January 17, 2017

To: County Council

From: Leslie Rubin, Senior Legislative Analyst
                    Office of Legislative Oversight

Subject: **The Role of Chief Data Officers in Government**

> *Data can enable government to do existing things
> more cheaply, do existing things better and do
> new things we don't currently do.*[1]

As governments expand their use of and reliance on data to shape policy and influence day-to-day decision-making, the management of government data takes on a more critical role. In response, many jurisdictions are hiring a Chief Data Officer (CDO) to manage data, oversee data quality, and guide data use. This report responds to the County Council's request to the Office of Legislative Oversight for more information on the role and responsibilities of Chief Data Officers in government.

This memorandum report:

- Summarizes the growth of data use in government decision-making and service delivery,
- Describes the position of a government Chief Data Officer,
- Explains how a Chief Data Officer differs from a Chief Information Officer, and
- Identifies federal, state, and local jurisdictions that employ a Chief Data Officer and describes the innovative use of data in two contexts.

A. Data in Organizations

More than ever, the federal, state, and local governments are examining how to "leverage" or use data as an organizational asset rather than simply collecting and storing data as a byproduct of providing services.[2] Organizations and government entities typically generate isolated datasets that cannot be used together across departments, agencies, or business units. Bringing these data silos together with a unified data strategy "can unlock enormous business value."[3]

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[1] Rutter, Tamsin, "How big data is transforming public services – expert views," www.theguardian.com (Apr. 17, 2014). https://www.theguardian.com/public-leaders-network/2014/apr/17/big-data-government-public-services-expert-views

[2] Aiken, Peter and Gorman, Michael, *The Case for the Chief Data Officer: Recasting the C-Suite to Leverage Your Most Valuable Asset*, at p. 21 (2013) [hereinafter "*The Case for the Chief Data Officer*"]; Moore, Jack, "Rise of the Data Chiefs: Meet the Federal Officials Aiming to Usher in Government's 'Golden Age' of Data," www.nextgov.com (Mar. 18, 2015); Snowdon, Jane, "How chief data officers can improve agency decisions," www.federaltimes.com (Jun. 15, 2015); "Chief Data Officers: Unlocking the Power of Big Data for Federal Agencies," Dun & Bradstreet Government Business Council, at p. 1 (Aug. 2015) [hereinafter "'Chief Data Officers,' Dun & Bradstreet"].

[3] "Chief Data Officers," Dun & Bradstreet, at p. 1.

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Many jurisdictions have developed open data initiatives to make government data publicly available in a way that individuals can access and easily use the data without having to make a request to the government, typically publishing datasets on a public website or "open data portal" and reaching out to the public to solicit input and encourage use of the datasets.[4] Many jurisdictions have developed data-supported online applications and services that let users view and manipulate data and often provide online forums and message boards to allow feedback from people who use the data.

Harnessing the value in data to its fullest potential requires an understanding of what the data are and what they can do. Specialized businesses dedicated to helping public and private clients use open data successfully – such as Open Data Nation[5] and DataKind[6] – have emerged in recent years. This has coincided with an increase in demand for "data scientists" – individuals who bring together knowledge of statistics, analysis, programming, data mining, and communications – who can clean, combine, analyze, and tell a story with large and complex datasets.

Public jurisdictions are discovering that the type of data analysis that companies such as Google, Amazon, LinkedIn, and eBay have been doing for years to connect the dots between seemingly unrelated "things" can enhance the creation of policy and/or delivery of government services (see Section E). Many federal departments and agencies and state and local governments that want to make in-depth data analysis a normal part of government business are hiring a Chief Data Officer.

B. What is a Chief Data Officer?

Peter Aiken, an Associate Professor of Information Systems at Virginia Commonwealth University and nationally-recognized data management authority, describes a Chief Data Officer as an individual in an organization whose sole responsibility is to facilitate using data efficiently in order to further the organization's goals.[7] One report describes the CDO as a "chief data evangelist," referring to the CDO's role in spreading the word throughout an organization about the benefits of using data.[8]

The structure of data management in an organization or government agency can help focus the work of a CDO. "Data management" includes many varied areas[9] such as:

- Data governance – ensuring that data is collected accurately and consistently
- Data quality – maintaining data accuracy and consistency over its life-cycle
- Data integration – combining separate datasets to gain insight from the combined information
- Data mining – extracting useful information from large datasets
- Data security – protecting data from unauthorized use or dissemination

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[4] See Montgomery County's open data website at https://data.montgomerycountymd.gov/. Dataportals.org identifies 100 government open data websites in the United States. http://dataportals.org/

[5] http://www.opendatanation.com/

[6] http://www.datakind.org/

[7] *The Case for the Chief Data Officer*, at p. xv.

[8] "Chief Data Officers," Dun & Bradstreet, at p. 3.

[9] See, e.g., "Chief Data Officers," Dun & Bradstreet, at p. 2; "The Big Debate: Are Chief Data Officers a Tactical or Strategic Force?", Data Digest Online (Apr. 21, 2016) http://www.datadigestonline.com/2016/04/the-big-debate-are-chief-data-officers.html; https://www.icpsr.umich.edu/icpsrweb/content/datamanagement/dmp/elements.html.

