

## AVERTING TRAGEDY OF THE RESOURCE DIRECTORY ANTI-COMMONS

A practical approach to open data infrastructure for health, human, and social services

By Greg Bloom, visiting scholar, Indiana University's Ostrom Workshop on the Commons

### **Introduction: What Is Community Resource Data?**

Community resource information is comprised of data about the health, human, and social services that are made available by government agencies and non-profit organizations (NPOs) to people in need: specifically, what services exist, where they are located, and how people can access them. This is public information, and yet it is persistently difficult to find.

This difficulty reflects the complexity of the health, human and social services that are represented by resource data. Organizations provide various services in different combinations at different locations. Funding for services comes from fragmented, overlapping jurisdictions and sectors, with no central institution that can establish and coordinate common practices. Access to services is limited according to various criteria as to who is eligible and under what circumstances. All of these details are in constant flux as a result of changes in funding, policy,

staff, and any number of other factors. Complicating matters further, diverse actors in varying contexts might each use different vocabularies to describe the same concepts.<sup>1</sup>

I learned about these challenges myself while working at a large community-based anti-poverty organization that provides dozens of services across multiple departments and facilities. I was responsible for managing “communications” — the primary purpose of which was fundraising. The organization’s website, for example, was designed to generate donations. I chose to add additional pages with specific information about how to access our various services, but I wasn’t expected to do so. Our peer organizations’ websites, by comparison, often described their services with a broad mission statement (i.e., “we give support to our neighbors in need”) alongside little more than a front-desk number to call for more information.

These experiences illuminated the root cause of the resource directory problem: many service providers lack strong incentives to attract new “clients.” Such providers often are not paid by their clients. Furthermore, providers often don't receive funding on a per-client basis. Even among those who receive fee-for-service revenue or reimbursement from particular funding sources, such compensation often isn't sufficient to cover the full costs of service. As a

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<sup>1</sup> For instance: “outpatient behavioral health treatment program” and “addiction therapy.”

result, the labor of disseminating information about their services is typically not a priority for already-overburdened staff.

One might assume that funders of services, whether governmental or philanthropic, would require resource data to be reported as a condition of funding, but this kind of policy is not typical. (I will discuss the *potential* for such a policy below.) Funders tend to collect data about inputs (number of clients served) and outputs (results of services), but not data about how a service is actually accessed, such as what documents might be required, application processes, hours of operation, and so on. Even the federal government, through 990 forms submitted to the IRS, only asks broad questions about organizations' programming — to which organizations tend to submit their mission statements.

All of these factors combine to make information about “community resources” harder to find and less reliable than information about commercial services in a conventional market, where vendors have strong incentives to attract customers. The most accurate, detailed information about such services are often produced *ad hoc* by frontline staff, and scattered among emails, PDFs, and paper flyers posted across their facilities.

## Who Maintains Community Resource Directories?

In lieu of organizations' self-directed promotion of their own service information, resource data tends to be manually aggregated by third parties in "community resource directories." Many, if not most, community resource directories are produced by the people who use them on a daily basis. This, too, I learned about firsthand: social workers at my organization built a Microsoft Access database of more than a thousand other organizations' services to which we would refer our clients, and spent hours every Friday afternoon maintaining it. Other organizations would occasionally ask us for copies of this database, and use it to create their own community resource directories — which led to a proliferation of places where we were expected to spend time keeping our own information up to date, despite our lack of incentive to do so.

This experience was in the late aughts, when the emergence of Wikipedia (among other sites of open knowledge production) generated excitement about the prospect of "commons-based peer production."<sup>2</sup> It seemed at the time like the community resource directory data problem could soon be solved by "crowdsourcing." Some such sites did appear, like the San

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<sup>2</sup> See for example Clay Shirky's *Here Comes Everybody* (New York: Penguin Books, 2008) and *Cognitive Surplus* (New York: Penguin Books, 2010), and Yochai Benkler's *Wealth of Networks* (New Haven: Yale University Press, 2006).

