



UMEÅ SCHOOL OF BUSINESS,
ECONOMICS AND STATISTICS
UMEÅ UNIVERSITY

A DATA-DRIVEN LAB IN THE CONTEXT OF OPEN DATA

Opportunities and challenges for a sustainable business model

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Report

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SAMMANFATTNING

Huvudsyftet med denna rapport var att undersöka möjligheter och utmaningar för att skapa ett regionalt datadrivet lab inom området öppna data och att undersöka möjligheterna att utveckla en hållbar affärsmodell för ett data drivet lab i Umeå (Västerbotten). I rapporten studeras konceptualiseringar av öppna data som ursprungligen kommer från den offentliga sektorn och belyser de krav dessa data förväntas följa. Olika typer och kategorier av öppna data, som kan användas för att erhålla en mängd olika fördelar inom den offentliga och privata sektorn, samt stimulera datadriven innovation och öka medborgerliga värden lyfts fram i rapporten. Dessutom presenterar rapporten hinder för publicering och återanvändning av öppna data. Analysen av kontextuella förhållanden bygger på framträdande internationella, regionala och nationella initiativ och visar på både praktiska aktiviteter och beslutsfattande inom ramen för öppna data. Vidare presenteras olika teoretiska perspektiv på konceptualisering av affärsmodeller och omspannar allt från att presentera företagets organisation och dess strategiska syn på delar för att skapa, leverera och fånga värde i ett visst sammanhang. I framställningen diskuteras möjligheten för hållbara affärsmodeller att uppnå en långsiktig framgång genom innovation av affärsmodellen samtidigt som miljömässiga och sociala utmaningar adresseras och det ekonomiska resultatet bibehålls. I rapporten betonas vikten av att skapa ett komplext ekosystem som engagerar olika intressentgrupper i förhållande till livscykeln för öppna data allt i syfte med att utveckla framgångsrika affärsmodeller med öppen data som bas. Rapporten granskar affärsmodeller som användes inom området öppna data och presenterade praktiska överväganden som är relevanta för ett datadrivet lab.

Det empiriska material som använts för att ta fram denna rapport kommer från två workshops med deltagare från både offentliga och privata organisationer, deltagandet i en konferens, analysen av fem (internationella och nationella) exempel på datadrivna lab, samt från djupintervjuer med utvalda representanter från offentliga och privata organisationer. Resultaten visar på olika möjligheter och utmaningar, som måste beaktas för att utforma en hållbar affärsmodell för ett datadrivet lab. Rapporten ger praktiska rekommendationer för att utveckla en hållbar affärsmodell för ett regionalt datadrivet lab i Umeå (Västerbotten). Detta genom att adressera frågeställningar gällande (1) strategiska val, ekosystem och värdeerbjudande, (2) värdeskapande och värdeleverans, och (3) värdefångst. Sammanfattningsvis betonas det kritiska i att skapa förutsättningar för att utnyttja den värdefulla resursen öppna data och prioritera inrättandet av ett regionalt datadrivet lab med tanke på dess potential att stimulera utvecklingen av datadrivna innovationer och inte minst av ett ökat medborgarvärde för samhället.

De rekommendationer som presenteras i denna rapport grundar sig på empiriska bevis som samlats in för etablerandet av ett regionalt datadrivet lab i Umeå (Västerbotten). För att stödja en innovativ affärsmodellutveckling och till fullo utnyttja potentialen i detta lab rekommenderas ytterligare studier för att utforska potentialen, undersöka ekosystemet och bedöma kontextuella förhållanden. Till exempel kan framtida studier undersöka följande forskningsfrågor:

- Vilka är de mest kritiska intressenterna för att skapa ett effektivt ekosystem för en datadrivet lab? Hur ska olika roller distribueras i ett framgångsrikt datadrivet lab?
- Hur bygger ett datadrivet lab långsiktiga relationer och engagemang med olika intressentgrupper?
- Hur ska ett datadrivet lab agera för att bygga ett starkt varumärke?
- Vilka resurser och kompetenser behövs för varumärkesbyggnad i kontexten öppna data?
- Hur organiseras ett datadrivet lab avseende effektivt värdeskapande och effektiv värdefångst?
- Hur påverkas verksamhetens effektivitet i ett datadrivet labb av olika kommunikationsstrategier?

1. INTRODUCTION

1.1. Purpose

This report investigates theoretical and practical perspectives on sustainable business models in the context of open data. Specifically, this report examines alternative approaches to developing a business model for a regional data-driven lab and provides practical recommendations for making strategic decisions about this lab. The research conducted for this report was financed within the framework of the Vinnova project “2016-04313 Ladds – lab för det datadrivna samhället” (“*2016-04313 Ladds – lab for the data-driven society*”) coordinated by Region Västerbotten.

The main purposes of this report are:

- To investigate the opportunities and challenges for establishing a regional data-driven lab in the context of open data,
- To explore possibilities for developing a sustainable business model for a data-driven lab in Umeå (Västerbotten).

This report advances the findings of the pre-study on Smart Västerbotten that explored a regional approach to data-driven innovation and societal development (Kvist 2015). The authors considered the initial assumptions presented in the pre-study while designing this research and analyzing the empirical data. The report highlights the contextual conditions for initiating the operations of a regional data-driven lab and presents practical suggestions for establishing a sustainable business model for this lab.

1.2. Methodology

The research conducted to prepare this report took place from January to May 2018. The authors collected empirical evidence from a large number of primary sources. During the data collection process, relevant information and empirical materials were gathered through the following activities:

- 1) Workshop 1: “A lab for the data-driven society” (“*Ett labb för det datadrivna samhället*”), January 17, 2018, with participants invited from public organizations, private companies, and academia.
- 2) Workshop 2: “A data-driven lab in Västerbotten” (“*Ett datadrivet labb i Västerbotten*”), March 1, 2018, with participants from public organizations and private companies.
- 3) Conference participation: Clarity Conference, “Open Government of the Future,” February 14-15, 2018, The Great Northern, Skellefteå, Sweden.
- 4) International and national cases:
 - The City of Chicago’s Open Data Portal,
 - Open Data BCN of Barcelona City Council,
 - Open Data Institute in London,
 - OpenLab in the region of Stockholm,
 - Botnia Living Lab at Luleå University of Technology.
- 5) In-depth interviews with selected representatives of public and private organizations.

