Thinking 'Big' in Deliberative Systems: Big Data and the Potential of a Computational Turn in Deliberative Systems

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Since the 1990s, the study of deliberative democracy has taken a decidedly systemic turn. Hendriks (2006) argues that multiple minipublics can be analytically integrated as elements of a larger deliberative process transcending each individual site. Habermas (1996) outlined a decentralized series of public deliberations which could provide the legitimation for government decisions. And Dryzek (2010) has identified a series of functions and categories of spaces comprising deliberative systems. From an empirical standpoint, the move from the analysis of single deliberative sites to deliberative systems raises a number of complex conceptual and methodological issues. The systemic turn is in large part motivated by the observation that in practice all of the functions of deliberative democracy are not exhausted within a single site of activity (Dryzek 2010; Jensen 2014; Parkinson and Mansbridge 2012). Rather, many sites with sometimes dubious or inadequate deliberative credentials when measured in isolation, carry out elements of political activity which when integrated form a functional deliberative system. As the political significance of any activity cannot be contained within a single site, the democratic nature of any activity cannot be evaluated in isolation. Rather it requires the situation of activity within a wider system in which it participates. Democracy in systems terms implies the capacity to participate in the steering of the system. The systems turn in deliberation represents an analytical effort to develop the categories by which systems as a whole can be characterized in terms of their democratic qualities and to identify the empirical conditions which facilitate or impede the democratic integration of deliberations into system steering processes.

In advancing the empirical study of deliberative democracy, this paper looks at a so-called “big data” approaches to deliberative systems. By big data, I mean computational analytical strategies working on digital objects produced as the by-product of interactions or transactions within political life. Many of these techniques can also be applied to other forms of data collection that are subsequently converted into digital objects such as interviews which become digitized text in the form of a transcript. The reason big data is increasingly relevant to the study of deliberative systems is because the informational turn in political is significantly a cause and consequence of the growth of digital communications and information production. And it is under these conditions with a proliferation of spaces of political communication under varying deliberative conditions that a more systematic approach to the study of deliberative democracy becomes increasingly important.

The Informational Turn and Systems Turn in Deliberation

Deliberative democracy has emerged as both a normative and an empirical project with case studies as exemplars of deliberative processes and failures. Empirical work in this vein is best cast as analyses of the deliberative qualities of cases and the factors which impede or facilitate the attainment of normatively desirable ends and operations rather than the development of falsifiable
theories of deliberation (Mutz 2008; Rosenberg 2005; Thompson 2008). Deliberative qualities may or may not manifest in a particular case but such data do not warrant an argument against the normative agenda of deliberative democracy. Indeed, many empirical studies have bolstered the systemic turn in the study of deliberative democracy. However, as spatial and temporal expanse of required observations expands, new analytical tools may be crucial to enable researchers to gain analytical purchase on the system level operations of a deliberative system.

Information, Deliberation, and Political Life

Contemporary society and politics have been termed a “network society” (Castells 2010), a “risk society” (Beck 1992; Giddens 1991), “liquid modernity” (Bauman 2013), and so forth. While all of these titles may be apt, the focus on information as a defining attribute attunes our attention to critical aspects of society which highlight the relevance of deliberative systems to understanding politics in contemporary society. The diffusion and integration of digital networked devices into everyday life enables ubiquitous communication rendering the experience of everyday life an encounter and interaction with digital objects (Castells 2009; Jensen, Jorba, and Anduiza 2012). Political organization is said to be increasingly professionalized meaning that formal political organizations increasingly turn to highly specialized information processing roles and centralized communications (Blumler and Gurevitch 1995; Castells 2009, 204–216; Lilleker and Negrine 2002). However the growth of digital communications in political organization can also be a disruptive force. The growth of communications beyond the broadcast era of politics is estimated to produce a doubling of information every two years (Keane 2013, pt. (Kindle) 89). With the growth of social media, public spaces of communications are increasingly difficult for governments and other political actors to control.1

Politics in information society is not just about the sheer abundance of political information but a transformation in the organization and operation of political life. Information in information society is not only or primarily an instrumental quantity transmitted from one place to another. It is produced and circulated as a central activity of political life, coordinating the flow of events and activities as a series of political inputs, throughputs, and feedback from various parts of a political system (Corning 1983, 206–207; Crozier 2012; Easton 1965b). Luhmann (1995, 67) defines information as “an event that selects system states” by which he means, information has a limited temporal existence which updates any particular state of a system. While information retains meaning through repetition, it loses its informational value as the subsequent communications – and this includes decisions and actions which are meaningful – which that information gives rise are only implicated in the first instance. The transition from industrial to information society represents a shift in the organization of political life shifting sites of political contestation to new problematics. Lash (2002) notes that the metanarratives which organized society around various ideological confrontations against relations of exploitation, have given way to a society organized around the production and circulation of information. Information society compresses meaning to small bits which move too quickly for grand metanarratives. Political life is not just characterized by an abundance of information, these changes represent an informational logic which is coming to permeate politics.