San Francisco Homeless Wiki, yet they tended to be produced by one or two unusually committed individuals, and would peter out after a few years.<sup>3</sup> More than a decade later, the value proposition of the community resource directory wiki remains largely unrealized.

As the years went by — while I witnessed one community resource directory project after another start, sputter, and be abandoned — I came to realize how old this problem is, and how the internet is ironically exacerbating it. In the mid-20<sup>th</sup> century, local libraries would maintain community resource information files as an additional service to their community.<sup>4</sup> Through the 60s and 70s, increasing amounts of federal funding for nonprofit organizations fueled the formation of a professional sector known as “information-and-referral” (I&R). In 1973, the Alliance of Information and Referral Systems (AIRS) formed as a trade association for this field, setting standards and providing support to a membership that grew to include more than 1,000 organizations across the country. These conventional “I&R providers” typically operate call centers (such as local 2-1-1 hotlines, aging and disability resource centers, childcare resource and referral centers, etc), through which inbound callers receive information from resource databases

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<sup>3</sup> Fitch, Dale. “Wherefore Wikis?” *Journal of Technology in Human Services*, 25(4), 79–85.  
doi:10.1300/j017v25n04\_05

<sup>4</sup> Kate Williams and Joan Durrance consider this practice to be a key point of inception for the field “Community Informatics” as a whole. “Community Informatics,” *Encyclopedia of Library and Information Sciences*, Third Edition.(2010) DOI: 10.1081/E-ELIS3-120043669

that the I&Rs maintain through outbound calls to health, human, and social service organizations.

Since the turn of the century, a range of startups (both non-profit and for-profit) have taken new entrepreneurial approaches to this challenge of I&R. This emerging market is largely fueled by demand from the healthcare sector for “care coordination” solutions that can address the “social determinants” of health by connecting patients with social services.<sup>5</sup> (Similar startups are courting educational and correctional sectors; however, healthcare is where companies can find the most demand — and capital.) As described by a recent research report produced by the Social Interventions Research & Evaluation Network, this “dizzying array of new technology platforms have emerged with the shared aim of enabling health care organizations to more easily identify and refer patients to social service organizations.”<sup>6</sup> The SIREN report observes that resource directory maintenance is a challenge common to all of these platforms; the vendors thereof tend to scour the web for resource directory data (especially the sites maintained by conventional I&R providers), and then pass the ongoing costs of data maintenance onto their

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<sup>5</sup> Freij M, Dullabh P, Lewis S, Smith SR, Hovey L, Dhopeswarkar R. “Incorporating Social Determinants of Health in Electronic Health Records: Qualitative Study of Current Practices Among Top Vendors” (2019) *JMIR Med Inform* 7(2):e13849. See also: Buitron de la Vega, P, Losi, S, Sprague Martinez L, et al. “Implementing an EHR-based screening and referral system to address social determinants of health in primary care.” (2019) *Medical Care*. 57:S133–S139. doi: 10.1097/MLR.0000000000001029.

<sup>6</sup> Cartier Y, Fichtenberg C, & Gottlieb L. “Community Resource Referral Platforms: A Guide for Health Care Organizations.” San Francisco, CA: SIREN. (2019) Available at: <https://sirennetwork.ucsf.edu/tools-resources/resources/community-resource-referral-platforms-a-guide-for-health-care-organization>

users – either through added fees, or an expectation that users will produce and maintain this information themselves.

Across both markets of referral providers — the conventional call centers and emerging web-based startups — these information services tend to be bundled “end-to-end.” Aggregation, maintenance, classification, curation, and delivery: each conducted by every intermediary. Today, most of these “information intermediaries” consider the resource data that they aggregate to be their private property.<sup>7</sup> These organizations typically provide access to their aggregated, bulk resource data only upon condition of payment.

