Center for
Technology in Government

Modeling the Informational Relationships between Government and Society

A Pre-Workshop White Paper

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Open Government Consultative Workshop
June 26-27, 2012
CTG, Albany, NY

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June 2012

NOTE: This paper is primarily concerned with assistance to government decision makers at all levels who are involved in open government initiatives. Our analysis of an information polity will be limited to open government initiatives, but the basic ideas and methods used and discussed could be extended to many other aspects of the governance related to information intensive initiatives.

INTRODUCTION

The premise of this paper is simple: If public leaders want to pursue opening government, particularly through the use of new technologies and information-centric activities (OMB, 2012; OECD, 2003), then we need to have a good understanding of how all that works. Limited insights are available based on existing research and practice. There are some good guides, tools, techniques, and theories for dealing with technologies and information in the public sector; however none presents a holistic opening government framework, specifically one for understanding and evaluating the impact of different technology, management, and policy choices *before* they are implemented. This paper offers just such a framework as an aid for government decision makers in designing and implementing open government initiatives.

The many benefits of pursuing open government through technology- and information-centric strategies are clear: (a) *internally* governments are seeking ways to enhance their own productivity, whether through using citizens to do the work (co-production), providing employees with more knowledge to help steer behaviors, or simply by making more efficient and effective requests for information (e.g., freedom of information requests or 'green button' initiatives) and (b) *externally* governments are looking to maximize citizens' potential to scrutinize government and spot wasteful spending (e.g., citizen auditors), provide citizens with more choice (e.g., smart disclosure), or stimulate economic development through the public re-use of government data. However, research and practice also raise caution about the negative aspects, such as the risk (or reality) of creating a new type of information divide or stimulating changes in behaviors that make things more secretive than open (e.g., relying on confidential classification to avoid openness).

Open government initiatives have diverse goals, competing interests, and broad scopes that often produce intended and unintended consequences. Optimism often rises at each new technological turn (Taylor, 1998). But, we also know from decades of research and practice findings that when new and extensive information and communication capabilities are adopted by government they "do so in ways that are inclined to replicate rather than rupture existing practice" (Taylor, 1998 p. 159; Fountain, 2011). Therefore, realizing the promise that opening government initiatives will transform the status quo— requires significant research and practice attention to break away from historical results.

Our goal is to improve understanding of what shapes the value generated through opening government initiatives. That understanding can guide the way forward, particularly in the area of *governing public information*, so that public managers can work successfully with employees, advocacy groups, civic hackers, citizens and other

stakeholders to create new ways of collecting, integrating, disseminating, and using information in pursuit of improved governance.

The next sections present and elaborate on the framework. First, we describe the value of an information polity perspective as an approach to broadening and sharpening understanding of the nature of open government initiatives in a holistic way. Second, we present an illustrative case example of the informational relationships among actors in an information polity and how information, information flows, and relationships are central to the analysis. Third, we describe the dynamic aspects of information polity activities using system dynamic modeling methods. This modeling approach shows how understanding the dynamic activities related to providing, using, and governing information in the public sector can assist decision making and planning.

OPENING GOVERNMENT AS DISTURBANCE

Opening government, as a transformation strategy, a reform agenda, or political mantra, represents the culmination of technical, social, and political developments brewing since 2005 (OECD, 2003). These developments moved into more prominence in 2009 in the US with President Obama's open government directive (OMB, 2009) and internationally with the UN-sponsored Open Government Partnership (OGP) and the World Bank's Open Data initiatives. Such initiatives to enhance 'openness,' whether in technical, social, or political terms, can introduce important shifts in circumstances—including power relationships, resources, risks, or opportunities. These disturbances can impact the interests of stakeholders and result in conflicts and disturbed routines, in both anticipated and unanticipated ways.

Three influential disturbances include (1) *technical*, meaning open data formats, open source, mobility, social media, and linked data, (2) *political*, meaning the opening government directive and open government partnership globally, and (3) *social*, meaning people's expectations change (i.e., ways of interacting, speed of interactions, etc.), co-production of services, the increase in users and developers (i.e., civic hackers) and the other players such as non-governmental organizations (NGOs) and research centers.

Under the umbrella of opening government, public administrations are once again responding to the perception that the problems faced by governments are increasingly beyond their ability to solve alone. Providing citizens and employees with information is seen as part of the solution, both in the consumption of services and participation in decision making (Taylor, 1998). Therefore, open government initiatives are introducing a variety of new actors (e.g., advocates, technical specialists, citizens, and other stakeholders) and new technological- and information-mediated activities into the governance of public information resources.