Information society is not organized around organic or linear ties, but through a variety of communication channels. Habermas (1996, 360) describes the public sphere as “a network for communicating information and points of view.” Increasingly, this public sphere takes shape in the “virtual presence of scattered readers, listeners, or viewers linked by public media.” The mediatization of these interactions lead “communication structures contract to informational content

1Morozov (2012) and similar critics hold that online communication facilitates surveillance capacities which can have a chilling effect on political communication or effectively blunt its effects if governments decide to crack down on online dissent. While this is true, social media sites provide an additional outlet beyond other modes of communication which can sometimes belie or confound government efforts to suppress communication and information as well as provide additional spaces for political organization and deliberation (Howard and Hussain 2013; Oates 2013).
and points of view that are uncoupled from the thick contexts of simple interactions, from specific persons, and from practical obligations” from which they emerge in the lifeworld (Habermas 1996, 361). Though Habermas is critical of the deliberative quality that emerges through online communications, fearing the fragmentation of the public sphere into enclaves of issue publics (1998, 2006), the empirical basis for those claims is questionable (Garrett 2009; Garrett, Carnahan, and Lynch 2013) and, in any case these, communications form an increasingly important aspect of political communications however democratizing or distorting they may be.

In contrast to the organic ties of cleavage identities which integrated social and political life within civil society, new forms of political community are emerging. There is evidence of this in movements such as Occupy Wall Street and the Indignados which resist organic identities such as class just as they reject efforts at co-optation by formal political organizations such as unions and parties (Bennett, Segerberg, and Walker 2014; Jensen and Bang 2013). Today, political organization occurs within and through communication such that the capacity to exercise power “centers on capacities to coordinate and cultivate information flows” (Crozier 2010, 508). Formal political organizations, institutions, unorganized publics, crowds and so forth all are increasingly using a variety of digital media platforms to carry out organizing functions which transforms the nature of political life. Most importantly, it creates new capacities outside of formal bureaucratic organizations to organize information flows steering the operation of the political system (Bennett and Segerberg 2013; Bimber 2003). These new forms of organization enact political communities which operate as part of a political system rather than agitating from the outside on the premise that they do not need formal representatives, they represent themselves (Tormey 2015).

The information turn in political life makes it more difficult for scholars of politics to avoid concerns which deliberative democrats have drawn our attention for over two decades. First, questions of inclusion and exclusion are central to information societies: who has access to information, has capacities to effect changes in the circulation of information and successfully reach centers of decision making are critical questions within both information societies and deliberative theory (Lasch 2002). Second, in addition to a normative framework, deliberative democracy involves an epistemic dimension as well as an empirical framework for organizing observations of political life (Habermas 2006). The growth of information and its centrality to political life increases the relevance of spaces for evidence interrogation and discussion. Such spaces themselves are not a brake on information dynamics but can become themselves part of those dynamics as sources of legitimation for one side or another of contested facticity claims. In serving that function, they may reduce or participate in the organization of information on which decisions are made and policies are implemented. With respect to the empirical aspects of deliberative systems, problematics centered around the integration of dispersed communications, their transformative capacities, and coupling with centers of decision making raise to the fore theoretical concerns about deliberative capacities and their relationship to political outputs – decisions, policy articulation and performance, political culture, and so forth.