### **The Ongoing Tragedy of the Resource Data Anti-Commons**

To summarize this overview of the resource directory problem, we’ve discussed three distinct modes by which resource data is produced:

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<sup>7</sup> Such intellectual property claims would be difficult to enforce: longstanding legal precedent holds that publicly-knowable facts, even when laboriously aggregated, cannot be subject to copyright without some degree of creative presentation. (See *Feist Publications vs Rural Tel. Service Co.* (1991) <https://caselaw.findlaw.com/us-supreme-court/499/340.html>.) Resource directory maintainers may claim that their curation, especially categorization, of resource data is a creative work, but this still would not prohibit a third party from ‘scraping’ resource data from a directory website, and repurposing that data in some other way. This precise right was recently affirmed in federal court — see Kerr, O. "Scraping A Public Website Doesn't Violate the CFAA, Ninth Circuit (Mostly) Holds," *The Volokh Conspiracy*. (November 1, 2019) <https://reason.com/2019/09/09/scraping-a-public-website-doesnt-violate-the-cfaa-ninth-circuit-mostly-holds/>

- *Self-production*: Organizations that provide health, human, and social services can publish this information themselves. However, they often don't have strong incentives to do so, and aren't required by their funders.
- *Co-production*: Resource directories are produced by the people who use them, though these co-produced directories typically struggle to reach any significant scale, or to sustain themselves.
- *Intermediary production*: resource directories are produced by third party providers — conventionally, call centers; recently, web-based software vendors — that provide the service of information about services. However, these intermediaries tend to treat the resulting data as their property, and enclose it within their proprietary channels.

This state of affairs may be understood as a kind of “knowledge anti-commons.”

Initially coined by Heller, an “anti-commons” occurs when rights to a shared resource are held concurrently by multiple parties — each of whom can exclude others — leading to systematic underutilization of the resource.<sup>8</sup> Though digital resources are non-rivalrous (in that they are not diminished by use) and non-excludable (in that, once published, they can be used by many

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<sup>8</sup> Heller, M. “The Tragedy of the Anticommons: Property in the Transition from Marx to Markets.” William Davidson Institute Working Papers Series 40. (1997)



parties simultaneously, in ways that are difficult if not impossible to restrict), they can still become tragic anti-commons.<sup>9</sup> In this case, when the same resource directory information is aggregated simultaneously across multiple databases by multiple parties, the result is a proliferation of data silos that each struggle to sustain themselves — while competing with each other, directly or indirectly. With more and more sources of less and less reliable information, supply grows while demand remains unmet.

In any given community, at any given time, one might find multiple efforts to build a 'centralized community resource clearinghouse' in various stages of design, launch, or collapse. Successful instances of this method — in which a single community resource directory serves as a canonical, sustainable platform of human service information for an entire community — are rare, perhaps even unprecedented. Given the vast, context-specific range of needs in a given community, it is exceedingly difficult to design one set of interfaces that can effectively serve all possible users. When attempted anyway, this mode of intervention tends to repeat and reinforce the anti-commons pattern: yet another system ends up competing for resources and attention.<sup>10</sup>

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<sup>9</sup> Kamppari, S. "Tragedy of digital anti-commons," Helsinki University of Technology, Networking Laboratory. (2004) [https://www.netlab.tkk.fi/opetus/s38042/s04/Presentations/06102004\\_Kamppari/Kamppari\\_paper.pdf](https://www.netlab.tkk.fi/opetus/s38042/s04/Presentations/06102004_Kamppari/Kamppari_paper.pdf)

<sup>10</sup> This reflects the classic characteristics of a 'wicked problem.' Rittel, H., and M. Webber; "Dilemmas in a General Theory of Planning" pp 155-169, Policy Sciences, Vol. 4, Elsevier Scientific Publishing Company, Inc., Amsterdam, 1973.

This is not to dismiss the prospect of collective action. As Elinor Ostrom has shown, practical solutions to collective action problems may best be achieved through *polycentricity* — distributed, nested, and interconnected systems of production and decision-making. In this context, polycentricity might entail re-alignment of the modes of resource data production described above, along with their associated actors and incentive structures, around shared infrastructure and processes. Instead of being centralized within one monolithic system, *resource data as a commons* could circulate through a distributed ecosystem of heterogeneous technologies and institutional contexts.