Likewise, rhetoric about open government initiatives tends to focus on information or data in some form. However in practice to-date, the significance of both new actors in the governance of public information and of new forms of information and access is largely de-contextualized in practice, with only a very limited sense of the many ways context affects how information is acquired, understood, and used to impact government and

public life. We've found this narrowness evident in dozens of open government initiatives reviewed over the past year. Some technically focused initiatives amount to little more than a web site linked to miscellaneous data files with no attention to the usability, quality of the content, or consequences of its use. Other initiatives are complex organizational or enterprise projects that envision wide reaching political and social outcomes, but lack technical specificity or design sophistication.

One of the goals of opening up government is to expand information and access in ways that draw new actors, interests, and influences into government to improve operations and decision making (i.e., improve governance). The advent of an open government initiative is thus a kind of disturbance, in that it alters some combination of technical, political and social factors that influence governance. The kinds of gaps and omissions discussed above undermine the potential benefits of opening government and risk wasting valuable resources on initiatives with vague goals and little prospects of success.

AN INFORMATION POLITY FRAMEWORK

This section describes a holistic analytical framework for understanding how open government initiatives can shift public information governance. The framework is built on the concept of an information polity and uses that concept to interpret and contextualize the broad spectrum of information-intensive activities related to open government initiatives. We then describe how the framework can sharpen government leaders' and managers' ability to look below the surface of open government rhetoric; to see what is hiding from the conventional gaze; to examine what is happening at the system level; and to address the 'reflexive' nature of information and its flows (Taylor, 2007).

A polity perspective

We use and further develop the concept of a *polity*[1] to explore the shifts among different sets of actors engaging in opening data and opening government. The polity perspective frames the shifts in relationships between sets of actors, particularly the technologically-mediated informational relationships (Taylor & Lips, 2008). This perspective provides a departure from conventional thinking about the ways that relationships between government and citizens and other stakeholders are changing.

An information polity view

In this view, opening government is a phenomenon of an *information polity*[2]. An information polity "is a heuristic device for analyzing the ways in which the institutions

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[1] We ground our analysis from a recent thread of literature in international relations that has pursued the concept of 'polity' (such as 'global polity') as a way to address the empirical reality of rising non-state actors in world politics that do not fit conventional nation-state relations, signal a dismantling of hierarchies, and the presence of different types of actors playing a significant role in networks of governance (Corry, 2010).

[2] The term was first introduced in the late 1990s by a group of academics exploring the governance changes occurring between government and citizens as a result of advanced technologies and expanding information processes (Taylor, 1990, 1991; Bellamy & Taylor, 1998).

of governance are shaping, and are shaped by, new information flows and new modes of communication" (Taylor & Bellamy, 1998 p. 152). The concept "gives primacy to the notion that systems of governance can be conceived as networks of relationships that are sustained by, and reflected in, complex sets of information flows" (Taylor & Bellamy, 1998 p.152).

We propose, in general, that an *information polity* exists whenever a set of actors are oriented towards the governance of one or more common governance objects, (Corry, 2010). Unlike a 'global polity' that may be oriented toward 'the climate' (Corry, 2010), an information polity would be oriented toward the public information resources associated with an operational or policy area (such as performance, or health policy). When applied to opening government, an *information polity* will exist whenever a set of actors has become oriented toward the public information resources associated with an opening government initiative (the common governance object).

An *information polity* view draws attention to relations between *actors* and *objects* and how they relate to one another in a larger system (Corry, 2010). By focusing on the relationships between actors and objects, an information polity view differs from classic views of government-citizen interactions commonly seen in much of the e-governance literature. An information polity model frees us from automatically thinking of opening government initiatives in terms of hierarchical, market-based, or community models that interpret the relationships between government and citizen within formal, constitutional terms (Taylor, 1998; Bellamy & Taylor, 1998), and other stakeholders within purely managerial terms (Chadwick, 2003).

Governing public information resources
While many objects can be construed as 'governable' at any one time (Corry 2010), in an information polity the objects are some part or all of an open government initiative, something that expands or enhances how public information is provided and used. Sets of stakeholders are oriented toward the governance of an open government initiative because they have an interest in how the initiative plays out.

The concept of public information resources, in this sense, includes both government-held and other publically available information resources (data, devices, infrastructure, etc.), as well as instances of social action (such as downloading a data set, initiating or responding to a freedom of information law request, or attending a government meeting). Public information resources include both government-held information and other publically available information about a policy problem or domain. This is an important analytical distinction because it allows us to simultaneously think about the governance of 'government-held' information (such as datasets on data.gov) and 'publically-held' information (such as comments, sentiment, patterns of use, geo-coded data).

