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Digital Fuel of the 21st Century: Innovation through Open Data and the Network Effect

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INTRODUCTION

The history of civilization has seen continuous evolutionary progress, occasionally culminating in changes that are revolutionary. In the broadest classification, three such revolutions are apparent, each one building upon the previous in a pattern of exponential growth. The agricultural, industrial and information revolutions have translated into massive social, political and economic change for people.

The permanent settling of lands was heralded by the mastery of agricultural techniques, moving civilization away from a nomadic existence. Trees were cleared, seeds were sown, fresh water diverted and eventually crops were harvested. The domestication of animals and other innovations continued to increase the efficiency of agricultural activities. Thus began the Agricultural Revolution and an end to the hunter-gatherers.

The prosperity resulting from these efficiencies and economies of scale and scope led to the emergence of urban establishments, including the eventual development of political, judicial and monetary systems.

The agricultural age lasted for thousands of years.

The steam engine was the symbol of progress for the Industrial Revolution. Machines could often replace manual labor to increase productivity, so that more work could be done by a single person, and in less time.

New industries emerged, others were transformed, and many perished. The energy industry, for example, emerged to provide coal, electricity, oil and other forms of energy used to drive new machinery. The transportation industry was reborn through the development of trains and steamships, and later the "horseless carriage" and airplanes. Carriage makers were no longer relevant. The steam engine gave way to the gas engine, the jet engine and the electric engine. The relevance of distance began to wane.

The industrial age lasted for hundreds of years.

In the Information Economy, the microprocessor is the new "steam engine." The digitization of information, or data, takes us from industrialization to automation. In this age, the microprocessor has enabled us to undertake data-manipulating activities in a mere fraction of the amount of time it took in previous ages. The accountant, who once slaved over the arithmetic of bookkeeping, can now focus on higher-order activities such as tracking investments, compliance and investor reporting. The relevance of distance to most economic activity is now being established as false. Knowledge work, increasingly the most valuable and common type of work, can be undertaken wherever it is most efficient to do so. Indeed, communications are evolving as a substitute for transportation. Work is delivered electronically through the Internet instead of by courier. The structural impediments for billions of people to collaborate in spontaneous networks and create or consume data have been removed.

All this happened in just the past few decades.

A SHIFT IN POWER

In the information economy, data is power and we face a choice between democratizing it and holding on to it for an asymmetrical advantage. For example, before a 13-year race to crack the code of life was complete, [1] a team of international scientists gathered in Bermuda to discuss the strategy for managing the Human Genome Project data. They made a set of critical decisions to make the human genome data freely available in the public domain. These decisions came to be known as the "Bermuda Principles."[2] This decision gave rise to an ecosystem of scientists and companies that have advanced everything from personalized medicine to creating economic activity that improves the human condition.

In today's age of information, data is supremely important. We generate and store more data today than any other time in history. In fact, data is predicted to continue along its exponential growth curve to 1.8 zettabytes in 2011. To get a sense

of this exponential growth, a zettabyte is a trillion gigabytes; that's 1,000,000,000,000,000,000,000.[3] If this data isn't sliced, diced and cubed to separate signal from noise, it can be useless. But, when made available to the public and combined with the network effect—defined by Reed's Law,[4] which asserts that the utility of large networks, particularly social networks, can scale exponentially with the size of the network—society has the potential to drive massive social, political and economic change.

In today's world, open data leveraged by networks is the fuel that powers important decisions at each level of society—from government, to business, to community, to households—but it is also a product of our every activity at every level of our existence. Channeling the power of this open data and the network effect can help:

1. Fight government corruption, improve accountability and enhance government services
2. Change the default setting of government to open, transparent and participatory
3. Create new models of journalism to separate signal from noise to provide meaningful insights
4. Launch multi-billion dollar businesses based on public sector data

Technology enables the disruption of institutions that was structurally not even possible before. The adoption of social, mobile and cloud technologies is lowering the co-efficient of friction and giving rise to the network effect that has already changed the power dynamics between large institutions and the people.

Facebook has more than 800 million active users[5] and Twitter has over 100 million active users.[6] These are still early days in the social space when you consider that there are approximately 7 billion people[7] in the world and 5 billion people[8] with mobile devices that enable them to connect in ways that were impossible just years ago. The ability of 5 billion people to instrument the world and share their

experiences in a low-cost manner has forever shifted power away from the hands of the few to the network.