The informational turn is particularly problematic when viewed through the emergence and widespread use of social media channels. Social media transform the architecture of communications in modern political systems. Social media platforms are unique in that, in contrast to a broadcast era of politics which is characterized by unidirectional communication flows disseminated from a centralized point of broadcast, social media provide users with symmetrical and reciprocal capacities as senders and receivers of communications (Castells 2009). The resource requirements of social media are considerably lower than those involved in broadcast outlets. While interdependencies govern relations between media and political systems (Blumler and Gurevitch 1995), both media and political authorities are at times challenged by others using social media (Chadwick 2013). The decentralized production of communications online opens significant spaces of deliberation between laypersons and at times may serve as a means for political authorities to keep the public updated in a timely fashion. Whether or not these communications amount to normatively desirable deliberation, their ubiquitous presence and, at times political importance, make them relevant aspects of empirical deliberative systems.
The transformation of political life within information society makes ever more critical the theoretical development of deliberative systems. To be successful, such accounts and the methods used to study deliberative systems must be able to capture, analyze, and organize a wide variety of heterogeneous data covering the variety of spaces in which deliberation occurs. Communications in “empowered” and “public” spaces are increasingly archived as digital artifacts in the form of online parliamentary transcripts, social media posts, archives of newspapers and broadcast news transcripts, etc. The flows from these sources often interact and respond to each other creating complex information feedback loops (Chadwick 2013; Crozier 2007). Such flows do not terminate with political decisions as a decision point only sets the stage for the next stage in a continuing flow of communications. The success of a deliberative systems approach, just as with other analytical frameworks today, turns on the capacity adequately capture deliberation in an information era characterized by complex and recursive political communication feedback loops.

**Deliberation: Bringing the System Back In**

Deliberation on any particular thematic is normally distributed across a variety of sites within any political system. Such systems of deliberation need not be contained within national borders. Taken in isolation of the wider system of deliberation, each individual site may not, and often does not fulfill all of the operations normatively ascribed to various versions of deliberative democracy; however, across these spaces such functions may be fulfilled. More importantly, approaching deliberative systems as an empirical matter, one may evaluate the operation of any concrete deliberative system with respect to any variety of normative deliberative criteria. However, the development of deliberative systems has not proceeded by layering normative criteria on top of existing accounts of a political system. Deliberative systems have been defined as, “a set of distinguishable, differentiated, but to some degree interdependent parts, often with distributed functions and a division of labour, connected in such a way as to form a complex whole” (Parkinson and Mansbridge 2012, 4). Dryzek (2009, 1385–1386) identifies within these interdependent parts entities and relationships that must obtain between them in order to be defined as a deliberative system: public space which is generally inclusive; empowered space where binding decisions are rendered, transmission of interests from a public space with the aspiration that it be redeemed as influence in an empowered space; accountability of actors within empowered spaces; and deliberation must be decisive with respect to policy outcomes.

The inadequacy of analyzing democratic deliberation with respect to isolated and bounded spaces is apparent. Decomposing deliberation into the deliberations of particular sites neglects the structural constraints and facilitations that the system imposes as a whole. It leaves each site as a sufficient unit of analysis whereby the deliberative system is no more than the aggregation of its parts. But if deliberations function as a system within which there are differentiated functions (Parkinson and Mansbridge 2012), the operation of any one part of the system cannot be understood apart from its place within the deliberative system. Within a deliberative system, partisan rhetoric may contribute to the inclusion of more voices if there are no other spaces in which such discourse enters (Dryzek 2010). However, a homogeneous partisan review of scientific evidence, at least with respect to the inclusion of scientific discourses, would not likely add to the deliberative inclusiveness of a system that already includes spaces of open scientific discussion on a subject matter.

The characteristics of various media channels structure deliberative properties and capacities as well. Such media facilitate the emergence of networked forms of political organization enabling greater scalability and rapid adaptation. The capacity to use various communication technologies to engage politically is not evenly distributed across persons and organizations (van Dijk 2005). This means different constellations of participants will be advantaged depending on the mediation of any particular deliberative space. These media specific attributes implicate patterns of exclusion and inclusion within various spaces. Digitally mediated spaces are becoming increasingly important as the mode of organization within information society is networked. Political authority is distributed as well, exercised through governance networks involving both formal government authorities and
institutions, nongovernmental organizations, market actors and so forth. While such networks are not elected and subject to varying degrees of indirect electoral accountability, they may provide or produce spaces of deliberation (Dryzek 2009). With the growth of deinstitutionalized authority, “the ‘deliberative turn’ in political science and public policy analysis can in part be seen as a symptom of this kind of transformation in power problematics just as it is an attempt with normative intent to come to terms with newer patters of political action” (Crozier 2010, 508). New information dynamics have made information processes produced through dispersed deliberations central to understanding contemporary political systems and the consequences of these deliberations cannot be understood apart from understanding how they function in terms of a system of deliberation.