This more inclusive treatment of public information resources opens the analysis to a wider range of interests and stakeholders. Thus, being oriented toward the governance of the initiative and its public information resources can range from providing feedback or new information, simple surveillance of its progress, or direct participation in decision making and control. Many different kinds and sources of information are important for

improving government, and while information is an important and valued resource, not all kinds or sources are solely 'owned' by government. Notions of who are the data owners is replaced by conceiving of multiple stewards of public information resources (Dawes, 2010), of which government, citizen, and other stakeholders are included. For example, citizens providing personal information or civic hackers are using and changing the data in some way—each play a stewardship role in governing public information resources.

Actors and key information relationships in the governance of public information sources

In Figure 1, the various stakeholders are oriented toward steering (consensually or antagonistically) (Corry, 2010) the public information resource. Each has potential interests in the characteristics and success of the open government initiative, such as enhanced program effectiveness for a particular program, or increased political influence, or national security. Their interests and capacities for participation in governance make them part of the information polity and oriented as such to governance of the public information resources that make up the open government initiative. The entire collection of stakeholders shares this orientation, but also has possible relationships with other actors. Stakeholders can be members of more than one information polity simultaneously.
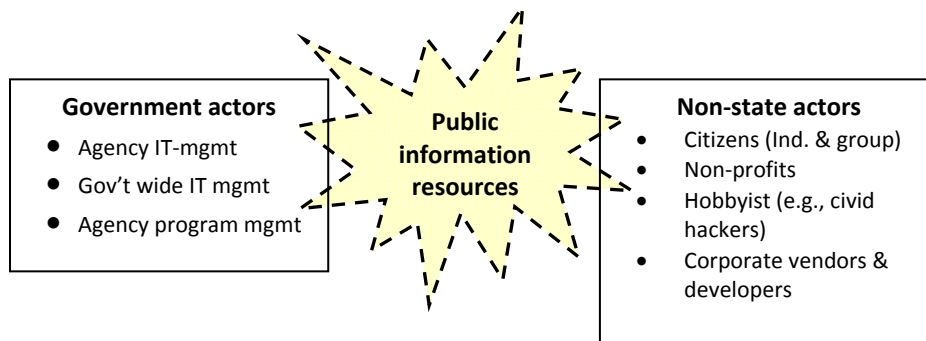

Government actors
- Agency IT-mgmt
- Gov't wide IT mgmt
- Agency program mgmt

Public information resources

Non-state actors
- Citizens (Ind. & group)
- Non-profits
- Hobbyist (e.g., civid hackers)
- Corporate vendors & developers

Figure 1 – An open government information polity

Government decision makers working on opening government make up only a part of the larger group of actors who have an interest in and ability to influence what happens. Since their interests are affected by how public information resources are governed, the stakeholders are oriented toward the governance of that information. The basic idea is that many diverse stakeholders have interests in how government information is acquired, accessed, and used. The governance of public information resources involves policies, business processes, social processes, technologies, standards, meaning and interpretation, and adding value. In general terms, all of government information acquisition, provision, and use are activities that occur in the polity. For our analysis, however, only open government initiatives are of interest.

Organizational and technical stakeholders can influence events in an information polity. Their presence represents the understanding that opening government directly involves the internal management of agency and information technology systems. The others are external actors that are producers or consumers of the information from the source central to the initiative. The other actors around the polity space represent other sources of

influence on action, connected to the social and political environment of the action, the nature of the information of interest, and the institutional context of law and policy. This is a general representation of an opening government information polity, the specifics of which would vary according to the nature of a particular initiative.

AN INFORMATION POLITY OVER TIME: THE CASE OF RESTAURANT INSPECTION INFORMATION IN NEW YORK CITY

The recent history of technical and political actions surrounding New York City (NYC) restaurant inspections provides a rich and nuanced example of an information polity at work and over time[3]. The NYC Department of Health and Mental Hygiene (DOHMH) is responsible for inspecting the City's roughly 24,000 restaurants for compliance with the City's Health Code. If an inspector finds a violation, the notice is given to the operator of the restaurant along with the required remedy and, for serious a violation, a summons or fine can be imposed. The inspection process is long standing and has been relatively hidden from the public review, but different points in time have produced controversy. One source of controversy began when actions to increase public access to inspection records—a form of government information—created a progression of ever more complex shifts in the restaurant inspections' information polity[4].