FIGHT GOVERNMENT CORRUPTION, IMPROVE ACCOUNTABILITY AND ENHANCE GOVERNMENT SERVICES

A culture of closed, opaque and secretive governance leads to corruption and ultimately to a government that doesn't work. Making data open to all, or democratizing data, empowers citizens to fight corruption. In countries like Brazil and India, citizens are using open data to umbrella against the never-ending rain of government corruption. Landmark programs and legislation in both countries have been a catalyst for citizens to fight for their rights to information, and thereby lead initiatives to tackle corruption and improve transparency.

Claudio Ferraz and Frederico Finan conducted a study in 2008 called "Exposing Corrupt Politicians: The Effects of Brazil's Publicly Released Audits on Electoral Outcomes." The two researchers focused on an anti-corruption program conducted by Brazil's federal government that audited and published the data on "any irregularity associated with fraud in procurements, diversion of public funds, or over-invoicing" through the Internet and local media.[9] They found that the exposure of the audits of 373 municipalities severed the relationship between constituents and politicians. "In the small city of Vicosa, in Alagoas, where a lot of corruption was found, the mayor, Flavis Flaubert (PL), was not reelected. He lost by 200 votes to Pericles Vasconcelos (PSB), who during his campaign used pamphlets and large-screen television in the city's downtown to divulge the report. Flaubert blames the CGU for his loss."[10]

Flaubert was one of a number of politicians exposed through these audits. The government of Brazil also depended on local media and radio to help make this data tangible and real to the public. The audit data was good news for some and bad news for others. If corruption was found in the data, "the reduction in the likelihood

of reelection in municipalities with three violations and radio becomes 29 percentage points." [11] Open data has a direct impact on election outcomes and ultimately how well the government performs.

One persistent champion for a Freedom of Information Act in Brazil is activist, author and journalist Fernando Rodrigues. Rodrigues created a website called Politicos do Brasil, which now houses details on the campaign finances of over 400,000 politicians.[12] Having started with just 25,000 data sets, Rodrigues quickly understood the value of open government information. He was able to expose corruption in the political process, outing a number of candidates and creating an "endless source of news stories for media outlets all over Brazil."[13] In an interview with BBC, Rodrigues said: "Only six months after the election, 343 mayors and legislators had already lost their jobs because so much data was available about them and it became easy to identify wrongdoings during the electoral process."[14]

Another example can be found in Rajasthan, India, where an organization called Mazdoor Kisan Sakthi Sangathan (MKSS, English translation: Organization for the Empowerment of Workers and Peasants) fought for the rights of the rural poor by demanding information from their government. The MKSS realized that secrecy on behalf of government officials was the primary obstacle to accessing records necessary to establish the legitimacy of wageworkers' accusations of not receiving their paychecks.[15]

The MKSS team was creative and worked around local government. For example, MKSS co-founder Shanker Singh retrieved a "muster roll" from an on-site project. [16] The muster roll was a list of workers along with how much they were supposed to be paid. The team then took a grassroots approach to try and match muster rolls with individuals, and they found some major holes between what a worker was supposed to be paid and what they were actually paid, if paid at all. MKSS hosted public audits to introduce these documents, showcasing how unfair wage practices were and thereby energizing a grassroots movement. [17] In 2005, India

assertively added the "Right to Information Act" as a law of the land, stating that "democracy requires an informed citizenry and transparency of information which are vital to its functioning and also to contain corruption and to hold Governments and their instrumentalities accountable to the governed."[18] Once the Right to Information Act was passed, MKSS had a legal right to these official documents.

MKSS began retrieving government data, deciphering it and putting the data into a language that the public could understand. They continued to host public audits of government data, and could mark where major discrepancies occurred. The corruption masked within this data included thumb printing of illiterate individuals attesting to receiving wages that they had not received, deceased workers on project lists that were allocated funds that practically "disappeared" (into someone else's pocket), and camel dung prints in place of thumb prints to falsely indicate affirmation next to a name. MKSS members found creative ways to display this corruption, including through song and dance and more symbolically, through "web walls," where local villagers would take wage information and paint it on a wall for all to see.[19]

The contagious passion of these and numerous other Indian villagers fighting for their right to information has led to a national government transparency movement and a decrease in corruption by local officials. Local government officials in Rajasthan have worked with MKSS and even showed up to public hearings to be a part of the discourse. During the hearings, the local individuals cite what they see as false information in the records, and "discussions become especially animated when public officials try to defend the projects that they supervised."[20] Officials are often called out on blatant lying and in front of an audience of hundreds, officials have handed over money to workers who were deprived.

MKSS goes beyond public audits and works to create a better working relationship between citizens and government. The end goal is a mutually beneficial environment for both the people and those elected to represent them.

MKSS fights to ensure that government information is not a privilege, rather a right.