### **Toward a Polycentric Resource Data Commons: The Open Referral Initiative**

In an essay published in Code for America’s *Beyond Transparency*, I first described the resource directory data anti-commons and articulated the possibility of cooperative solutions.<sup>11</sup> Shortly after the essay’s publication, I facilitated a series of dialogues among institutions involved in community resource data aggregation and/or dissemination (including

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<sup>11</sup> Bloom, G. “Towards a Community Data Commons,” *Beyond Transparency*. B. Goldstein and L. Dyson, eds. Code for America. (2013)

AIRS, Code for America, [Google.org](http://Google.org), and others). Through these dialogues, I proposed and launched the Open Referral Initiative in 2014.

Open Referral's mission is to develop data standards and open source tools that make it easier to produce and circulate resource directory data as an open, common good. This mission serves a vision of a future in which everyone has access to, and the ability to use, reliable information about the resources available for people in need.

In contrast to the concept of a “centralized platform,” Open Referral is not a product but rather a community of practice that fosters cooperative capacities among actors who have previously been trapped in anti-commons dilemmas. Similar in function to that of a Standard Setting Organization<sup>12</sup> (though less formal in structure) Open Referral facilitates participatory research and development processes through which priorities are set, and outcomes evaluated, by people working closest to the actual problem at hand – often service providers who maintain resource directories and/or provide referral services to people seeking help. This development process entails iterative, distributed cycles of research, deliberation, modeling, testing, and

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<sup>12</sup> Simcoe, T. "Governing the Anticommons: Institutional Design for Standard-Setting Organizations," *Innovation Policy and the Economy* 14 (2014): 99-128

deployment, involving multiple stakeholders from multiple communities, each with their own socio-technical landscape and tactical objectives.<sup>13</sup> It is a live experiment in polycentricity.

### *Solving One Piece of the Puzzle: Interoperability Through Resource Data Standards*

In 2014, Open Referral developed version 1.0 of the Human Services Data Specification (HSDS), a non-proprietary data interchange format. HSDS has been adopted by dozens of organizations to share resource data among various channels — from web and mobile applications, to call centers, and even printed directories. In 2017, Open Referral introduced version 1.0 of the Human Services Data Application Programming Interface protocols (HSDA),<sup>14</sup> modeled off of HSDS, to enable real-time data exchange. In 2018, the Alliance of Information and Referral Systems (the official membership association for I&R providers) formally endorsed the use of HSDS and HSDA as industry standards for resource data exchange.<sup>15</sup>

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<sup>13</sup> Insights from these processes are reflected in claims made by this essay, and aggregated in Open Referral’s website (<https://openreferral.org/category/blog>) and associated public documentation, viewable at <https://drive.google.com/drive/folders/0B-5CZ4ZLjTHqfk12WTFUbVkiNjBYMjRaZTlZRlN1UjhWMS1MN0tLV3Q4ejY3TWpOYWwwVDg>

<sup>14</sup> Application Programming Interfaces (APIs) enable computer programs to access the contents of databases. Standardized API protocols provide common conventions so that different APIs can speak the same ‘language.’

<sup>15</sup> <https://openreferral.org/airs-recommends-open-referral-for-resource-database-interoperability/>

As a result, there is now a common method by which the same resource data can be used by many systems – and through which resource data from many systems can be synthesized for the same type of use. These protocols have already helped organizations reduce the costs of developing new resource directory websites, redeploying already-built websites and tools, and exchanging resource data among intermediaries.

The development of open standards is a necessary pre-condition to the establishment of resource data as a public good, provisioned through polycentric institutional cooperation; however, it is not sufficient. A formidable collective action dilemma is yet to be resolved: If resource data is to be openly accessible, yet it requires effort to maintain, how can such maintenance be sustained?

### **Hypothetical Models for Sustainable Open Resource Data Production**

To seek answers for this question of sustainability, we can draw an array of principles and pattern languages for the institutional design of data infrastructures from the emerging literature about ‘knowledge commons.’<sup>16</sup> These principles guide the strategic development of

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<sup>16</sup> Frischmann B, Madison M, and Strandburg, K. *Governing Knowledge Commons*, Oxford University Press. (2014)

the Open Referral Initiative and its associated pilot projects, in which diverse sets of actors — from intermediary I&R providers, to emerging startups, to local community anchor institutions, governments and funders — work together to formulate and test hypotheses as to how resource data might be established as a commons.