The shifts have taken place over more than a decade and involved the technical, informational, legal, and political relationships of many actors in the City. The basic story is simple. Prior to 1999, the results of inspections were required to be available to consumers on paper through postings in a conspicuous place. Fines for the more serious violations could be paid without informing customers. The information exchange was restaurateur to customer: one customer obtaining inspection data, in person, from one restaurant at a time. In terms of information relationships in the polity, the pre-web information relationship structure was simple.
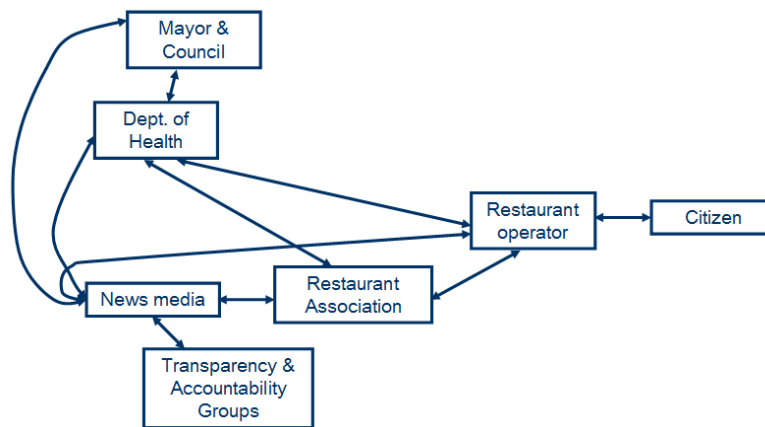

Figure 2 - Inspection Information Relationships - Pre-website

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[3] The case analysis is on-going. We gathered data from news reports, government documents, and interview data from a prior project.

[4] The practice of putting government restaurant inspection results online is not unique to New York City. There are similar examples in other US cities and in London, England, Edmonton, Canada, and Sydney, Australia.

As shown in Figure 2 above, inspection information went from the restaurant to DOHMH, then back to the restaurant and from the restaurant to individual customers on site. Other actors (media, advocacy groups, or other government units) with an interest in restaurant inspections could request the information from the DOHMH, possibly through a Freedom of Information Request, or by collecting it from individual restaurants.

At that time, the introduction of a technological disturbance (the Internet) and stakeholder interactions show a dynamic information polity at work. The first web server hosting the inspection results was overwhelmed by traffic and crashed within 24 hours of going live, in spite of no advertising or public notice of its appearance. So a technical change to a more robust system was required. The importance of inspection results increased dramatically for restaurant operators who began to demand more frequent inspections to correct bad scores. Stories began to appear in City news media about the inspection website and the favorable public reaction to it.
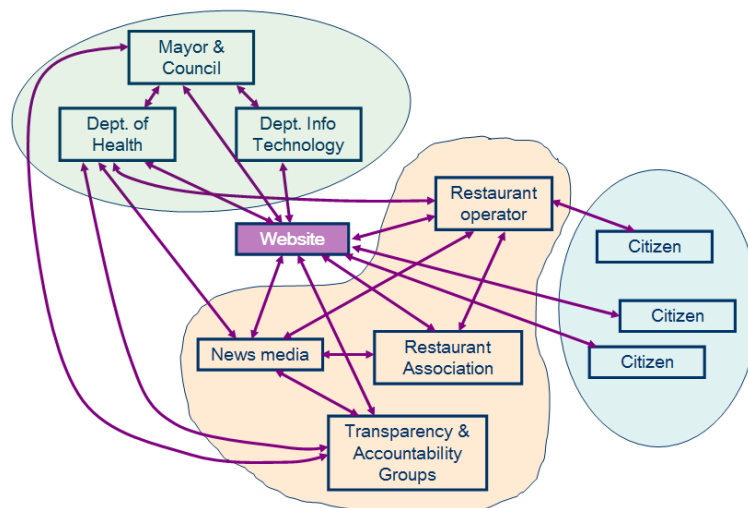

Figure 3 – Inspection Information Relationships – Post website

By 2009, a mobile app was created providing access to the inspections via mobile devices at the street level and in 2010, the DOHMH changed the ratings to a letter grade, A, B, or C. The City also required restaurants to post the letter grade result in the front window. The creation of the app put a new information source in play and a third channel of access. The technology, social, and political environment at the time was also moving toward 'more openness' 'more collaboration' and more peer production and crowd sourcing. Social media tools further expanded the reach of the information relationships. The movement to the letter grade, posted in a highly visible place, further enhanced the "signal strength' so to speak, in the on-site channel between the customer and restaurant. At this stage, the complexity of the information relationships represent a much more intense network-like structure, as shown in Figure 4 below.
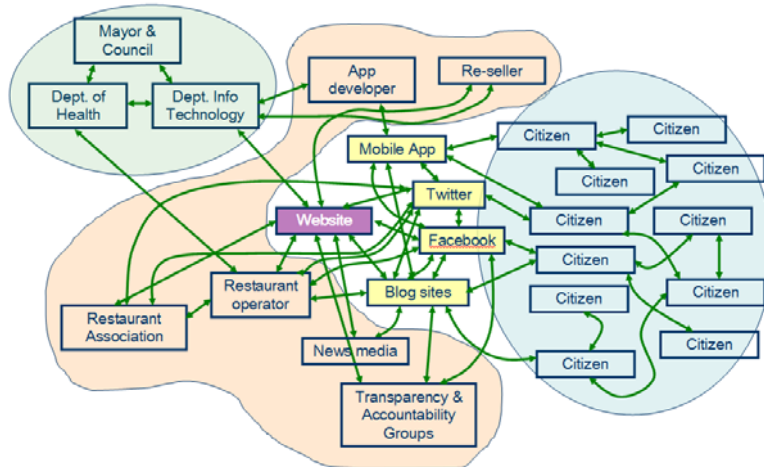
Figure 4 - Web 2.0 Information Relationships