CHANGE THE DEFAULT SETTING OF GOVERNMENT TO OPEN, TRANSPARENT AND PARTICIPATORY

When I served as the Chief Technology Officer of the District of Columbia (D.C.), I decided to change the default setting of government to open, transparent and participatory by throwing open D.C.'s warehouse of public data so that everyone—constituents, policymakers and businesses—could hold the government accountable, improve services and co-create innovative solutions. D.C. maintains vast stores of data on every aspect of government operations, from government contracts to crime statistics to economic development. It organizes this data into convenient catalogs and live data feeds, which we made available to the general public.[21] The District gathered real-time data from multiple agencies and delivered it to citizens—ensuring agencies operate as more transparent, responsive and better performing organizations.

Visitors to data.octo.dc.gov can find information on crime incidents by date, time of day, ward, block or method; details on construction projects by location, type of construction, budget, completion date or status; data on registered vacant properties by ward, address, owner or tax assessment; or information on businesses, such as the locations of District establishments that hold liquor licenses. Mapping technology also allowed users to view data geographically with a single click.

After the launch of this open data movement, we found that individuals and organizations were not only viewing the government data, but that users actually began analyzing and repurposing the information in very useful ways. One innovative D.C. resident took it upon herself to gather publicly available government data on service requests, crimes and building and public space permits to create a Web-based informational clearinghouse site that informs southeastern

D.C. residents about local real estate development and the quality of government services.

Adrian Holovaty, with a two-year grant from the Knight Foundation, transformed District data into an online community news forum at EveryBlock.com. Here, visitors can plug in their zip code and find and exchange information about everything of interest in their neighborhoods. This includes local businesses and reviews, real estate listings, crimes, road construction, city service requests and community meetings.

In another example, a private entrepreneur assembled law enforcement data from the District and across the country into an online database called "CrimeReports." Visitors can get crime data and maps by address, zip code and type of crime, as well as sign up for personalized crime alerts.

These are truly grassroots ventures. The democratization of government data revealed an enormous appetite for civic participation. This approach ushered in a new age of participatory democracy, one in which technology is developed by the people, for the people. Citizens shouldn't be treated as subjects that need to be governed; they should be treated as co-creators. That is why we launched the "Apps for Democracy" contest in 2008, challenging citizens, NGOs and the private sector to develop new software applications to make the government's data more accessible and useful for the general public and the government. Especially in difficult economic times, it's crucial to the government's mission to find more efficient and powerful methods for delivering an even higher level of service for a fraction of the cost.

The Apps for Democracy competition produced 47 applications that were conceived, developed and delivered in 30 days—applications that government alone would not have been able to create.[22]

The story of D.C. government's open data movement and the Apps for Democracy program are examples of a new age of participatory democracy, one in

which citizens are in the driver's seat when they interact with government. Citizens' accessibility towards information in their government has never been greater. And this is just the beginning.

While at the White House, I had the opportunity to scale the D.C. experiment at the national level by launching the Data.gov platform, which opened up the workings of the federal government by making economic, healthcare, environmental and other government information available on a single platform, allowing the public to access raw data, to transform it in innovative ways.

Data.gov has spawned a global movement—29 nations, 31 states, 13 cities and several international organizations have established open data platforms.[23] The biggest threat to the open data movement is the desire for governments to operate in a closed, secretive and opaque manner and to create a mirage of openness by releasing low value datasets. It is critical to hardwire the open data policy through legislation.

CREATE NEW MODELS OF JOURNALISM TO SEPARATE SIGNAL FROM NOISE TO PROVIDE MEANINGFUL INSIGHTS

The Common Agricultural Policy (also known as CAP) is a system of agriculture subsidies and programs in the European Union. This policy alone represents 48% of the EU's budget.[24]

Due to the number of nations in the European Union, as well as a lack of government transparency on agriculture subsidies, it was very difficult to track where the money for farm subsidies was going. Many farmers weren't making money, but at the same time the EU was paying large sums of money in subsidies.

The large scope of these subsidies and a shared desire for transparency brought a group of European journalists, researchers and activists together in 2005 to launch the data journalism project "farmsubsidy.org." This website provides detailed data on farm subsidies (both payments and recipients) in every EU member state, as

well as a Transparency Index that compares how well EU member states are doing at providing information on Common Agricultural Policy subsidies.[25]

"The network is very loose, from a journalistic view, it's a new thing," explains Danish journalist Nils Mulvad in the farmsubsidy.org documentary "Fields of Gold."[26] "Normally you don't want to share your research with NGOs, or people with a political background," he explains. "Deciding that we can work together on getting the data, and then everybody can use them for their own purposes… That made it possible for us."