Organizations that collect data often have existing procedures or practices related to data governance and data security, regardless of whether they employ a CDO. Data integration and data mining in organizations that collect data are less common and many organizations look to a CDO when they want to expand into those realms of data management.

The primary role of a CDO in an organization at any given time will be determined by an organization's current state of data.[10] Some organizations' data are in a primitive state and cannot be used effectively in their existing forms (data quality). Other organizations clean and combine existing datasets with the goal of extracting useful business information (data integration and mining). Examining the state of data in an organization or jurisdiction can help focus the primary role of a CDO at any given time. The IBM Institute for Business Value's *The Chief Data Officer Playbook* describes three different roles that a CDO can play based on the state of data.[11] *The Chief Data Officer Playbook* warns, however, that CDOs cannot fulfill all three roles at once.[12]

Data Integrators *Building a data foundation via technology infrastructure and data governance*	Data integrators focus on implementing a modern and integrated data system in an organization just beginning to explore how to incorporate the use of data in business decision-making – establishing a foundation for the meaningful use of existing data. These CDOs focus on establishing a data governance model to ensure data quality and protection going forward.
Business Optimizers *Instilling an organizational culture of data-driven decision-making*	In organizations with an established data structure, business optimizers guide an organization's ability to make decisions and optimize business processes using data from the established structure. These CDOs can expand an organization's data assets by bringing in outside data that will enhance the use of existing organizational data and/or can focus on analyzing and using existing data to optimize operations.
Market Innovators *Seeking innovative, data-supported business models*	Market innovators push the envelope of data acquisition and use – seeking new ways to collect and integrate data from various sources into decision-making. These CDOs often don't focus either on cementing the infrastructure of data or the day-to-day analysis of data. These CDOs think strategically to see where data can eventually take an organization.

C. How does a Chief Data Officer differ from a Chief Information Officer?

Professor Peter Aiken makes a strong case in his book *The Case for the Chief Data Officer: Recasting the C-Suite to Leverage Your Most Valuable Asset* that a Chief Data Officer differs from a Chief Information Officer (CIO).[13] The position of Chief Information Officer stems from the increasing use in business of technology to automate business processes such as billing, payroll, personnel, and inventory. As businesses and governments increased their use of technology, leaders saw the need for an individual to be in charge of technology in the organization – the CIO.[14] Among other responsibilities, CIOs are expected to:

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[10] *The Chief Data Officer playbook*, IBM Institute for Business Value, at p. 4 (2016).
[11] Ibid.
[12] Ibid.
[13] *The Case for the Chief Data Officer*, at pp. 6-7.
[14] Ibid. at p. 11.

- Provide leadership,
- Develop IT infrastructure,
- Understand technology, and
- Lead large organizational changes.

A Chief Data Officer, by comparison, focuses exclusively on leveraging an organization's data to improve the organization – whether it is a business or a government. This includes helping employees see how using data in decision-making can improve their work and outcomes and helping employees incorporate the use of data effectively.[15] While an organization's data generally is captured by and stored in an information technology system, development and oversight of the IT system would fall to a CIO where oversight and use of the data would fall to a CDO.

D. Who does a Chief Data Officer report to?

The decision of who a Chief Data Officer reports to can have a significant impact on whether the CDO position can succeed. Currently, CDOs typically report to one of three types of positions: (1) the Chief Executive Officer/Chief Administrative Officer, (2) the Chief Information Officer, or (3) the head of another functional area, such as a Chief Operating Officer or Chief Financial Officer. Several sources recommend that a CDO report to a CEO (or a CAO in local government) because that structure "emphasizes the strategic value placed on data and reflects an organizational mandate for culture change and innovation."[16] The next table summarizes pros of cons of having a CDO report to different positions.

Who Does a CDO Report To? Pros and Cons

	Pros	Cons
Chief Executive/ Administrative Officer	• High level support empowers CDO • CEO/CAO controls/directs data of all business units/departments	• Risks power issues between CIO and CDO
Chief Information Officer	• Easy coordination of data management, architecture, and IT	• IT does not own data • CIOs have a significant number of other responsibilities
Other	• Data independence from IT	• Less operational effectiveness because of loss of IT contact

Sources: *The Chief Data Officer playbook*; *The Case for the Chief Data Officer*

E. Who has a Chief Data Officer? What do they do?

One source estimates that there were 250 Chief Data Officers working in business and government by the end of the 2014.[17] In February 2015, the White House named the first national Chief Data Scientist. The work of a Chief Data Officer often is defined by the current state of data in an organization, as described above in Section B. If a jurisdiction needs to organize its data for the first

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[15] *The Chief Data Officer playbook*, at p. 14.

[16] Ibid., at p. 9; *The Case for the Chief Data Officer*, at pp. 51-55.

[17] Zurier, Steve, "Rise of Chief Data Officers Promises More Open Access to Government," FedTech, (Feb. 23, 2015). http://www.fedtechmagazine.com/article/2015/02/chief-data-officer-open-government-data

time, a CDO may initially focus on data infrastructure and quality. A CDO in a jurisdiction with readily useable data may focus on integrating data into decision-making processes or may look to solve problems with available data.