A set of hypothetical models have emerged through this process. Corresponding loosely with the modes of resource data production described above, we'll describe these models as:

- A service registry
- A data utility
- A data collaborative
- A data trust

These hypothetical models should not be considered mutually exclusive. Indeed, hybridized designs may be the most likely to succeed. Nevertheless, it will be helpful to consider each on its own terms.

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See also: Neylon, C. "Sustaining Scholarly Infrastructures through Collective Action: The Lessons that Olson can Teach us." KULA: knowledge creation, dissemination, and preservation studies. 1(1), p.3. (2017) DOI: <http://doi.org/10.5334/kula.7>

*The service registry: publication by authority.* A Register is an official official list.<sup>17</sup> A register could be, for example, established by a funder to aggregate canonical information about the entire set of services that it funds. As such, a Service Registry model could address the resource directory problem at its root, by requiring service providers to keep information about their services up-to-date as a condition of funding. This would establish information about services — like the services themselves — as a public good.

This model is being tested by a range of institutions, both governmental and philanthropic. For instance, New York City’s Mayor’s Office of Opportunity is using HSDS to standardize data extracted from NYC’s health, human, and social services contracting system, and has published the resulting register of contracted services on the city’s open data portal.<sup>18</sup> Meanwhile, the Florida Legal Aid Resource Federation (FLARF) has developed a shared registry of every legal aid provider in Florida that receives funding from the Legal Services Corporation and Florida Bar Foundation. In this instance, each provider is expected to input their service information into a form deployed within their case management system, which outputs

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<sup>17</sup> See the Open Data Institute’s 2018 report, “Registers and collaboration: making lists we can trust.” <https://theodi.org/article/registers-and-collaboration-making-lists-we-can-trust-report/>

<sup>18</sup> <https://openreferral.org/nyc-government-publishing-open-data-for-municipally-contracted-service-providers/>

aggregated resource data that is shared back with, and verified by, the peer network of providers.

*The Data Utility: Sustainable 'Infomediary' Infrastructure.* A reformulated version of the “centralized clearinghouse” concept, the Data Utility model takes an infrastructural “infomediary” approach to the resource data problem: rather than one system that everyone would supposedly use, a Data Utility can serve as the centralized supplier of up-to-date open resource data that can be accessed simultaneously by many different information systems, institutions, and associated users. In turn, the Utility can recover the costs of production through fees for value-added services desired by organizations that require high-performance functionality associated with the data.<sup>19</sup>

In this Data Utility model, one infomediary bears responsibility for stewardship of resource directory data it does not own; the data would be openly accessible to third parties via an open API. The Utility can become sustainable through revenue earned from the provision of

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<sup>19</sup> For examples of open data business models, see Janssen M and Zuiderwijk A "Infomediary Business Models for Connecting Open Data Providers and Users" *Social Science Computer Review* 1-18 (2014) DOI: 10.1177/0894439314525902

See also Donker, F.W. and Loenen, B. “Sustainable Business Models for Public Sector Open Data Providers,” *Journal of eDemocracy & Open Government*. 8. 28-61. (2016) 10.29379/jedem.v8i1.390



specialized club goods — such as premium services and value-adding features — for which a subset of institutions have the resources and motivations to pay. Through market analysis and pilot experiments, Open Referral's Miami Open211 pilot has affirmed this hypothesis that a range of organizations which currently maintain duplicative databases would instead use data supplied by a reliable third party; a sufficient number of these institutions indicate interest in paying for services such as unlimited API access and frequency of updates, and/or features such as customizable classification tools, whitelabeled custom websites, special filters, reports, and other curatorial products.<sup>20</sup> Most promising of all, a successful Data Utility could analyze traffic patterns (such as search terms, clicks, etc) across all of the channels that use its API, generating valuable insights about communities' needs, resource allocation, and program effectiveness at a scale and granularity that is not currently possible.