The project is run by EU Transparency, a non-profit based in the United Kingdom and Kaas and Mulvad, a research and analysis partnership in Denmark. Funding has come from a variety of sources including The German Marshall Fund of the United States and The European Social Fund.[27]

The website also supports journalists and NGOs taking legal action to get data through the court system. In most cases though, it is farmsubsidy.org pushing for new transparency laws in EU countries and then extracting the resulting data published by governments.[28] The format of this government data is usually too difficult for most to understand, so farmsubsidy.org works to make it accessible for journalists and others who are interested in the information, in essence mining signals out of otherwise noisy data.

This publically available and easy to understand data puts pressure on the EU nations. It was the site's Transparency Index that inspired the Lithuanian government to reach out directly to farmsubsidy.org to find out how they can improve their ranking and took meaningful actions to do so. Today, they rank number four on the list, while Greece ranks at the bottom at number 27.[29]

Specific elements in the European Commission's forthcoming Common Agricultural Policy reform proposals can be traced to the work of farmsubsidy.org, says co-founder Jack Thurston.[30] This includes an emphasis on payment limits for large recipients of subsidies—following the site's revelations of six- and seven-figure

payouts to wealthy beneficiaries and large businesses—as well as requiring beneficiaries to be "active farmers," following the discovery of farm subsidies going to airports and golf clubs. Farmsubsidy.org serves as an effective counterweight to powerful European Union institutions.

Similarly, opacity in the French market for water is a serious issue where the market for tap water has been privatized at the city level and there is no central platform to compare one provider against the other. Two towns next to each other can pay very different prices for water, and not even know it. In France, the water utility market is comprised of more than 10,000 cities purchasing water to distribute to taxpayers, from only a handful of utility companies.[31]

The French NGO France Libertés is working on improving transparency in the French water market and empowering citizens and mayors who negotiate water utility deals. Two years ago, the French government decided to address the problem with a census on water price and quality, but this is moving at a snail's pace. To date, only 3% of the data has been collected.[32]

In hopes of speeding things up, France Libertés developed a crowdsourcing data experiment. Teaming up with *60 Millions de consommateurs* (they stand for the rights of French consumers), the NGO launched "prixdeleau.fr" (translated to mean "price of water"). This site allows users to scan and upload their water bill. Since March, the website has sourced over 5,000 water bills in France, tracking the prices of water across the country. A city near Paris even sent in all of its water utility bills (including schools and local administration buildings) to the project.[33]

According to prixdeleau.fr developer Nicolas Kayser-Bril, "The result is an unprecedented investigation that brought geeks, NGO and traditional media together and improved transparency."[34]

One big challenge facing this creative data project is that most households in France don't see their water bill, as many residents are renters, and it's automatically included in the rent. This prevents the project and issue from going mainstream.

Despite this, more than six months after the site's launch, conversion rates to providing water bill information are still strong, says Kayser-Bril.

"While this does not allow for a perfect assessment of the market situation, it showed stakeholders such as national water overseeing bodies that there was a genuine, grassroots concern about the price of tap water."[35]

This initiative is shining light on the gap in water prices across the country and has created pressure on the government and utility companies to address the problem.

LAUNCH MULTI-BILLION DOLLAR BUSINESSES BASED ON PUBLIC SECTOR DATA

There is an opportunity to create value with government data, and numerous new companies can be built on this data.

"We booked a one way ticket to D.C. and said we weren't going back to San Diego until we had the information we needed. We had to kick down the door, and we wouldn't take no for an answer," explain the Alfred brothers.[36] Their business BrightScope is a for-profit company based on government data. Brothers Mike and Ryan Alfred wanted to find a way to help Americans retire earlier, and discovered an innovative means to analyze 401(k) data from the Department of Labor and FINRA. They are an example of how open data can help spawn new businesses.

After submitting over 50 Freedom of Information Act requests to the Department of Labor to release audit report data, the Alfred brothers eventually retrieved annual data reports of Form 5500s.[37] The Department of Labor defines Form 5500 as, "a disclosure document for [401(k)] plan participants and beneficiaries, and a source of information and data for use by other Federal agencies, Congress and the private sector in assessing employee benefit, tax and economic trends and policies."[38] BrightScope found free, untapped government data that gave them enough information to begin building their multi-million dollar company.

Initially, all of the data that BrightScope requested was delivered as reams of paper in boxes. BrightScope then began "chipping through the rock to find valuable information."[39] The founding brothers lobbied repeatedly to get this data in a form that would allow them to start analyzing the information, and once they got it, it was the beginning of the creation of a large database of corporate filings with the Labor Department, Securities & Exchange Commission and FINRA to rate 401(k) plans.