**Deliberative Systems and the Computational Turn**

The changing nature of political life within information society calls for the development of new methods of investigation which can grapple with new forms of data which are produced within political life as well as the complexity of political life. At the same time, these changes introduce new analytical and technical challenges for researchers. The selection of research techniques and the theoretical context of explanation are not independent (Kuhn 1970). Therefore reliance on traditional methods of empirical research in this field would hamstring theoretical development through crude method-driven research. Therefore, the development of a deliberative system approach needs to be open to the consideration of new methods. This section advances the argument that a systems approach in the study of deliberation lends itself to a “big data” or computational approach in collecting and analyzing data as both a practical and theoretical matter. It concludes with a discussion of what how some computational techniques may be leveraged in elucidating the operation of empirical deliberative systems. We will begin with a discussion of the system turn with respect to two aspects of deliberative systems: system boundaries and the within-system communications.

**Deliberative Systems: Difficulties with Decomposition**

Studies of single-site deliberations are relatively unproblematic in terms of demarcating spatial boundaries and the flows of communication within the site. The site, forum, institution, and so forth normally provides an intuitive boundary – say the institution of the parliament as a boundary confining parliamentary addresses. Starting from the position that deliberations are distributed, one needs to draw analytical boundaries around a series of activities which are distributed in space and time. This would include the channels through which communicative exchanges pass discourses from one space to another or are modified or discarded entirely. Identifying the boundaries and the communication channels which connect parts of a system are therefore critical analytical in a deliberative systems approach which then require empirical approaches adequate to their elaboration.

The operation of deliberative systems as a system poses significant hurdles for research methods which analyze deliberation in terms of individual spaces of activity. The multitude of relationships between systems and across subsystems such as policy networks, parliamentary bodies, and unorganized publics create problems for understanding the whole of a deliberative system in terms of its parts. Each site or space within a deliberative system undergoes change over time in relation to the operations in other parts of the system. In addition to composition of the deliberative system as a set of interdependent sites of discourse, the wider societal context and the organization of power within society structures spaces throughout the deliberative system (Easton 1990, 244–245). Whatever the inclusivity, capacities for meta-deliberation, and transmission capacities that exist in a public space, the implications of this space for the overall deliberative character of the system could be moot if its discourses were summarily dismissed through a gatekeeping function operating in empowered spaces. In addition to the spatial expanse of the deliberative system, deliberative systems are extended in time. The previous series of deliberations on this specific topic or related ones can create path dependencies which influence which discourses emerge as persuasive in any given setting. Successes and failures in any one space can lead to
different configurations of participants and strategies in other parts of the system. This is not to say that each space does not have some ability to shape its own deliberations. However, it does mean that making sense of what happens in one part of a deliberative system may be contingent upon what happens in another part of the system and an ability to relate them.

In addition to the challenges posed by the inability to decompose deliberative systems into individual spaces of deliberation, informational dynamics belie efforts to understand the operation of these spaces through individual interviews and surveys of participants. While individuals are adept at providing purposeful, agency-centric accounts of events, recursive information dynamics are irreducible to individual meanings or intentions, often a product of path dependencies which are “hardly reversible or negotiable in the short term” and “can neither be understood in terms of individual or collective initiatives nor fully be controlled by locally-embedded actors” (Kallinikos 2006, 79, 84). Professional marketing campaigns often lose control of messaging on social media platforms such as Twitter, it should be no surprise then that lay political actors without a specialization in strategic communications may have little control over the communications they react to or produce. Whether we take individuals as representatives of activities in one part of a system or as experts within their activity roles, interviews with individual participants provide little analytical leverage. These individuals often participate in and reproduce higher order structures of which they are often unaware and the consequences of their actions, particularly in an informational domain, irreducible to questions of agency and intention (Easton 1990). Interviews with participants and analyses of texts within individual deliberative sites may be useful in getting at the practice level of the double hermeneutic, we still are in need of approaches which get us to a system level order of analytical abstraction.