1.3. Practical relevance

A successful data-driven lab in the context of open data has the potential to stimulate the publishing and re-use of open data, establish an effective ecosystem involving public and private organizations, and facilitate innovation by creating favorable conditions for multiple stakeholders committed to developing new products, services, and processes based on open data. At the regional level, early forecasts estimated the monetary value of gains from open data, only in the sector of public administration in the European Union, at over 20 billion EUR in 2020 (European Union 2015). Overall, the total market value of open data across the European Union is expected to reach 325 billion EUR and create 30 000 new jobs directly related to open data by 2020 (European Union 2017).

At the national level, open data can be expected to contribute to the automation of knowledge through advanced analysis and computerized decision making, which is forecasted to create value in the form of productivity gains worth 360 to 465 billion SEK per year in Sweden by 2025 (McKinsey & Company 2017). The importance of supporting open data initiatives is emphasized in a recent report on artificial intelligence (AI) in Swedish business and society (Vinnova 2018). This report calls for the prioritizing of the open data needed for AI and for improving the data access problems that currently limit the development of business and operational models based on AI applications (Vinnova 2018). As highlighted in a directive released by the European Commission, open data must be considered as “an engine for innovation, growth and transparent governance” (European Commission 2011, p. 2). Therefore, the creation of a regional data-driven lab and the development of a sustainable business model for this lab are preconditions for fully utilizing the opportunities arising from open data and creating value for not only the stakeholders involved but society as a whole.

1.4. Structure of the report

This report aims to enhance the reader’s knowledge about open data and business models. The conceptualization of open data and the contextual conditions of this phenomenon are used as points of departure. The first main theme of the report is open data. The report reviews various definitions of open data, presents different categorizations of the notion, and clarifies its contextual conditions. The second main theme is business models. The report provides an extensive overview of the theoretical perspectives and practical logics used to conceptualize business models. The report elaborates upon the issues concerning the development and implementation of specific business models based on open data. The report expands the focus from an examination of alternative configurations of business models to an investigation of the complex ecosystem of a data-driven lab engaging multiple stakeholders in the context of open data. The empirical chapters of the report present evidence collected by the authors from a multitude of primary sources and discuss the results of the analysis, which form the basis for practical recommendations. The empirical findings are derived from workshops and case studies. The selected cases lay the foundation for understanding the diversity of approaches to developing sustainable business models in the open data context and represent best practices for successful implementation. These case studies exemplify the large variation among the strategies applied in data-driven organizations and indicate opportunities for a regional data-driven lab. The final chapters of the report provide practical recommendations and conclusions for developing a sustainable business model for a data-driven lab in Umeå (Västerbotten).

2. OPEN DATA

2.1. Conceptualization of open data

In general, *data* can be conceptualized as “the raw material produced by abstracting the world into categories, measures and other representational forms – numbers, characters, symbols, images, sounds, electromagnetic waves, bits – that constitute the building blocks from which information and knowledge are created” (Kitchin 2014, p. 1). Amid the increasing interest in opening up data access and the many demands of various stakeholder groups to improve free access to available data, academics, practitioners, and policy-makers have proposed a number of definitions to clarify assumptions about open data and determine the boundaries between different data types. Since initiatives of opening data originated in the public sector, early definitions of open data emphasize the relevance of attributing the data to public organizations or providing public funding to such initiatives. For example, one initial definition proposed in academic research conceptualizes *open data* as “non-privacy restricted and non-confidential data which is produced with public money and is made available without any restrictions on its usage and distribution” (Janssen et al. 2012, p. 258). Considering the nature of open data, most of the proposed definitions highlight the main determinable characteristic of open data, which is openness.

Conceptualizations of open data have evolved along with the growing involvement of private organizations and the progress made in the open data industry. One of the most widely used definitions of open data was proposed by the global non-profit organization Open Knowledge International. This definition considers *open data* as any type of data which “can be freely used, modified, and shared by anyone for any purpose” (Open Knowledge International 2018a). This definition has been accepted by several stakeholder groups, including academics, practitioners, and policy-makers. For example, this conceptualization was used in a systematic review of open government data initiatives (Attard et al. 2015) and by a consortium of private and public organizations responsible for preparing a guidebook for organizations in the open data industry, which was recently released by the European Union (2018a). This definition has also served as the basis for the core conditions that data need to meet to be considered open.

The guidelines developed by the European Commission state that data must be open legally as well as technically to comply with openness requirements (European Union 2018a). To achieve *legal openness*, data can be accompanied by an open license and free re-use conditions. To achieve *technical openness*, data can be provided in a machine-readable and nonproprietary format. Open Knowledge International (2018b) specifies that open data and content denoting *open works* through which knowledge is being transferred must meet the following requirements:

- To have an open license or status by being available in a public domain,
- To be accessible as a whole and preferably without charge,
- To be machine readable.

One of the most salient requirements of open data is the presence of *an open license* that would clarify re-use, attribution, and other legal conditions applicable to a released dataset. The licensing assistant available on the European Data Portal provides detailed information about more than 30 official forms of licenses, which can be assigned to the sets of open data (European Union 2018b). The available licenses vary in terms of their permissions, obligations, and

prohibitions. Regarding more general characteristics, Open Knowledge International (2018b) specifies that an open license must fulfill the following conditions:

- Free use,
- Redistribution,
- Modification,
- Separation,
- Compilation,
- Non-discrimination,
- Propagation,
- Application to any purpose,
- No charge.

The importance of meeting diverse openness requirements becomes critical when open data are used by private or public organizations as input for facilitating data-driven innovation. The existence of open data does not, as such, warrant value creation unless they serve as a key resource for improving current market offerings or creating new competitive solutions. *Data-driven innovation* implies exploiting data to develop new ideas, processes, services, or products that can generate positive economic and social value (Jetzek et al. 2014). Processing open data in innovative ways and using the results for data-based decision-making enable private and public organizations as well as society at large to utilize the full potential of this valuable intangible resource (Andrade et al. 2014). However, the successful use of open data in facilitating data-driven innovation requires not only the presence of relevant initiatives and a functioning infrastructure but also the development of legislation and ethical guidelines. Addressing potential ethical dilemmas and challenges related to open data requires establishing *a policy framework* that would “balance as free flow of data as possible while protecting the privacy and security of individuals, with a focus on reasonable principles and best practices that are consistent with the rapid pace of technological evolution” (Hemerly 2013, p. 31).