*The Data Collaborative: A Cooperative Network of Resource Data Producers.* In a Data

Collaborative model, resource data is a common pool resource, co-produced among multiple

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<sup>20</sup> <https://openreferral.org/miami-open211-developing-new-business-models-for-resource-data-as-a-service/>

organizations that cooperatively align their efforts — distributing the burden of data production and maintenance, and sharing in its benefits.<sup>21</sup>

This model assumes that even though intermediary organizations might compete with each other for funding and other resources, they share common interests in the quality of available resource data. If, by developing a “pre-competitive” resource data supply chain, such intermediaries could process more information of higher quality at lower cost, then they would be able to shift their own resource allocation to invest more into their core programmatic activities, such as curating and delivering this information in ways that are custom-tailored for their particular clients and contexts.

The prospect of a resource data collaborative poses serious technical and institutional design challenges, which intersect with each other. Technologically, multi-lateral resource data management could be facilitated by the development of a “federated publishing platform” that enables records to be matched across databases, updates to be shared, conflicts to be identified and resolved, etc.<sup>22</sup> However, a successful federation will require more than just technology.

Ostrom identifies a range of conditions that need to be established in the “struggle to govern the

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<sup>21</sup> See the GovLab’s aggregation of research on data collaboratives at <http://datacollaboratives.org>

<sup>22</sup> Bloom, G. “An Open Data Approach to the Human Service Directory Problem,” Bloomberg Data for Good Exchange Conference (2015).  
[https://www.academia.edu/16449530/An\\_Open\\_Data\\_Approach\\_to\\_the\\_Human\\_Service\\_Directory\\_Problem](https://www.academia.edu/16449530/An_Open_Data_Approach_to_the_Human_Service_Directory_Problem)

commons” — such as social capital shared among members, the development of monitoring capabilities, the means of enforcing norms, and the ability to exclude non-compliant actors from the common pool.<sup>23</sup>

There are few precedents for such cooperation in the field. A rare example is the Community Information Online Consortium: CIOC is a cooperative that provides a software platform to its organizational members, includes dozens of infomediaries across Ontario, Canada. Over more than a decade, CIOC has developed data collaboration tools that enable its members to not only share data but also work together to improve its quality over time. CIOC's leadership has described a set of “lessons learned” from this experience, which appear to reflect the principles of Ostrom's Institutional Analysis and Design framework. For example, CIOC's successful data partnerships tend to emerge from strong relationships that establish clear boundaries around which resources will be stewarded by which infomediaries, and clear expectations about how those responsibilities should be upheld.<sup>24</sup>

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<sup>23</sup> Dietz T, Ostrom E, Stern P, “The Struggle to Govern the Commons,” *Science* 302 (5652):1907. (2003)

<sup>24</sup> Presented at the 2019 Workshop on the Ostrom Workshop at Indiana University; notes available here: [https://docs.google.com/presentation/d/11OpmmXaj-3-aHHxzn23-UaGkUSyBA\\_ItG5-Plo-DoYo/edit#slide=id.p](https://docs.google.com/presentation/d/11OpmmXaj-3-aHHxzn23-UaGkUSyBA_ItG5-Plo-DoYo/edit#slide=id.p)

See also: <http://opencioc.org/>

The Data Collaborative approach is also being tested in the Service Net pilot, led by Benetech, among multiple referral providers in the San Francisco Bay Area. Through Service Net, Benetech is developing open source infrastructural tools that enable multi-lateral data management among previously-siloed resource databases.<sup>25</sup> This initiative, if successful, could be transformative for the field.

*The Data Trust Model: Governing Resource Data as a Commons.* The previous three models describe new potential methods of data production. A Data Trust may serve as a potentially useful method of data governance, in that it can ensure operational viability of any such method.

Data trusts are a new version of an old concept: as a fiduciary instrument, a “trust” is a legal instrument that can hold and execute assets on behalf of designated beneficiaries.<sup>26</sup> The concept of a trust offers several benefits that help communities cope with the dilemmas that pertain to their data.