**Deliberative System Boundaries and Intra-system Transmissions**

Systems can be constituted in a variety of ways which produce different directions for empirical research. If we limit ourselves to social systems, individual institutional bodies can be decomposed into organizational systems; systems can be composed of concrete interactions; or they may be constituted self-referentially as system operations and its corresponding environment (Luhmann 1995). Additionally, the theoretical status of a system may be analytical or ontological. An ontological status takes the designation of a system as such as a claim of facticity; that is, a claim that a system as so designated at a first order level of practice exists (Luhmann 1995, 179–180). As an analytical framework, systems are drawn with respect to second order theoretical concerns and justified not in terms of whether they can be said to constitute an extant system in practice but whether they can be said to constitute a theoretically interesting and useful system (Easton 1965a). Ultimately this distinction collapses at the point a systems approach becomes the point of analytical departure. Whether participants in a first order deliberative practice see themselves as all engaged in the same deliberative system or only the researcher sees that, a determination is made that a series of activities are related in a meaningful sense so as to avoid analytically arbitrary or capricious conclusions.

The manner in which systems are construed has direct implications for identifying the system boundaries. We begin with some general observations about the nature of political systems and therefore deliberative systems as well. Although deliberative systems, like all social systems are open and subject to influences from their environments, systems need boundaries which differentiate them from their environments lest they lose analytical coherence. The boundaries of a system need not be fixed over time as they may expand or contract due to changes in both the environment of a system, with which it is reciprocally constituted, and changes within the system itself. Changes in economic practices or pollution levels may give rise to the formation of a new deliberative system or changes in the organization of an existing system. Persons and sites or spaces are never fully in a deliberative system as they are often simultaneously operating in multiple other systems. To the extent they are in a deliberative system, they participate in a functional division of labor related to at least some aspect of the deliberative system. If the deliberative system is exclusively an interactive system, then only parts which interact are considered. This may be a
reasonable choice for some investigations but not others as interaction systems would render deliberative enclaves into separate systems. Alternatively, a deliberative system might be self-referentially construed such that it is organized around a set of themes and functions (Easton 1965a; Luhmann 1995). This latter approach to understanding the constitution of a deliberative system will be discussed at greater length given its utility in understanding how systems constitute themselves. Demarcating the space of activity constituting the deliberative system would involve an analytical categorization of the activity in question as related as functionally distinct from other political and social activity.

Transmission is a communicative mechanism connecting various parts of a deliberative system. Transmissions of discourses need not directly go to political authorities as it may be processes by other parts of the system such as broadcast media channels. Transmissions are what keep the deliberative system functioning as the system ceases to operate at the point communications cease to flow between spaces. In some cases systems may become modified as strategies of various actors within a system change. For example, in the absence of parliamentary success, movements may switch to litigation thereby shifting the composition of the system to include judicial bodies and perhaps eliminating parliamentary bodies in the process.

**Big Data and Computational Social Sciences**

The term, “big data” has in recent years become a highly popularized expression in media reporting, presentations by technology companies, consulting firms, and so forth. The the bigness in big data normally signifies something more than the volume of data in question, but beyond the terabytes, petabytes, and zetabytes of data this term has been treated with in a conceptually loose manner. In its popular renditions, it is often defined in terms of attributes with varying degrees of necessity and sufficiency in capturing the distinctiveness of big data. However even in academic accounts, big data has been used to denote a series of distinct but partially overlapping concepts which often conflate concepts and the words with which they are denoted. Before elaborating the relevance of big data or computational social science – terms which I will use interchangeably – it may be useful to adumbrate a conception of big data which we can link to the development of system-level theorizing within deliberative systems.

Big data has been defined in conceptually distinct forms which are not commensurable. Some aspects of big data are cultural with the suggestion of differentiated epistemic authority (boyd and Crawford 2012). Others focus on differences in big and conventional data analytics rather than defining big data itself. Most popular definitions focus on the volume or speed of data along with a variety of potential and contingent data management and analytical properties. One of the more popularized definitions of “big data” comes from Edd Dumbill of O’Reilly Media (Dumbill 2012). He defined big data in terms of the “three V’s:” volume, velocity, and variety. The three V’s were originally developed by Doug Laney (2001) to describe emerging challenges in data management. Rob Kitchen uses the same three V’s in defining big data and adds that big data is “exhaustive in scope (n=all);” that it is “fine grained in resolution;” “relational in nature, containing common fields that enable the conjoining of datasets;” “flexible, holding the traits of extensionality...and scalable” (2014, 262). Kitchin’s definition comes closest to engaging the nature of the data by identifying attributes of big data but it fails to offer an underlying conceptual definition relating these attributes into a whole. These definitions all focus on attributes of data management without defining an underlying concept of big data, and it is not clear any of these attributes are either necessary or sufficient.