Thus, open data represent a valuable resource for facilitating economic and social progress through data-driven innovation. The unique nature and complexity of this resource requires investments at both micro and macro levels to, for example, develop relevant organizational capabilities, establish infrastructure, and develop regulatory policies. On the open data portal of the European Union, the European Commission asserts that, without data, it is impossible to create information and that, without information, it is impossible to create new knowledge (European Union 2018c). Therefore, open data can be seen as a critical cornerstone for generating the new knowledge needed to support development in contemporary society.

2.2. Types and categories of open data

Considering the fact that open data can be used to create value in both the public and private sectors and across industries, which have diverse contextual conditions, it is important to adopt a broad view of the forms open data can take. Depending on their nature, open data can be considered primary or secondary, real-time or offline, local or aggregated, and numerical or pictorial, among many other classifications (Hossain et al. 2016). The datasets opened by public organizations can include a wide variety of areas, ranging from “traffic, weather, geographical, tourist information, statistics, business, public sector budgeting, and performance levels, to all kinds of data about policies and inspection (food, safety, education quality, etc.)” (Janssen et al. 2012, p. 258). To support the re-use of open data, organizations responsible for managing open data portals commonly classify open data according to contextualized categories. For

example, the datasets available on the EU Open Data Portal are classified as follows (European Union 2018d):

- Agriculture, fisheries, forestry and food,
- Economy and finance,
- Education, culture, and sport,
- Energy,
- Environment,
- Government and public sector,
- Health,
- International issues,
- Justice, legal system, and public safety,
- Population and society,
- Regions and cities,
- Science and technology,
- Transport.

More general categorizations of open data can be derived by considering the origin and source of the dataset. Over the last two decades, public sector organizations have taken the leading role in opening government-related data and developing open data initiatives. Thus, *open government data* represent one large category of open data (Attard et al. 2015). In addition to the open data provided by the public sector, open data are also released by organizations in the private sector. *Open business data* are made available by companies without charge for further re-use by other private or public organizations. *Linked data* represent another major category of data that comprises “data which is published on the Web and, apart from being machine readable...is also linked to other external datasets” (Attard et al. 2015, p. 402). *Linked open government data* and *linked open business data* are the two categories of open data with the greatest potential to generate significant and timely insights for data-based decision making and data-driven innovation.

This categorization of open data not only allows effective management of the large number of diverse datasets but also can serve as a starting point for developing an open data strategy. For example, at a macro level, organizations responsible for international, regional, or national data portals can assess the current status and demands across categories of open data and implement action to address these needs. At a micro level, organizations facilitating the re-use of open data, such as data-driven labs, can plan initiatives for raising awareness or the re-use of particular datasets and hold events designed to foster practical outcomes. Furthermore, as can be observed across a large number of international cases, such organizations can initiate operations with a limited number of categories and then develop a strategy for increasing the number of categories and available datasets in each category.

2.3. Benefits and barriers of open data

In the digital era, the accelerating rate of digital transformation and the continuous evolution of technological innovations are generating special conditions for the effective use of unique resources such as open data. The ambition to create value manifested through numerous benefits is at the core of open data policies and initiatives implemented worldwide. Successful cases provide evidence that the dynamic nature of open data allows them to be used to achieve a competitive advantage and to increase profitability in the private sector, as well as to facilitate

efficiency and gain other advantages in the public sector. A review of studies on open data demonstrates that their most prominent benefits include (1) making government institutions transparent, (2) empowering citizens, (3) increasing social value, and (4) fostering economic growth through innovation (Hossain et al. 2016). Prior research also shows that the benefits of publishing and re-using open data vary across a wide range of categories (Janssen et al. 2012, p. 261):

- Political and social benefits (e.g., democratic accountability, public engagement, new governmental services, improved policy-making processes);
- Economic benefits (e.g., stimulation of innovation, creation of new economic sectors, development of new products and services, improvements of existing products, services and processes);
- Operational and technical benefits (e.g., convenient access to existing data, possibilities to re-use the data, possibilities to link public and business data, optimization of administrative processes).

Currently, the attractive opportunities arising in the open data context have not been fully utilized by either public or private organizations. The reports published by practitioners and policy-makers as well as scientific articles provide evidence of the various barriers hindering the utilization of possibilities in the open data context. For example, a recent report released by the European Commission presents the results of a study assessing the level of open data maturity across 28 European countries (European Union 2017). Based on the results of this study, the most challenging obstacles for *open data publishing* are financial barriers (71%), legal barriers (57%), technical barriers (50%), political barriers (39%), and other barriers (39%) (European Union 2017, p. 89). Furthermore, the results of this study also show that the greatest obstacles for *open data re-use* are awareness (64%), technical barriers (43%), availability issues (39%), financial barriers (29%), legal barriers (25%), and other barriers (21%) (European Union 2017, p. 92). Although these findings are based on responses provided by public administrators across the European Union, the identified barriers to open data publishing and re-use can also be observed in the private sector.

In addition to the barriers hindering the publishing and re-use of open data, certain risks require special consideration in the open data context. Examples include possible violations of legislation on data protection and privacy, data abuse, misinformation, misuse of information, misinterpretation, as well as other unintended consequences caused by opening certain types of data (Barry and Bannister 2014). Paradoxically, the publishing and re-use of open data, which are expected to lead to higher social value, can trigger tensions between core public values, such as transparency, privacy, security, and trust (Meijer et al. 2014). In a worst-case scenario, for example, the greater transparency achieved by publishing large sets of data in real time can breach individual privacy, threaten national security, and undermine trust in public organizations. To address these contradictions, most of the policies and guidelines on open data emphasize the critical importance of considering ethical issues and integrating an ethical perspective into the development of open data strategies and initiatives.