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<sup>25</sup> <https://openreferral.org/introducing-benetech-service-net/>

<sup>26</sup> Wylie B, McDonald S, “What Is a Data Trust?,” Center for International Governance Innovation. (2018) <https://www.cigionline.org/articles/what-data-trust>

See also Porcaro K. “In Trust, Data: The Trust as a Data Management Tool.” (2019) Available at SSRN: <https://ssrn.com/abstract=3372372> or <http://dx.doi.org/10.2139/ssrn.3372372>

For example, a trust can establish a set of principles and priorities reflecting the interests of various stakeholders for whom the data is collected and maintained, and, accordingly, a set of rules pertaining to the use of this data. Those rules can change over time through processes that are transparent and accountable to the beneficiaries.

The trust can then serve as a coordinating mechanism, bringing to bear capacities such as legal expertise, software, scientific processes, etc — while ensuring that these actors are constrained in accordance with the rules established by the Trust. The Trust can facilitate monitoring of these activities, and solicit appropriate consent for production and use of resource data and other associated assets. Finally, the Trust can manage the process of valuation and transactions involving services associated with the resource data. In this way, the Data Trust can disentangle the fate of community resource directory data from the actions of the parties that might temporarily collect, store, or use it, establishing a kind of collective ownership over the former and accountable stewardship of the latter.

## **Conclusion**

This chapter has described the resource directory data anti-commons: many types of users need resource directory data, and many types of producers produce resource directory data, yet these activities are both concurrent and non-cooperative, resulting in a proliferation of resource data sources that don't actually satisfy demand. We explored the contours of this market failure by examining distinct methods in which resource data is produced: provided directly from an organization about its own services, or co-produced by users of the data themselves (such as peer service providers in internal resource directories, or “help-seekers” on wikis, etc), or aggregated by an intermediary organization that supplies it as a service to third parties.<sup>27</sup>

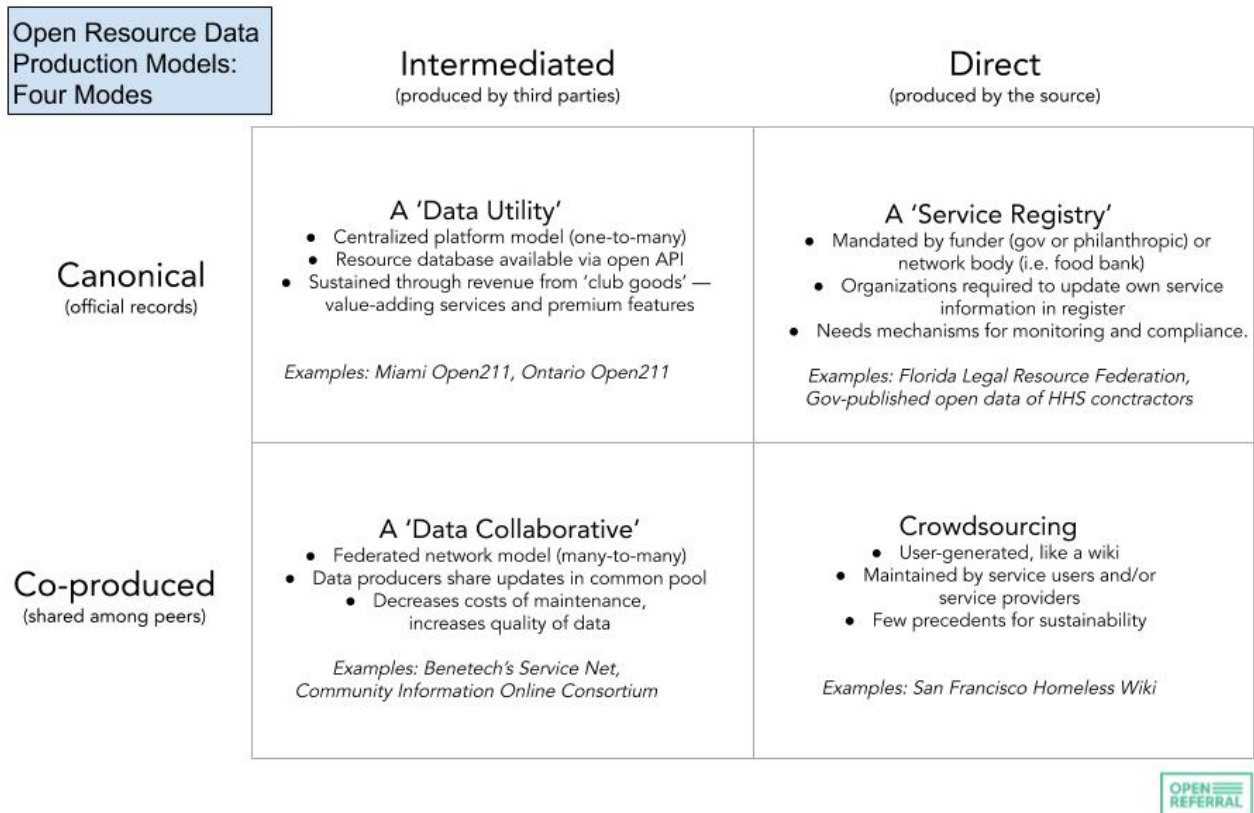
Finally, we've explored a set of hypothetical models that can address the points of failure for each of the above modes of production – from a “service registry” model that can be implemented directly by funders about their own contractors and grantees, to a “data utility” model through which an intermediary can sustainably monetize the provision of open data, to a