What makes big data’s digital objects distinct is that unlike surveys or other forms of record keeping, the data operated on are the digital by-products of transactions. There are two critical aspects of this definition. First, big data involves working with digital objects. Digital objects are

2Luhmann (1995, 197) also refers to meaning boundaries whereby the boundaries discriminate meaningful from nonmeaningful themes and topics.

3Dumbill, like Kitchen below, use the three V’s without attribution. A point which Laney raised on Dumbill’s post and later in a separate reposting of his original report (Laney 2012).
distinct from other forms of data due to the fact that lossless copies can be made of them, they have an existence as they are not physical objects, they may be edited, they are easily transmittable, and they are readily recombinable with other data. Digital objects may be decomposed into granular objects and tasks (Chadwick 2012; Kallinikos, Aaltonen, and Marton 2010). At a digital level, a heterogeneous mix of text, sound, video, numeric, and other symbolic content may be rendered within the same domain, subject to various algorithmic processes for information extraction.

Second, these objects are the by-products of transactions meaning they are not reactive data such as the data collected by experiments, interviews, and surveys which introduce validity issues stemming from the gap between individual accounts or simulated situations and the manner in which recalled events actually played out or subjects actually conduct themselves. Digital data capture interactions and exchanges that materially are the communications which constitute political life.

Beyond questions of epistemic validity, big data can be valuable to researchers of deliberative systems in identifying the boundaries of systems and relations between different parts of a deliberative system. The capacities to analyze large volumes of different kinds of digital objects has a bearing on scale of data researchers can meaningfully collect. For example, if we were confined to human coding of text objects, it would make little sense to collect tens of thousands of news articles and millions of social media posts. In outlining the utility of big data in approaching deliberative system boundaries, we begin with data collection whereas issues concern transmission will highlight some analytical approaches within computational social science to understand the circulation and transmission of discourses within a system.

Perhaps the biggest challenge deliberative systems confront is the sheer size of a system. If we are to take system-level properties as critical to understanding deliberative systems, we need to be able to differentiate the system from its environment. This challenge is more difficult in information society given the volume of communications regularly produced. The ever-widening digital footprints left by these activities provide new opportunities for researchers to understand the distributed discourses which make up the public, personal, empowered, and informal spaces of deliberative democracy. At the same time, digital methods render this process more manageable.

Deliberative systems often include a mix of spaces of everyday communication, broadcast media, “empowered” spaces where binding decisions are rendered and policies are implemented as well as spaces falling in between such as governance networks. Although not all spaces are digitally archived, many of these are. Databases such as Google News, Lexis/Nexis, and Factiva provide access to media reporting (print as well as broadcast) as well as Congressional transcripts. Not every geographical jurisdiction is covered but many are. Everyday communication in the form of social media posts on Twitter, blogs, comments on newspapers and other web fora, and to a certain extent Facebook can be collected customized programs and even a variety of off the shelf products. Hansard reports and similar parliamentary transcripts and reports can often be retrieved from institutional websites using web crawlers. As more governments place such documents online, this becomes easier. Although much of this data can be collected at no cost in real time, some data such as historical Twitter data or very high volume topics on Twitter require that data be purchased.

Depending on the kind of system a deliberative system is taken to be, scholars have available a variety of approaches to defining the boundaries. If one takes an institutional approach, then the domain of documents, transcripts, and other communications recoverable from those institutional sites constitute the domain of data. Transcripts of these interviews can be subject to a variety of text analyses such as using topic models to identify factors influencing the selection of certain topics or association rules to identify differences and similarities in the manner certain terms

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4One difference between Facebook and Twitter is that Twitter's settings make communications by default public whereas Facebook posts are more often protected by various privacy settings. Nevertheless, posts and comments made on public pages can be retrieved which often captures many of the relevant spaces where deliberations are occurring.

5High volume topics means any topic consuming > 1% of the entire flow of tweets on Twitter at any given time. For high volume topics this currently amounts to a volume of a little over 3,000 tweets per minute.
are used (more on this below). If the deliberative system is construed as an interaction system, one might consider the domain of interactions between agents and artifacts such as the circulation of a report or a blog post within and across communicative spaces and the networks created through the sharing of these documents. Network analysis software render the visualization and analysis of these networks, and to the extent interactions are captured in a digital formal, For thematic constitutions of boundaries, using the key terms reflecting the thematic constitution, one can search the above-mentioned databases and social media sites as well as engage in web crawls to capture the relevant objects concerning that theme. One needs to afterwards clean the data to remove spurious or malformed entries. Patterns that led to errant entries in the database can be removed algorithmically by searching for and eliminating all entries that fit the pattern.