2.4. Contextual conditions

In broad terms, the different types of information collected, produced, reproduced, and disseminated by public sector bodies represent *public sector information (PSI)* (European Parliament and Council of the European Union 2003). Historically, the functioning of public sector organizations has involved certain releases of PSI (e.g., national statistics). The

increasing interest across multiple stakeholder groups in PSI and the more proactive approach by governments in using PSI to engage citizens triggered the development of legal frameworks in the 1990s (Zuiderwijk et al. 2014). Consequently, the introduction of special initiatives at the international, regional, and national levels stimulated the release and re-use of open data. For example, at the regional level, one of the earliest regulations creating preconditions for the formulation of open data strategies in the public sector included the directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information (European Parliament and Council of the European Union 2003). At the national level, one early example was the Memorandum for the Heads of executive departments and agencies of 21 January 2009 on transparency and Open Government (Obama 2009), which triggered further global initiatives. In Sweden, following a directive by the EU, national efforts towards the re-use of PSI (including open data) were stimulated by the law on the re-use of public administration documents (Lag SFS 2010:566) (Sveriges Riksdag 2010).

Internationally, progressive legislation and initiatives for open data were facilitated by the Open Government Partnership (OGP) begun in 2011. By 2018, the OGP had engaged 79 participating countries, 20 subnational governments, and many representatives of civil society organizations (Open Government Partnership 2018a). Over the last seven years, the OGP has facilitated over 3000 commitments related to open government (Open Government Partnership 2018a). Since 2011, Sweden has completed 12 commitments related to the OGP. The ongoing commitments of Sweden include (1) putting citizens at the center (e-government) of government administration reforms, (2) the re-use of public administration documents and open data, (3) improved opportunities for dialogue and transparency in aid management and implementation, and (4) developing a new format for dialogue with CSOs (Open Government Partnership 2018b). All countries participating in the OGP endorse the Open Government Declaration, which emphasizes the following values (Open Government Partnership 2018c):

- To increase the availability of information about governmental activities,
- To support civic participation,
- To implement the highest standards of professional integrity throughout our administrations,
- To increase access to new technologies for openness and accountability.

Over the years, international efforts and activities related to open data have resulted in a number of global policies and initiatives. In 2013, the members of the inter-governmental political forum G8 signed the G8 Open Data Charter (Open Data Charter 2018a). Subsequent collaboration between governments and experts resulted in the development of an international Open Data Charter and the establishment of an independent program facilitating this movement (Open Data Charter 2018b). The recent version of the international Open Data Charter, which was revised by governments and civil society organizations in 2015, highlights the following five core principles (Open Data Charter 2018c):

1. Open data by default,
2. Timely and comprehensive,
3. Accessible and usable,
4. For improved governance & citizen engagement,
5. For inclusive development and innovation.

In addition to governments, the broad network of the stewards of the Open Data Charter includes large institutions, not-for-profit organizations, multinational organizations, and other expert organizations such as the World Bank Group, the United Nations, the Organization for Economic Co-operation and Development (OECD), the Open North, the Open Institute, the

Center for Open Data Enterprise, and the Sunlight Foundation, among many other organizations (Open Data Charter 2018b). Besides this movement, these and other organizations have established other forums focusing on open data and have developed and implemented initiatives supporting the publishing and re-use of open data. For example, between 2012 and 2017, the World Bank supported a large number of open data projects, provided technical assistance and funding to over 50 low- and middle-income countries, co-hosted and co-organized over 15 conferences focusing on open data, cofounded the Open Data for Development Partnership (OD4D), and conducted or supported 45 Open Data Readiness Assessments (ODRAs) at national, sub-national, and municipal levels, among many other activities (World Bank Group 2017). In addition to collaborations and activities implemented at the international level, regional and national institutions have facilitated open data publication and re-use across regions and countries.

At the regional level, practical activities initiated by large regional institutions have strongly impacted and stimulated policy-making and the practical re-use of open data by different stakeholder groups. For example, the European Data Portal launched in 2012 by the European Commission and funded by the European Union enabled access to data generated by the European Commission, other institutions within the European Union, and bodies across the 28 EU member states (European Commission 2013). Besides the harvesting of data, the European Data Portal organizes various activities for improving access to and increasing the value of open data (European Data Portal 2018). One example of activities is the distribution of information about different events promoting the re-use of open data (see Figure 1).

At the national level, governmental and municipal organizations have developed actions to improve the publishing of open data related to the public sector and have organized training sessions, seminars, and other events (e.g., hackathons) to stimulate the re-use of open data. In Sweden, the national data portal provides primary access to national data held by public organizations (see Figure 2). The assignment to promote the work making available open data and PSI for re-use was transferred from the Swedish National Archives (*Riksarkivet*) to the Agency for Digital Government (*Myndigheten för digital förvaltning*) on September 1, 2018.

Giving a detailed overview of the very large number of initiatives conducted by the many different stakeholders at the international, regional, and national levels extends beyond the scope of this report. Ultimately, the efforts devoted over the last decade by numerous organizations, networks, and movements has resulted in the execution of a broad spectrum of activities, which have made a significant impact on establishing and shaping the contextual conditions for open data.



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Figure 1. European Data Portal. (<https://www.europeandataportal.eu>; accessed September 19, 2018)

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OCH PSI**

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Miljö

Ekonomi och finans

Utbildning, kultur och sport

Regioner och städer

Jordbruk, fiske, skogsbruk och livsmedel

Regeringen och den offentliga sektorn

Hälsa

Energi

Rättsliga system och allmän säkerhet

Befolkning och samhälle

Internationella frågor

Vetenskap och teknik

Transport

Ladda ned all metadata

Syns inte dina datamängder här?

Registrera dem på registrera.oppnadata.se och följ vår [steg-för-steg guide](#) för att komma igång.

Riksarkivet har fram till den 31 augusti 2018 i uppdrag att främja arbetet med att tillgängliggöra information om öppna data från statliga myndigheter för vidareutnyttjande. Den 1 september 2018 tar Myndigheten för digital förvaltning, DIGG, över förvaltningen av den här webbplatsen. Riksarkivet har lämnat en [slutrapport över regeringsuppdraget](#) till regeringen.