When the City changed to the letter grade system, the restaurant association complained publically and created their own survey of restaurant operators to document negative impacts on business. The City countered with statistics on reduced frequency of hospitalization for Salmonella infections in the City. Both the Mayor and the City Council took part in the back and forth in attack or defense of the inspection reporting system. And the issue remains alive today.

The network diagrams are not complete specifications of the relationships between actors and objects. But, what these network diagrams help to describe is how open government initiatives become a part of, and are already affected by, the interactions in an information polity as it developed over time.

In the next section, we discuss how the relationships in an information polity are historical, emergent, and dynamic, i.e., consisting of processes with feedback and reinforcing effects. As we've discussed, the advent of an open government initiative is considered a disturbance in that it alters some combination of technical, political and social factors that influence governance. The example below illustrates how a dynamic information polity-based analysis extends and enriches the understanding of an open government initiative and opening government more generally.

UNDERSTANDING THE COMPLEXITY OF OPENING GOVERNMENT: A POLICY-MODELING APPROACH

Complex systems are dynamic. Defining a problem dynamically means paying attention to how processes and relationships change over time. The information polity, as described above, includes rapid and unpredictable technological developments, trends and shifting relationships in the social and organizational environment, all at flux with political processes. These environmental and contextual influences interact over time in a variety of ways.

This section illustrates how various modeling techniques can support thinking, learning and planning in open government projects. The goal is to assist public managers with making evidence-based decisions in a complex, unpredictable world (Armenia et. al 2010). Public managers face many complex challenges in implementing opening government, characterized by multiple interactions between actors, objects, and interests. Therefore, we follow a growing trend that seeks to link tools for scenario design, simulation, and forecasting, that can understand the non-linear relationships, complexity, and time dimensions that can allow for a better understanding of the impacts and consequences of technological, political, policy, and managerial choices.

A causal map to frame open government initiatives
We have chosen system dynamics as one tool to show how modeling can improve our thinking about open government initiatives. System dynamics is a simulation method that works under the assumption that observed behaviors over time – like the amount of available information or the value generated by this information – are explained by endogenous (internal) feedback processes embedded in the system. The example presented in this section of the document, however, is not a fully developed simulation model, but only a partial conceptual explanation of the restaurant inspection case, which we usually refer to as dynamic hypotheses. That is to say, only a small set of causal relationships and feedback processes have been examined and hypothesized here to explain the behavior observed in this case.

The story in the case starts with opening information, making available to the public the information about restaurant inspection in NYC. Figure 5 shows a conceptual representation of this process. The box Open Information in the figure represents the accumulation of all restaurant inspection data available to the public, and the valve Opening Information, represents the activities necessary to make available such information. Thus opening information adds to the accumulation of available open information. To make this happen, governments need to allocate some effort to opening information. Every person*hour of effort varies on how effective the person is, reflecting that most experienced people will be able to open more information with the same effort.
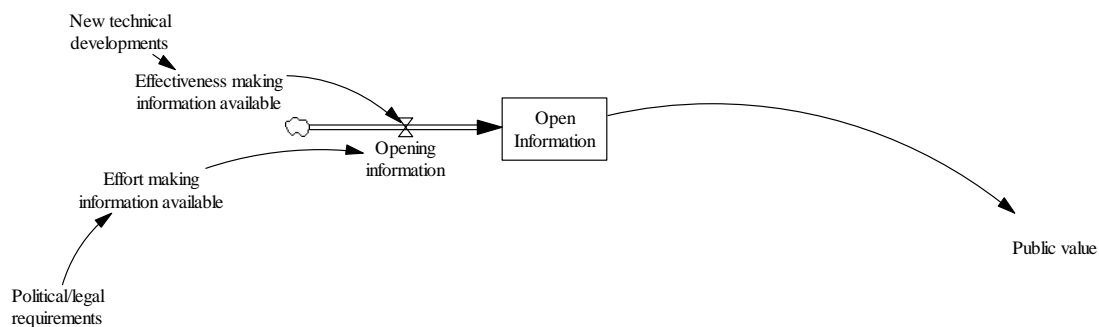

Figure 5. Effort and effectiveness to open information.