Geography poses some unique issues for thematically bounded deliberative systems. For thematically bounded systems, the system is defined in terms of all communications that deal with a particular topic. In this sense, although systems often belie geographic boundaries, a geographic space may be constitute the thematic boundary. For example, if we were concerned about California discourses on energy use, discourses would need to be related to energy use in California in order to qualify, independent of the geographic location of their production. At the same time, discourses which were uttered in California about energy use in, say Canada, would not qualify. Depending on the analytical utility of strict geographic boundaries, one may regard all discourses that do not directly concern discourse within the geographic region as part of the deliberative system's environment. The thematic rendering of geography helps resolve another problem as in information society, it is often difficult to determine the geographic location in which a communication was uttered and such details are often irrelevant as digital networks effectively eliminate spatial constraints in communication (Castells 2010; Poster 2001). Themes and specific references often transcend all manner of geographic borders.

A thematic approach to studying deliberative system provides a basis to detect enclaves and blockages within the system as the thematic approach captures all available discourses including those which are uttered but go no further. A critical concern within information society as well as deliberative systems are relations of inclusion and exclusion. Casting a large net of all thematically relevant communications independent of their connections increases the likelihood enclaves will be identified. Traditional interview techniques and text analyses focused on individual sites may either miss points of transmission (a Type I error) or they may not be sufficiently attuned to the wider presence of enclave in the deliberative system (a Type II error). By aiming to collecting as much of the communication flows within a system as possible one reduces the otherwise substantial risk of errantly identifying a site as an enclave when in reality it may have limited or subtle influence in other parts of the system.

**Tools for Analyzing Thematically Constituted Systems**

All research methods encounter temporal limits as human memories are increasingly fallible with time and databases increasingly under-inclusive the further one searches into the past. Additionally, greater focus on certain spaces due to the ease of data retrieval may bias conclusions with respect to the overall operation of a system. For this reason, research designs aimed at investigating a thematically bounded deliberative system may benefit from recursive elaboration of the boundaries as information gleamed from each part of the system may influence further elaboration elsewhere. Information uncovered from interviews may be useful in developing the criteria for the collection of digital data. But just as useful are digital data in identifying relevant or useful cases for interviews and other document collection. The import of big data involves both the collection of data and its analysis: not only are these tools useful in casting as wide a net as possible to collect data, they are useful in refining that net through various analyses of the data collected. Three methods for identifying system boundaries and the transmission of discourses may be useful.

1. Digital data collection to reveal the spatiotemporal expanse of a thematically bounded deliberative system. Digital data collection represents one of the most systematic (not to be
confused with the system) manners to collect data based on a set of criteria. Web crawlers can search for certain topics based on a series of seed sites which snowball outwards (Ackland 2013). Web content may be text mined to extract content in a variety of ways, and the relationship of hyperlinks may reveal underlying networks of relationships between topics. Additionally, articles retrieved from Factiva or Lexis/Nexis may provide one indication of the expanse of a topic over time. These files can be directly imported into the R programming environment for text mining or the development of machine learning models (Feinerer et al. 2015). Without any significant data analysis, the volume of news stories over time can be quite useful in understanding the expanse of a topic. Additionally, searches may be conducted on Facebook to find all of the relevant Facebook pages. The links and other material provided in Facebook posts or those collected from Twitter provide relationships between entities and other digital artifacts and further extend the boundaries of the deliberative system. The connections within a space and between a space to another which it is linked to are not the same and would need to be theorized based on the nature of the relationship enacted between these spaces.

2. Topic models. Topic models identify the diversity of issues raised within a space of discourse. Once we have collected all of the relevant documents for a particular deliberative system, we want to know what topics are covered in the spaces composing the deliberative system. These spaces may be temporally segmented in order to make sense of transmission relationships. The volume of materials can be overwhelming for human readers (Ramsay 2011) but a topic model may reduce the complexity, organizing large volumes of text or any data that can be rendered as text into an accessible list of discrete topics. Though limited to specific words and collections of words with which they are associated, topic models are able to discriminate words by their parts of speech such that lead as in what a leader does and lead as in the metal can be algorithmically distinguished (Richert and Coelho 2013). Topic models therefore enable the classification of discourses in different parts of a deliberative system at any point in time.