Topp 7 uppladdare av datamängder

Uppladdare	Antal datamängder
Geodataportalen	450
Dataportalen	250
ITS centrala metadata katalog	150
K-samsök	120
Lidingö stads Datamängder	50
Skatteverket	30
Göteborgs Stad	20

Fördelning av datamängder över kategorier

Kategori	Antal datamängder
Miljö	401
Utbildning, kultur och sport	201
Befolkning och samhälle	97
Regeringen och den offentliga sektorn	96
Ekonomi och finans	82
Regioner och städer	48
Transport	43
Hälsa	33
Vetenskap och teknik	23
Jordbruk, fiske, skogsbruk och livsmedel	12
Rättsliga system och allmän säkerhet	9

Explore Open Data - Swedish subtitles

Öppna data kan effektivisera offentlig förvaltning och öka kvalitén i offentliga tjänster.

Europeiska dataportalen eLearning-program

Den europeiska dataportalen har tagit fram ett eLearning-program om öppna data med 16 kortmoduler. Modulerna passar alla nivåer från nybörjare till experter.

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OM WEBBPLATSEN

Detta är en webbplats som förvaltas av Riksarkivet fram till och med den 31 augusti 2018. Den 1 september tar Myndigheten för digital förvaltning över förvaltningen.

Riksarkivet lämnar över förvaltningen av portalen till DIGG 10 augusti, 2018

Besök från Nederländska ministeriet för ekonomi 4 juli, 2018

Hack for Swedens event i Almedalen 2018 28 juni, 2018

KONTAKT

vidareutnyttjande@riksarkivet.se

Figure 2. Swedish National Data Portal. (<https://www.oppnadata.se/>; accessed September 19, 2018)

3. BUSINESS MODELS

3.1. Conceptualization of a business model

The concept of business model has emerged in managerial practice as a means of describing the main business idea of a company and its strategic view on how to achieve a competitive advantage in the marketplace. Research on business models started to gain popularity in the 1990s (DaSilva and Trkman 2014). Over the last three decades, the focus of the literature on business models has evolved from defining and classifying business models to specifying their components and elements, and, consequently, from modeling the core elements to applying the concept of business model (Osterwalder et al. 2005). Despite the continuously increasing number of studies on business models, no consensus has been reached regarding the conceptualization of this phenomenon. Some theoretical perspectives propose that *a business model* is “an integrated presentation of the company organization, in order to contribute to the success of management in the decision-making process” (Wirtz et al. 2016, p. 37). Other theoretical perspectives argue that *a business model* can be seen as “an abstraction [...] aimed at describing the organizing logic for delivering value” (Janssen and Zuiderwijk 2014, p. 696). The evolving emphasis on such core outcomes as value creation and value capture has led to an increasing association of business models with their capacities to create and capture value (Zott et al. 2011; Massa et al. 2017). Therefore, the dominant perspective on business models emphasizes the importance of considering the capabilities of a business model to create, deliver, and capture value (Teece 2010).

From a practical viewpoint, one study concludes that the widespread perception among practitioners is that *a business model* represents “an organization-level phenomenon, an architecture or design that incorporates subsystems and processes to accomplish a specific purpose” (George and Bock 2011, p. 97). Essentially, business models can be used to manage, assess, and compare organizations (Bocken et al. 2014). To understand the nature of business models in particular industries, it is important to identify the conceptual core of a business model in a selected industry and specify the common characteristics of the business models used in the industry (Osterwalder et al. 2005). The nature of existing business models can then be assessed by analyzing the core characteristics and distinctive elements considering practical cases of different organizations in a selected industry (Osterwalder et al. 2005). These insights can be used by competitors to improve their market positions and by new market entrants to design their own business models.

Prior research proposes different views regarding potential specifications of a business model. One of the most influential and commonly applied approaches in research and practice is the business model canvas, which specifies the following elements of a business model (Osterwalder and Pigneur 2010, pp. 16–17):

- Customer segment,
- Value proposition,
- Channels,
- Customer relationships,
- Revenue streams,
- Key resources,
- Key activities,
- Key partnerships,
- Cost structure.

The business model affinity diagram represents an alternative approach that emphasizes the value created and captured by an organization and classifies the relevant elements as follows (Shafer et al. 2005, p. 202):

- Strategic choices – customer (target market, scope), value proposition, capabilities/competencies, revenue/pricing, competitors, output (offering), strategy, branding, differentiation, mission;
- Value network – supplier, customer information, customer relationship, information flows, product/service flows;
- Create value – resources/assets, processes/activities;
- Capture value – cost, financial aspect, profit.

Another theoretical approach focuses on the main factors of value and proposes the following classification of business model elements (Bocken et al. 2014, p. 43):

- Value proposition, including product/service, customer segments, and relationships;
- Value creation and delivery, including key activities, resources, channels, partners, and technology;
- Value capture, including cost structure and revenue streams.

In addition to these exemplary specifications, previous studies have proposed many other alternative approaches for operationalizing a business model. However, a closer look at the particular elements stressed by the different approaches can create the misleading perception that the business model concept is applicable only within a business context. While the specific elements of business models can be less or more important in certain contexts, a broad conceptualization of the business model can be adopted by organizations in the private and public sectors. Nevertheless, in each case, contextual conditions are critical to the particular configuration of a business model, its core elements, and future success.

3.2. Sustainable business models

Advances in academic research and managerial practice have furthered the development of viewpoints on business models. The term of *sustainable business model* is often used by researchers and managers to indicate different notions of sustainability achieved through business models. First, the sustainability of a business model is sometimes addressed by considering a long-term perspective and the business model's potential longevity. Second, in other cases, the sustainability of a business model is assessed by considering its capacity to address environmental and social challenges. Considering these interpretations of sustainable business models, it is important to acknowledge that the long-term success and performance of the business model is vital for all organizations, except those that are temporary and have a short-term orientation. Focusing on the capacity of a business model to confront environmental and social challenges is critical for attaining a more sustainable society. An increasing number of private and public organizations are emphasizing sustainability in their visions and making special efforts to address sustainability challenges by designing new business models or changing their existing business models.

Achieving long-term success and effectively addressing the dynamic nature of a business model requires a consideration of all the key stages related to the following changes in business models (Cavalcante et al. 2011, p. 1334):

- Business model creation (e.g., creating new processes);
- Business model extension (e.g., adding new processes);
- Business model revision (e.g., changing existing processes);
- Business model termination (e.g., terminating existing processes).

