive understanding of the popular will that can act alone or via representatives to inform democratic processes. In this way, e-democracy moves us beyond the longstanding democratic trade-off between group size of the deliberation group in the will formation process, and depth of will expression in the decision-making process. This bears the potential for more considered decisions, more citizen satisfaction, and more stable results. It has been shown that the basic building blocks for new approaches to democracy are already at hand. The stage that Kuhn (1962), in his *Structure of Scientific*

Revolution, condescendingly calls "puzzle solving" has begun.

NOTES

1. The "common will" refers to the republican tradition of "we want" (in Rousseau's words the *volonté générale*), while the aggregation of individual wills refers to the libertarian tradition of the intermediated "I want" (in Rousseau's terms the *volonté particulière*). One is, of course, not the sum of the other, and the common will needs to be created constantly. See also Barber, *Strong Democracy* (1984, p. 200). For an in depth discussion in the tradition of Rousseau (1762) and Kant (1793), see also Schachtschneider (2007).

2. A blog is a personal Web site with regular entries of commentary, descriptions of events, or other material such as graphics or video, commentaries, news, poems, or personal online diaries.

3. A wiki is a collection of Web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language.

4. The use of information-structuring techniques to gather collective intelligence is quite old. In the 1960s, the RAND Corporation pioneered Delphi forecasting techniques (Linstone & Turoff, 1975), and the 1970s saw the rise of groupware, computer-supported cooperative work (CSCW), and computer-assisted qualitative data analysis (CAQDAS) in business and academic environments (Johansen, 1988).

5. For example, AraucariaDB is a software tool that hosts around 500 arguments, produced by expert analysts, and drawn from newspapers, magazines, judicial reports, parliamentary records, and online discussion groups. See <http://aracaria.computing.dundee.ac.uk>.

6. Given Arrow's challenge (1963) to the possibility of aggregating a certain arrangement of preferences in a meaningful way, reaching a stable mathematical solution cannot be guaranteed. However, in combination with formerly presented collective deliberation techniques that influence the rational evaluation of individual utility, the risk of running into Arrow's impossibility theorem should be significantly reduced.

7. In information engineering, an ontology is understood as a formal representation of a set of concepts within a domain and the relationships between those concepts. It is used to reason about the properties of that domain and to define the domain.

8. In order to appreciate the ambitions of OWL, it is an interesting anecdote that its creators link it with the acronym "One-World-Language," in reference to an overly ambitious idea from the 1970s (Hendler, 2001).

9. Over the last decade, artificial intelligence research into the "understanding of natural language" has made great progress in fields such as automatic text classification,

filtering, indexing, clustering, tracking, and mining, among others. Applied machine learning systems still face a number of challenges at the present time. Semantic text interpretation needs to consider the pragmatic meaning embedded in the document structure, grammar, causalities, and the relative importance of certain words, including the characterization of synonyms, antonyms, and homonyms. The ambiguity of human language is often a hurdle. For example, whereas in the Northern culture the word “guinea pig” would be associated with descriptions like “pet,” a Peruvian Semantic Web classification system might assign connotations like “livestock.” This might lead to confusion even if the word is set in context, such as in a phrase like: “On Sunday, Pedro will enjoy his guinea pig.” Ultimately, the machine is confronted with the same problems as human deliberators when faced with the vagueness of natural language. Various approaches are currently being explored to tackle this challenge, including manually programmed keyword lists; supervised, unsupervised, and self-learning algorithms; and categories in a multidimensional space or a combination in classification committees. Various software programs are already being used in commercial applications to classify the semantic orientation of product assessments or film reviews. The machine reviews a large volume of unstructured online comments (in prose text form) to determine whether consumers are satisfied with the product or not. The categorization accuracy of these methods has already attained hit rates of some 80–90% (Pang, Lee, & Vaithyanathan, 2002). The potential is still large. In other areas, such as the recognition of faces at the airport control or the identification of cancer cells, artificial intelligence recognition systems have become much more precise than human classifiers.

10. Even the most successful Web 2.0 applications, such as the much-celebrated online Wikipedia, are actually only co-produced online, with members and managers of the community frequently working together physically or gathering at international conferences (such as the annual Wikimania).

11. The term “digital divide” refers to the gap between those people with effective access to digital ICT and those without access to it.

12. The Sixth EU’s Framework Program on Information Society Technologies was a notable exception; see <http://www.argumentation.org>.

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