As it is shown in the figure above, agencies' efforts to make information available may be increased or decreased by political or legal requirements. On the other hand, new technical developments may contribute to people's effectiveness in making this

information available. Of course, the expectation of governments is to create public value by making information available. That is to say, making restaurant inspection information available to the public creates value by informing the public about their health safety when eating in a restaurant by ensuring basic requirements of hygiene in each establishment.

However, restaurant information has been available long before the Internet. Restaurants were required to post inspection information in a visible place in the restaurant and citizens had access to detailed inspection records under the US Freedom of Information Act (FOIA). But the effort needed to get this information has been reduced over time, first by making it available over the Internet, and then by making it machine-readable and fit to re-use in different applications. Figure 6 represents these changes in technological ease by adding a second accumulation, 'Fitness to re-use'. The box 'Fitness to re-use' in the figure represents the accumulation of all restaurant inspection data available to the public, and the valve 'Making information easy to re-use' represents the activities necessary to make available such information machine readable. Making information more fit to re-use also requires agencies to allocate some effort to the process, and it is most likely that agencies will also have different levels of effectiveness in accomplishing this task. As it is shown in the figure, the amount of effort to prepare the information also depends at least partially on political and legal requirements, and agency effectiveness also depends on technical developments. The development of XML, for example, makes it easier to prepare information to be machine readable, and the open government initiative of President Obama has clearly increased agency effort to both—open information and make it more fit to re-use. The figure also shows how making information more fit to re-use will contribute to public value creation by reducing the costs of using the information in new and innovative applications.
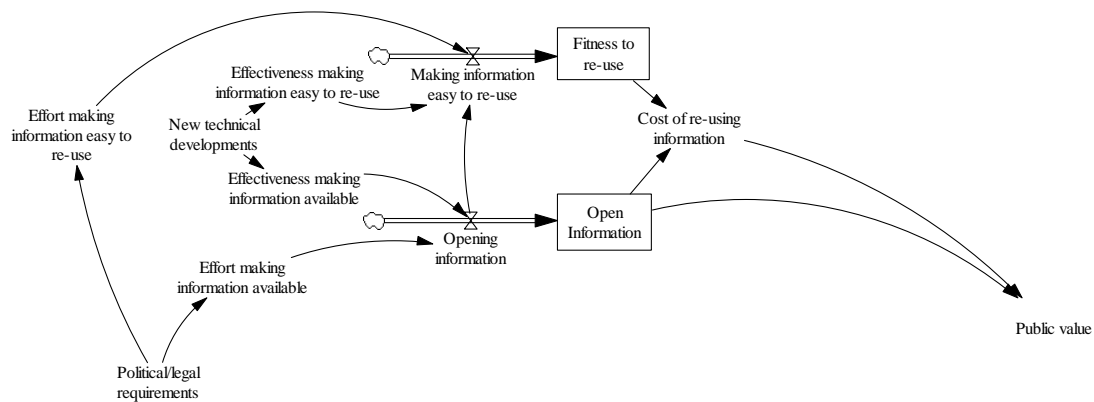

Figure 6. Open information and fitness to re-use.

Looking at this picture, we can imagine that in the last 25 years, access to government information has been increasing, with two main points of rapid growth, one of them around the mid 90's with the introduction of the Internet, and a second one around 2009 with the open government initiative. We can also imagine that 'Fitness to re-use' has increased over time with new technical developments, with an important push around

2009, when political and legal requirements mandated agencies to allocate more effort to this task.