The literature on business models emphasizes the critical role of business model innovation for addressing the ineffectiveness of an organization's current business model, sustaining growth, and increasing performance outcomes (Chesbrough 2010). *Business model innovation* represents "an organizational change process requiring appropriate capabilities, leadership, and learning mechanisms" (Foss and Saebi, 2017, p. 208). *Business model innovation* includes "new types of innovative ventures [...] that may affect firm performance" (Foss and Saebi 2017, p. 208). Previous studies have demonstrated diverse possibilities for implementing business model innovation, ranging "from incremental changes in individual components of business models, extension of the existing business model, introduction of parallel business models, right through to disruption of the business model, which may potentially entail replacing the existing model with a fundamentally different one" (Khanagha et al. 2014, p. 324). Therefore, ensuring the long-term success of a business model requires the organization to foresee and engage proactively in continuously innovating its business model.

During the initial design and innovation of a business model, its capacity to address environmental and social challenges can be enhanced by integrating an economic layer focusing on economic performance with "an environmental layer based on a lifecycle perspective and a social layer based on a stakeholder perspective" (Joyce and Paquin 2016, p. 1474). According to this view, successful business models should embrace "pro-active multi-stakeholder management, the creation of monetary and non-monetary value for a broad range of stakeholders, and which holds a long-term perspective" (Geissdoerfer et al. 2018, p. 409). Sustainable business models can have a variety of dominant components and be centered on technological, social, or organizational innovations (Bocken et al. 2014). Considering the core components, the main archetypes of sustainable business models can be classified as follows (Bocken et al. 2014, p. 48):

- Maximize material and energy efficiency,
- Create value from waste,
- Substitute with renewables and natural processes,
- Deliver functionality rather than ownership,
- Adopt a stewardship role,
- Encourage efficiency,
- Repurpose for society/environment,
- Develop scale up solutions.

In general, the central principles of a particular archetype affect all the elements of a business model specification. Furthermore, being sustainable in its nature, such a business model can be expected to lead to positive outcomes not only for the organization implementing it but also for diverse stakeholder groups, the broader society, and the environment. The open data context can serve as a fruitful setting in which to adopt some of the proposed archetypes in developing a sustainable business model for a data-driven lab.

3.3. Business models in the context of open data

An organization aiming to develop a successful business model in the context of open data needs to consider the multiple stakeholder groups involved in many activities and initiatives related to open data. Previous studies have highlighted the diversity of the interests and expectations held by a wide variety of stakeholders, including politicians, public officials, public sector practitioners, international organizations, civil society activists, funding donors, ICT providers, academics, and others (Gonzalez-Zapata and Heeks 2015). Furthermore, the influential stakeholder groups involved in the publishing and re-use of open data or directly affected by developed products and services include data providers, service providers, infrastructure providers, new startups, intermediaries, application developers, and application users (Kitsios et al. 2017). In addition to considering the primary stakeholder groups, such as developers, entrepreneurs, information and technology businesses, and civil society organizations, it is also important to assess the direct and indirect impacts of open data initiatives on ordinary citizens (Styrin et al. 2017). Therefore, a sustainable business model developed in the open data context needs to take into account the complex ecosystem involving diverse stakeholder groups.

Prior research and practical guidelines indicate possibilities for extending an ecosystem approach by considering the entire lifecycle of open data and specific roles different stakeholders perform during each stage in this process. In general, *the open data lifecycle* includes the following core stages: collecting data, preparing data, publishing data, and maintaining data (European Union 2018a). The stages in *the open data lifecycle* can be specified even further as follows: (1) data creation, (2) data selection, (3) data harmonization, (4) data publishing, (5) data interlinking, (6) data discovery, (7) data exploration, (8) data exploitation, and (9) data curation (Attard et al. 2015, p. 403). A more detailed view of this process emphasizes the evolution of the entire value chain, which incorporates the transformations of data into information and then into knowledge through data creation, data validation, and data aggregation, which is consequently used to develop data services and products and to create added value through aggregated services (European Union 2015).

In the open data context, organizations need to perform certain roles to enable specific processes within each stage in the open data lifecycle. For example, public or private organizations can adopt the following functions (Stott 2014, pp. 12–13):

- Suppliers, publishing open data;
- Aggregators, collecting and aggregating open data;
- Developers, designing and selling applications;
- Enrichers, gaining new insights from open data and delivering innovative services and products;
- Enablers, providing technologies and platforms for open data.

Hypothetically, a data-driven lab could maximize captured value by involving its employees in a large number of roles across most of the stages in the open data lifecycle. However, this strategy would not be feasible in practice. To effectively create and deliver value in such a case, a data-driven lab would require large resources and extraordinary capabilities. Previous studies have shown that the formation of a dynamic ecosystem involving influential stakeholders is important for achieving the anticipated benefits of open data programs (Dawes et al. 2016). Therefore, a sustainable business model for a data-driven lab would need to generate the conditions facilitating the emergence of a dynamic ecosystem that includes diverse stakeholders

adopting the critical roles needed for fully utilizing the opportunities and addressing the challenges that can arise in each stage of the open data lifecycle.

Current practices in the open data industry include various types of functional business models applied by businesses and other organizations. A review of these cases and prior research resulted in a typology that specifies 15 alternative business models relevant for the open data context, which can be classified into five broader categories (Zeleti et al. 2016, p. 543):

1. Freemium category – a limited dataset free of charge and a payment for a higher-quality dataset (e.g., freemium, dual licensing, charging for changes, open source, and free as branded advertising);
2. Premium category – a payment for a dataset with high quality (e.g., premium, sponsorship, support and services, demand-oriented platform, supply-oriented platform, and white-label development);
3. Cost saving category – reduced costs for releasing data, which are partly covered by engaging stakeholders and encouraging publishing of linked data (e.g., increase quality through participation, and cost avoidance);
4. Indirect benefit category – free releases of open data, which can be used by others to develop the tools needed to achieve the strategic goals of the company that released them (e.g., supporting primary business);
5. Parts of tool category – a limited dataset available at lower cost and complimentary data available for a payment (e.g., infrastructural razor and blades).