Below are other examples of federal departments and agencies and local governments that currently have a Chief Data Officer.

Federal Government Examples	Local Government Examples
Department of Agriculture	Allegheny County, Pennsylvania
Department of Commerce	Boston, Massachusetts
Department of Health and Human Services	Chicago, Illinois
– Centers for Medicare and Medicaid Services	Los Angeles, California
– Office of the Inspector General	New Orleans, Louisiana
Department of Transportation	New York, New York
Federal Communications Commission	Minneapolis, Minnesota
Federal Emergency Management Agency	New Orleans, Louisiana
Federal Reserve Board	Philadelphia, Pennsylvania
General Services Administration	Pittsburgh, Pennsylvania
National Institutes of Health	San Diego, California
Nuclear Regulatory Commission	San Francisco, California
U.S. Agency for International Development	San Jose, California
U.S. Army	Seattle, Washington
	Washington, D.C.

Source: http://datasmart.ash.harvard.edu/civic-analytics-network

Several private organizations and academic departments have been established to assist government entities with efforts to maximize public access to and the value of government data. Examples include:

- The Center for Open Data Enterprise,[18]
- Data-Smart City Solutions at the Harvard Kennedy School,[19]
- The Civic Analytics Network at the Harvard Kennedy School,[20]
- What Works Cities,[21] and
- The Data Coalition.[22]

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[18] "The mission of the Center for Open Data Enterprise is to maximize the value of open government data as a public resource, by focusing on data users." http://opendataenterprise.org/index.html

[19] "Data-Smart City Solutions is working to catalyze adoption of data projects on the local government level by serving as a central resource for cities interested in this emerging field." http://datasmart.ash.harvard.edu/

[20] "The Ash Center for Democratic Governance and Innovation at Harvard Kennedy School (HKS) has been awarded a two year grant by the Laura and John Arnold Foundation to establish and support a national peer network of urban Chief Data Officers (CDOs). The network will collaborate on shared projects that advance the use of data visualization and predictive analytics in solving important urban problems related to economic opportunity, poverty reduction, and addressing the root causes of social problems of equity and opportunity."   http://datasmart.ash.harvard.edu/civic-analytics-network

[21] "Launched by Bloomberg Philanthropies in April 2015, What Works Cities is a national initiative to help 100 mid-sized American cities enhance their use of data and evidence to improve services, inform local decision-making and engage residents." https://whatworkscities.bloomberg.org/

[22] "The Data Coalition advocates on behalf of the private sector and the public interest for the publication of government information as standardized, machine-readable data." http://www.datacoalition.org/

Finally, the following information summarizes two recent examples of government data use. The first highlights a local government's use of data to improve service to the community. The second highlights the federal government's efforts to consolidate data from various datasets into a useful public tool.

New Orleans' Blight Scorecard.[23] The City of New Orleans has thousands of blighted properties as a result of Hurricane Katrina. The New Orleans Department of Code Enforcement identifies and inspects blighted properties with the goal of bringing the condition of the properties into compliance with the law. The City has the legal authority to demolish houses or foreclose on and sell properties that are not brought into compliance. The decision of whether to demolish or sell a house lies solely with the Director of the Department of Code Enforcement and the City had a backlog of over 1,500 properties awaiting decision at one point.

To address the backlog, the City's Office of Performance and Accountability (OPA) worked with a data science startup company to develop a solution. Working with Code Enforcement staff, OPA staff identifies factors that impact the Director's decision and assigned scores to the factors in over 600 test cases. OPA and the startup company used the cases to develop a machine learning algorithm to "learn" how to score properties based on the pertinent factors identified by Code Enforcement staff. The program provides a weighted score between 0 and 100 where 0 means a property should be demolished and 100 means the property should be sold, with a final determination still made by the Department Director.

This tool has allowed the City to clear the backlog of properties awaiting a final decision and the City periodically updates the algorithm with the goal of having the algorithm make recommendations that the Director of the Department of Code Enforcement accepts nearly 100% of the time.

U.S. Department of Energy's Alternative Fueling Station Locator.[24] The U.S. Department of Energy (DOE) developed a website and iPhone app that allows users to find alternative fueling stations in the United States. The website differentiates between types of alternative fuels, such as biodiesel, electric, ethanol, and hydrogen, and allows users to limit searches to stations that are privately or publically owned.

To create and maintain this database, the DOE's National Renewable Energy Laboratory compiles data from a variety of sources, including trade media, the DOE's Clean Cities program, and fuel providers. The website also allows users to report fueling stations not already listed on the site or report a change about an existing station.

F. Acknowledgements

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[23] Hillenbrand, Katherine, "New Orleans Brings Data-Driven Tools to Blight Remediation," DataSmart City Solutions at Harvard University (Oct. 12, 2016). http://datasmart.ash.harvard.edu/news/article/new-orleans-brings-data-driven-tools-to-blight-remediation-915

[24] http://www.afdc.energy.gov/locator/stations/results?utf8=%E2%9C%93&location=&fuel=all&private=false&planned=false&owner=all&payment=all&radius=false&radius_miles=5