Unfortunately, most efforts in open government only focus on this technical component, without taking into consideration the social aspects of information, particularly providing sufficient context for information use. Contextualizing information (meaning its general quality, usability, and usefulness) makes it more relevant when using it for diverse applications. The Context of Information can be represented as a third accumulation in the case (see Figure 7). As is the case with the other two accumulations, this one requires effort to be developed, and also contributes to value creation by increasing the value of the information. Unfortunately, this dimension of open government is not always addressed by public agencies and technical developments cannot help much in improving it, given that this characteristic is closely related to the value of information for specific stakeholders, purposes, and applications. This fact limits, to different degrees, the extent of potential public value created by open government initiatives, which may partially explain the existence of many data sets already available which are not used by anybody in useful applications. Although, in most cases, the information is machine-readable, it is not contextualized in a way that might generate value, and no set of stakeholders exist (yet) that find value in that information.
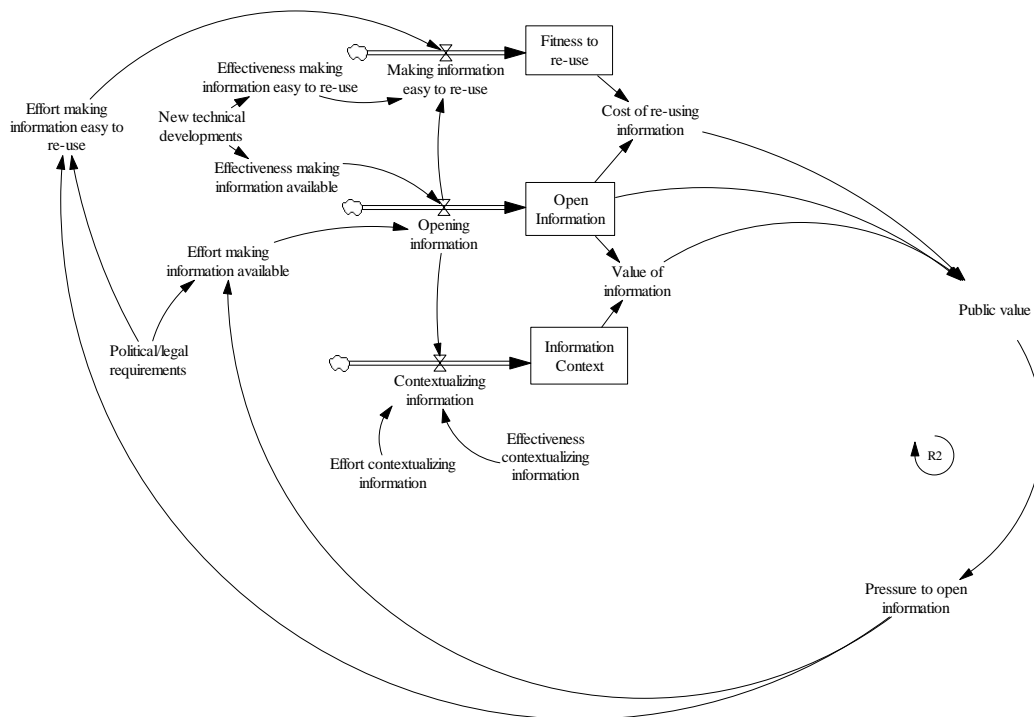

Figure 7. Contextualizing information and value creation

Figure 7 also shows for the first time one possible feedback process labeled as 'R2.' This feedback processes implies that the creation of public value through opening information will create public pressure to open information, pushing agencies to allocate more effort to this activities, and thus creating more value. A feedback loop exists when information

resulting from some action travels through a system and eventually returns in some form to its point of origin, potentially influencing future action. If the tendency in the loop is to reinforce the initial action, the loop is called a positive or reinforcing feedback loop. Reinforcing loops are sources of growth or accelerating collapse; they are dis-equilibrating and destabilizing. (Richardson, 1999). This positive loop process of value creation is virtuous cycle, but can be a trap during initial stages of a project, when there is still little or no value, and there is no pressure (from stakeholders because no polity is formed), and no added effort.

However, in some cases like the restaurant inspection information, the context provided along with the information may trigger other feedback processes that may pose significant challenges and even stop such initiatives (see Figure 8). For example, the lack of context of the information creates potential conflicts in meaning, which may trigger two other feedback processes labeled in the figure as B1 and B2. These processes are different to the reinforcing process explained before, and instead of promoting change, prevent change from happening. These negative or balancing loops have a tendency to oppose the initial action and can be characterized as goal-seeking, equilibrating, or stabilizing processes (Richardson, 1999). In our case, meaning conflicts created pressure to hide public information, reducing the effort on making information available or even eliminating already public information (process B1). On the other hand, this same conflict of meaning may trigger a pressure to contextualize the information, increasing such effort, and potentially improving the quality of the information (process B2).
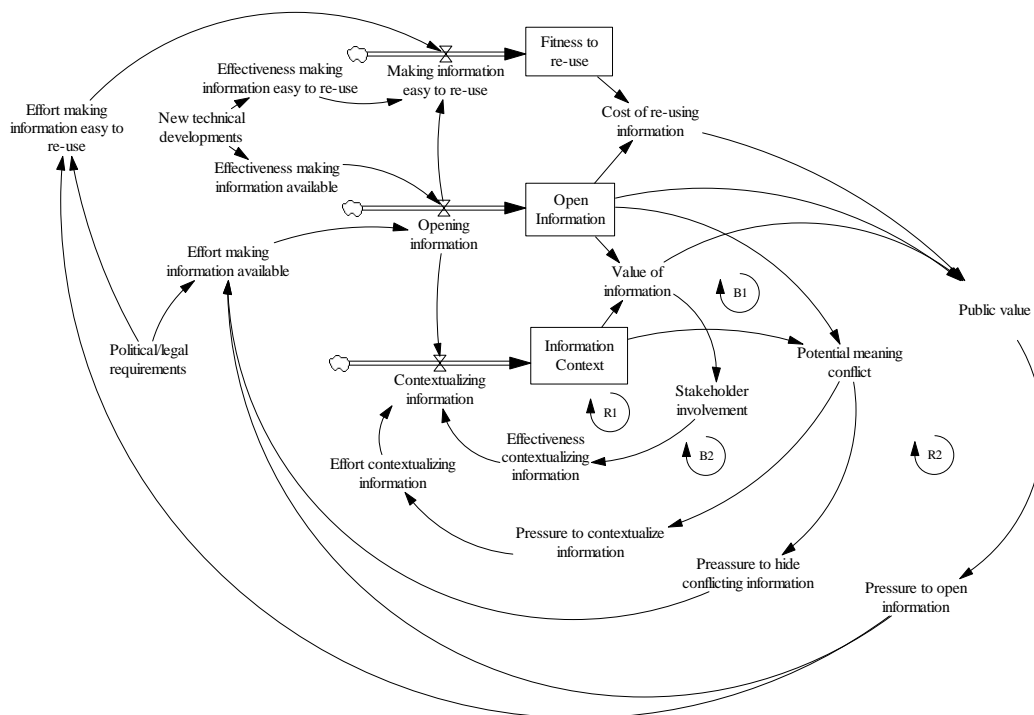