These alternative variations of business models are commonly discussed and considered in research and managerial practice. A data-driven lab can develop operations by adapting some of these propositions. However, it is important to notice that these categories and exemplary types emphasize the revenue acquired by an organization, while other outcomes and contextual conditions are not addressed explicitly in their primary assumptions. Prior research confirms that such a revenue model represents a critical element of a business model, but it does not define completely the entire business model (DaSilva and Trkman 2014). Failing to capture the dynamic nature of the complex ecosystem in the open data context, a sole focus on revenue might be too limiting for a data-driven lab. Depending on the strategy used and core stakeholders involved, a regional data-driven lab might focus on increasing public value and not on generating the highest possible revenue. Many practical cases show that the focus of organizations, like data-driven labs, governed by public bodies is not on continuously increasing revenue but on other goals, such as promoting awareness of open data, facilitating the publishing of new datasets, and stimulating the re-use of open data across different sectors, among other issues.

3.4. Business model for a data-driven lab

Prior research emphasizes that the choice of business model by an organization is one of its most critical strategic decisions, which can determine other tactical choices made to achieve its long-term mission and short-term goals (Casadesus-Masanell and Ricart 2010). A regional data-driven lab is one type of a unique organization in the context of open data. An effective business model of a lab can serve as a cornerstone for establishing a strong ecosystem engaging multiple stakeholders and act as a stimulus for facilitating innovation, enhancing sustainability, and creating public value. However, despite providing many opportunities, the complex nature of an ecosystem presents a challenge for a data-driven lab. As the ecosystem would involve diverse public and private organizations, the business model would need to be regarded as a

sociotechnical phenomenon operating in the physical and institutional environments of several stakeholders (Dawes et al. 2016). A business model facilitating the emergence of a complex ecosystem such as a successful data-driven lab would need to be able to combine organizational, human, material, and technical resources in a synergy of mutual dependencies and reciprocal influences (Sawyer and Jarrahi 2014). Therefore, the strategic choices and tactical actions related to a data-driven lab must be made considering the wider consequences for multiple stakeholders within the entire ecosystem as well as society at large. Previous studies have proposed a co-design approach whereby different stakeholders engaged in a public–private partnership would be proactively involved in developing different elements of a business model and innovating it over time (Hedman et al. 2008).

The recent guidebook for open data managers and holders provides detailed guidelines for making core strategic choices and establishing operations of an organization in the context of open data (for more information see European Union 2018a). The findings of previous studies complement these practical principles by highlighting the complementary issues relevant to a sustainable business model for a data-driven lab. For example, a study investigating open data initiatives implemented in different smart cities highlights the specific governance mechanisms used to support and implement these initiatives, including collaboration, participation, communication, data exchange, and an integration of service and applications (Ojo et al. 2015). Another study examining open data strategies in different countries specifies the particular mechanisms, which can support the implementation of open data policies (Huijboom and Van den Broek 2011, pp. 5–6):

- Education and training (e.g., knowledge exchange platforms, guidelines, conferences, sessions, workshops);
- Voluntary approaches (e.g., overall strategies and programs, general recommendations, public voluntary schemes);
- Economic instruments (e.g., competitions, app contests, camps, financing of open data portals);
- Legislation and control (e.g., laws, acts, technical standards, monitoring).

In general, previous studies emphasize the critical importance of not only internal factors (such as data, portal, initiatives) and external factors (such as legal obligations, institutional arrangements), but also of public engagement, stakeholder participation, and feedback (Attard et al. 2015). Furthermore, prior research demonstrates the importance of creating a supportive culture within an organization, stimulating the re-use of open data, communicating successes, collaborating systematically with different stakeholders, and focusing clearly on the desired effects, including the realization of public values (Zuiderwijk and Janssen 2014). The continuous assessment and improvement of data quality and the constant consideration of ethical principles are expected to be integrated into the strategic decision making and daily operations of a data-driven lab. It is also important to consider that organizations in the open data context have the potential to stimulate further dialogue about open data publishing and re-use, as well as to provide important input for policy-making (Janssen and Zuiderwijk 2014). A significant conclusion derived from practice and research is that “the value of open data materializes only upon its use” (Susha et al. 2015, p. 181). Therefore, the development of a sustainable business model for a data-driven lab that would stimulate the emergence of a complex ecosystem engaging multiple stakeholders in the context of open data is an important strategic priority for a region aiming to stimulate data-driven innovation, as well as for society at large, which would benefit from the increased public value.

4. EMPIRICAL FINDINGS – WORKSHOPS

4.1. Presentation of the workshops

To achieve the purposes of this project, the authors organized two workshops lasting around two to three hours each. The workshops were designed to systematically collect information and empirical evidence about the context of open data and a data-driven lab. The workshops were organized sequentially and were related to one another due to the nature of the collected evidence, ranging from general information to more specific insights. The workshops had a similar structure. After a brief introduction, the participants were divided into smaller work groups of three people in which they discussed questions related to particular themes. Afterwards, the insights developed by each discussion group were shared and elaborated upon during a joint session.

4.2. Workshop 1 – Challenges and opportunities of open data

The purpose of workshop 1 was to collect overall information about the context of open data and to assess expectations about a regional data-driven lab. Participants were selected and invited to participate in the workshop. The intention behind the selection was to achieve a relatively large representation of a wide range of organizations. Another aim of the selection procedure was to balance between different participant backgrounds and experiences. The workshop participants represented public organizations, private companies, and academia.

The overall focus of the workshop was the government's assignment that public organizations make their data accessible to the public and facilitate the re-use of public sector information. The following questions were posed during workshop 1:

- How should the "window" of these data look like according to you?
- Does your organization have any data that would be relevant to process in a lab environment?
- What skills are interesting for your organization in this context? Do you have skills to contribute and/or do you seek the needed skills?
- How do you create added value in a lab for the data-driven society?

During the discussion, the participants provided many answers to these questions as well as examples detailing their perceptions. Many opinions were expressed about the potential use of a data-driven lab and various practical applications that could be developed as a result of collaborations established within it. Detailing the comments about exemplary applications extends beyond the scope of this report. The particular examples given by the participants are omitted from the report in order to highlight their general expectations and clarify their views about the potential characteristics of a data-driven lab, which are of primary interest for this report.