The brothers then created a quantitative formula that scales from 1 to 100 to evaluate the effectiveness of an individual 401(k) plan. Their grading system measures "everything from the plan's investment choices and fees to its structure, including its generosity to employees," and the score identifies each plan's strengths and weaknesses.[40] This allows users to make more educated decisions about how strong their 401(k) plan is relative to other companies in their respective industry. Their goal is to make one's 401(k) plan simple to understand, easy to evaluate and readily available, which they do by publishing their evaluations online. “We wanted to bring transparency to the 401(k) market in order to help people retire,” say the brothers.[41]

BrightScope secured almost three million dollars in outside capital within one year of launching, and initially spent most of their funding solely on data entry. [42] Line by line, an initial team of 12 took 401(k) audit reports from the government and put the data into Excel sheets. The Alfreds started finding information that went missing in most 401(k) analyses because of an attachment that was located in a separate database than the standard form. "What the staff at the Department of Labor had on their desktops was different than the data made public." [43] They even found that many companies were filing audit reports differently. "Companies like Chevron contacted us and were asking us to educate them on a better way to file their 401(k) information." [44] In 2008, BrightScope had published about 800 401(k) plans, by 2010, more than 30,000.

BrightScope, through the analysis and evaluation of government data, found that Americans spend at least $4 billion in excess fees on 401(k) plans, thereby creating an opportunity for individuals and companies to find and shape better retirement plans.[45] "With nearly $3 trillion socked away in 401(k)s, it's ridiculous that no one has done anything with the data,"[46] says Mike Alfred.

Today, BrightScope employs approximately 40 people and is cash flow positive.[47]

Venture capitalists and entrepreneurs should not underestimate the value of government data. Healthcare, energy and education, among other areas, represent huge opportunities for innovation. As governments democratize data, there is a potential for hundreds of startups and the birth of billion dollar businesses based on this data.

RECOMMENDATIONS

Four specific actions can help to ensure that our society continues to build on and benefit from the power of open data and the network effect:

1) **Citizens and NGOs must demand open data in order to fight government corruption, improve accountability and government services.**

There is still a vast information gap between those with power and those without. Governments are supposed to serve the interests of their people, not themselves, yet too many decisions are made behind closed doors. The firewall between people and information generated as a function of governance is unnecessary and perhaps even undemocratic. Citizens must push for access to information from the government. In India and Brazil, this lack of transparency led to wide scale corruption, but citizen activists were able to force the government to share data with tangible outcomes. The same can be done around the world.

2) **Governments must enact legislation to change the default setting of government to be open, transparent and participatory.**

To hardwire the open government movement and to address some of the most difficult issues—such as releasing high value datasets, standardizing on regulatory reporting in an open and public way or making open data part of the procurement process—will require sweeping legislative change. There is a need to reset the way government operates, which can only be accomplished through comprehensive legislative reform.

3) **The press must harness the power of the network effect through strategic partnerships and crowdsourcing to cut costs and provide better insights**

Prixdeleau.fr and farmsubsidy.org demonstrate the power of collaborative storytelling and offer new models of reporting to traditional media outlets. The shift from a lone wolf approach to investigative journalism[48] to a collaborative approach (i.e., the network effect in journalism) leads to better outcomes, especially at a time when complexity is increasing exponentially, such as the global financial crisis, and newsrooms are short on time and resources and are looking for new models of journalism.

The explosion of open data produces a lot of noise, and this will require knowledgeable people coupled with the tools to separate noise from signal to provide meaningful insights. Strategic partnerships (journalists working with NGOs, activists and developers) can tackle this best together.

4) **Venture capitalists should invest in startups focused on building companies based on public sector data.**

Zilllow is valued at over $1 billion,[49] The Weather Channel was sold for approximately $3.5 billion in 2008,[50] and Garmin has a market cap of $7.24 billion.[51] These are all companies that were built using raw government data.

Venture capitalists should not underestimate the value of government data and how it could fuel a new ecology of startups while generating massive profits. BrightScope has successfully demonstrated the potential of leveraging untapped data to create a multi-million dollar company in less than two years. One can only imagine the opportunities for innovation in inefficient sectors of the economy, such as healthcare, energy and education.

Across time, the world has experienced many revolutions, and the information revolution fueled by open data and the network effect represents the largest shift in power. Similar to other revolutions, we will witness new industries emerge, others will be transformed and many will perish. We are still at the nascent stages of harnessing information and leveraging the network effect. Through these recommendations, citizens, government, the press and venture capitalists can ensure that we chart the innovative path in the 21st century.

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