Figure 8. Feedback processes in the restaurant inspection case

These two feedback processes operated in the restaurant inspection case, creating important political and economic costs to improve the validity of the information by improving not only the type of information being presented, but also the form in which it is available and presented through a restaurant rating system. The effort directed toward contextualizing information also includes efforts in gathering and preparing data. In our case, the inspection process frequency was changed to improve the quality of the information. That is to say, the governance of the public information resource is not only about preparing information systems, but also about adapting internal government policy, processes, and regulations.

Finally, the case also shows that stakeholder involvement is a way to increase the effectiveness of contextualizing information. Restaurant and consumer associations and citizens could participate in the process of agreeing on types of data to be opened and ways to present this data in order to create value. However, stakeholder involvement is embedded in another reinforcing process (R1). As we mentioned before, reinforcing processes can represent an initial trap, making it harder to get stakeholder involvement in the initial stages of the project because there are uncertainties related to the value of the information and the systems.

A system dynamic approach to analyzing information polities around open government initiatives contributes to our understanding of open government initiatives in a couple of ways. First, thinking about key dynamics and activities in the system allowed us to identify potentially important factors, such as the context of information and how current open government policies lack of emphasis on this factor may explain low levels of use in general. On the other hand, by thinking about the dynamics of new technical developments, such as the ease of opening information and making it more fit to re-use, we can see the possible impact on public managers. That is, the primary focus on technology distracts public managers from a focus on context, thereby increasing the focus on posting machine-readable data sets in a way that does not necessarily create public value. This initial conceptual model also suggests that involving key stakeholders is important to improve the chances of creating public value through opening information, although involving them also implies the initial cost and effort associated with engaging them in the project will be higher, sacrificing efficiency. However, not involving them in early stages of the project implies the risk of running into other political and economic costs related to fixing the information after it has been released.

DISCUSSION

This pre-workshop paper is intended to do three things: (a) develop a new way for policy makers, executives, and managers to view the broad context and complex information relationships in which opening government initiatives unfold, (b) provide a way to analyze and model the information relationships, and (c) begin to develop a holistic opening government framework, specifically for understanding and evaluating the impact of different technology, management, and policy choices before they are implemented.

Without this knowledge, it will be difficult to establish the necessary conditions, internal and external to government, that will enable meaningful use of new information access points, information resources, and enable initiatives that effectively exploit newly available technologies.

The paper builds on existing theory and practice focused on governance, technology, and social interaction to model open government initiatives as examples of a working information polity. We use the case of New York City's restaurant inspections as a representative example of an information polity at work. The case illustrates the interactions among the stakeholders oriented toward the governance of the initiative and government's information sources. The continuing development and interaction over restaurant inspection information illustrates many of the important dynamic aspects of opening government. The original initiative, a simple web site, was just the beginning.

By modeling the shifting informational relationships over time we can discuss in more systematic ways how open government initiatives and strategies shift internal and external information provision and use. There are opportunities for unanticipated results, both in terms of rapid increases in some activities—web site hits—or blocking of development by competing interests. This holistic modeling approach has potential to guide and enhance both new research and the development of practical tools for opening government and other information intensive initiatives.

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