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<sup>27</sup> In *Digital Dead End* (Cambridge: MIT Press, 2011. p110-120), Virginia Eubanks recounts a resource directory maintained by clients of a local YWCA. This site of peer-based knowledge production fostered “relationship building” and “peer learning,” enabling service users to “[explore] ways of knowing,” and “creating spaces for collaborative analysis.” Their peer-produced directory was eventually rendered obsolete by the launch of a local information-and-referral hotline. This call center had more capacity to maintain resource information at a greater scale, yet it shifted the context in which this information was produced as well as used — from clients of services working together as peers, to professionals serving callers. This may have been a more efficient means of information production, yet it resulted in the loss of ‘tacit’ knowledge that service users would share with each other, and the context in which that knowledge might be produced and shared.

“data collaborative” model in which multiple intermediaries can cooperate in the management of shared resource data.

See *Figure 1* for a depiction of these modes in relation to each other:



**FIGURE 1: FOUR MODES OF RESOURCE DATA PRODUCTION**

These models are complementary and likely require some hybridization to succeed. For example, the potential value of a Service Registry may be most practically realized when a funder contracts a Data Utility to deploy a registry, monitor it, and ensure compliance. And a Data Utility might be made more sustainable through the development of a Data Collaborative, which can efficiently distribute responsibility for resource data maintenance among members' domains of expertise. In turn, stewardship from a trusted Utility may bolster the ongoing viability of a Collaborative. For any given community's unique institutional landscape, the most effective solutions may be best found through a process of research and development, dialogue and deliberation, and trial and error.

Such long-term, relational, process-driven work is difficult to fund. Government procurement processes expect a complete workplan mapped out in advance; philanthropies expect simple solutions with linear, easily measurable impacts. However, governments and philanthropies are not merely sources of funding; they are also stakeholders, as prospective users of both the resource data itself and the analytics that can be gleaned from the monitored use of the data infrastructure. As I&Rs and their prospective partners seek funding for research and development of new data supply chain infrastructure, they can help governments and philanthropies understand the great potential to for this infrastructure to enhance their collective



capacities for community needs assessment, programmatic evaluation, and data-driven decision-making.

The development of such infrastructure is certainly not sufficient as a strategic intervention to establish equitable outcomes in the health, human, and social service sectors. Yet as a precondition for these sectors' evolution into complex, adaptive systems — through which diverse actors can monitor requests for help across contexts, observe patterns of service delivery, identify areas of unmet needs, and advocate for more appropriate patterns of resource allocation — it may be necessary.