3. Association rules. Association rules look for patterns of terms that are correlated in a text. There are a variety of ways to implement association rules, some more computationally efficient than others (Kotsiantis and Kanellopoulos 2006). Most association rules in common data mining libraries find all association rules within a set of texts, however there are functions which search for terms associated with a selected seed term (Feinerer et al. 2015; Goodrich, Kurkiewicz, and Rinker 2015). Association rules can aid in studies of deliberative systems in two ways. First, they enable researchers to move beyond counts of words to identify meanings of words in use. This is a clustering technique which contrasts with semantic accounts of meaning. As Kenneth Burke (1974, 20) observes, “the work of every writer contains a series of implicit equations. He uses ‘associational clusters.’ And you may, by examining his work, find what goes with what.... By inspecting his work ‘statistically,’ we...may disclose by objective citation the structure of motivation operating here.” Association rules therefore facilitate the discovery of meaning which even the communicators in question may not be aware. Second, in association rules enable researchers to determine whether a topic alone has transmitted from one space in a deliberative system to another or whether the particular framing of a topic has also transmitted. Transmission can be operationalized as the temporally deferred appearance of a discourse from site x in site y combined with evidence of transmission of discourse from site x to y. If communicators in a separate forum begin to not only speak about a particular topic but to speak about it in the same way as speakers in a temporally prior forum populated by a different set of persons, then this evidence would be consistent with the transmission of discourse from one space to another.

These techniques can be applied to native digital objects or to transcripts and digital renderings of analogue data sources such as interview transcripts or scanned documents. In this way, all of the data collected in regards to the operation of a deliberative system can be brought within the range of

6Many which are politically relevant are also public, accessing private sites raises issues of consent.
big data computational methods.

**Conclusion: Deliberative Systems and Beyond Digital Political Life**

The shift from studies of single deliberative sites to deliberative systems involves a significant increase in the scope of empirical data which researchers both need a theoretical apparatus to organize data and specialized methods of data collection and analysis. Deliberative systems involves more than the extension of deliberation in space and time. Deliberative systems also shed light on the manner in which the system as a whole operates in relation to its parts. As the currency of politics is increasingly information, deliberations will occur within ever complex systems which create new forms of inclusion and exclusion. Just as the informational turn in politics renders the deliberative systems framework all the more relevant in understanding contemporary politics, the shift from single deliberative sites to systems of deliberation makes the use of computational methods all the more necessary. These methods are particularly critical to identifying and tracing the movement of discourses across the various spaces which compose a deliberative system and outlining its boundaries in both space and time.

There will always be aspects of political life and therefore deliberative systems which escape the informational turn. Bracketing, for example, whether or not affective dimensions of communication are normatively desirable in a deliberative context (Dryzek 2002; Habermas 1996), intimacy and the communication of affect may feature in empirical deliberative systems. Though there are often efforts to recreate affective ties within digital communication flows (Papacharissi 2014), they loose their intimacy when decoupled from the contexts of face-to-face communication and thick social relations. Furthermore, there will always be aspects of formal and informal deliberative spaces which are not archived as a digital artifact in a format retrievable by others. The implications of such communications are an empirical matter as everyday communications between friends or discussions between political authorities behind closed doors may never be accessible to researchers outside of trustworthy accounts reconstructed through interviews.

To a certain extent, there are computational approaches that can push back against this. Although interviews are not native artifacts of the actual deliberations, to the extent they shed light on processes within and between institutions, the text of these interviews can be computationally analyzed using topic models or association rules to identify factors influencing the production of different themes and frames. Additionally, text documents that are not already digitized can be scanned and rendered readable through optical character recognition software which is fairly standardized and has a high level of reliability. There are also algorithmic techniques to identify objects and persons within video and the sound can be extracted and with varying degrees of reliability machine or human transcribed making available many of the text based operations mentioned earlier.

Data consisting of nondigital artifacts will remain a blind spot within computational approaches to social science as the native artifacts of the deliberation do not exist. At the same time, if the forgoing analysis on the informational rendition of political life holds, not only are deliberative systems more critical to understand contemporary politics, those communications which are digitally rendered may become an increasingly important currency in reaching and justifying political decisions. Under those circumstances, aspects of deliberative systems which resist digitization may become increasingly marginalized or even rendered isolated deliberative enclaves without any connection to centers of decision making. Whether or not that happens is an empirical question for future research.


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