In general, the workshop participants expressed varied opinions about the challenges and opportunities of open data. The diversity of their expectations can be seen in their comments about a data-driven lab in the context of open data:

A data-driven lab...

“... should have seminars and other types of activities to create a living, dynamic and developing environment ...”

“... can be an exposure area where we can experiment together and be a one-stop shop for data ...”

“... can help to facilitate the development of data-driven products and services, to commercialize ideas, to develop skills, to link different types of data ...”

“... can help to understand how people behave, capture and analyze electronic traces, predict future trends ...”

“... should be a stakeholder driven system that continuously develops quality and generates new insights ...”

To summarize, the empirical findings indicate the relevance of the following issues related to a data-driven lab:

- Organization – a stakeholder-driven system and a one-stop shop for data,
- Atmosphere – dynamic and allowing to experiment,
- Knowledge – generating new insights and innovative solutions.

4.3. Workshop 2 – Potential strategy and operations of a data-driven lab

Workshop 2 engaged a broader audience compared to workshop 1, as participation was based on the interest of particular organizations and individuals. Participation in this workshop was not limited according to specific characteristics. The ambition for workshop 2 was to involve a large number of participants in order to collect information and insights from a wide range of perspectives. The focus of this workshop was on gathering empirical evidence toward a conceptual description of a regional data-driven lab.

The overarching question for workshop 2 was

- How can a data-driven lab be of interest to you as an individual (citizen), create employment, generate revenue, and/or strengthen the competitiveness of your business or organization?

The participants emphasized the following views in their answers:

A data-driven lab ...

“... should increase social welfare, but also give value to businesses ...”

“... can support organizations to provide better and more efficient services to citizens...”

“... can collect and compile different types of data from the city, the municipality, and the companies ...”

Some of the answers and examples provided by participants touched upon the complex nature of a data-driven lab, as they were interested in integrating the individual citizen perspective with the business perspective. Thus, a data-driven lab in the context of open data must satisfy expectations derived from a variety of perspectives and be capable of addressing the demands and meeting the needs of multiple stakeholder groups.

During workshop 2, participants raised additional issues about data quality and ethics, in addition to the reflections shared during workshop 1. The workshop participants stated that these issues must be on the agenda when discussing the establishment of a regional data-driven lab:

A data-driven lab ...

“... must consider the privacy of individuals and follow ethical guidelines ...”

“... must have quality-proof data ...”

The participants expressed an uncertainty about what outcomes could be generated by a data-driven lab. It is thus expected that the potential outcomes would be visualized and presented in the form of cases and success stories. According to the participants, it is not only the outputs that need to be clear, but the implemented working process should also be clear. Both groups of workshop participants also emphasized that a data-driven lab would have to allow room for experimentation and provide a creative atmosphere. Illustrative statements about these issues are given below:

A data-driven lab ...

“... should have a clear working process, which will be followed by different projects...”

“... can consider relevant projects that many organizations already have and develop examples of results from these projects ...”

“... should create a contact network between different organizations, so that there would be a contact person in each organization and suggest services that may be relevant to specific organizations ...”

“... should have a relevant infrastructure and portfolio of services, so that it is known what this lab offers ...”

“... can gather people for brainstorming, develop ideas and find solutions ...”

Regarding geographical scope, the participants envisioned that a lab should be large and extend beyond traditional boundaries, which are not relevant in the open data context. A data-driven lab should have a much more all-embracing nature than is traditionally expected of a typical public organization or business. This matter might be looked upon from different perspectives, since the nature and vision of a lab may affect its capacity to achieve a competitive advantage. To be successful, a data-driven lab must have an advantage more significant than its mere location. Specifically, the participants shared the following viewpoints:

A data-driven lab ...

“... need not be limited to Umeå. It can drive the data collection and analysis among different municipalities in the region ...”

In general, the collected empirical evidence indicates a need to create a strong profile for the data-driven lab that will attract diverse stakeholder groups, including potential clients, developers, researchers, etc. The ecosystem of the lab is expected to include organizations from both the private and public sectors.

5. EMPIRICAL FINDINGS – CASE STUDIES

5.1. Presentation of exemplary cases

The selected exemplary cases demonstrate diverse approaches for developing sustainable business models in the context of open data. The three international cases represent best practices related to the successful implementation of open data initiatives. These cases are the City of Chicago's Open Data Portal, the Open Data BCN by Barcelona City Council, and the Open Data Institute in London. The two national cases illustrate the contextual conditions and alternative approaches that can be considered for establishing a regional data-driven lab in Sweden. These cases are the OpenLab in the region of Stockholm and the Botnia Living Lab at Luleå University of Technology. While the international cases represent organizations working directly with open data and fully utilizing the capacities of this resource, the national cases have the potential to extend their project portfolios by initiating projects focusing on open data. Overall, the analysis of the selected exemplary cases provides relevant insights about strategic choices and particular elements of business models used in the context of open data. The findings demonstrate potential opportunities and practical actions of relevance for a successful data-driven lab in the open data context.

5.2. Case 1 – The City of Chicago's Open Data Portal

<https://data.cityofchicago.org/> (City of Chicago 2018)

The City of Chicago's open data portal is a well-known established portal in the context of open data. This case highlights the importance of having a strong leader to initiate the establishment of a data-driven organization, formulate an effective strategy and tactical actions, engage diverse stakeholder groups, and continuously develop a data-driven organization. The Mayor of Chicago, Emanuel Rahm, initially promoted the principles of an open and effective government, which led to the decision to work proactively with open data initiatives. In 2012, the Mayor issued Open Data Executive Order (No. 2012-2), which created the basis for effective strategic and tactical decisions facilitating the publishing and re-use of open data, including the launch of the open data portal (City of Chicago 2012). This order clarified the importance of releasing datasets and associated metadata for each city agency, created an open data advisory group, established positions of the chief data officer for the City of Chicago and open data coordinators, initiated the City of Chicago data portal, assigned the administration of the data portal, introduced the annual open data compliance report, formulated an open data policy, and emphasized technology-related procurements, among other issues (City of Chicago 2012). The first Technology Plan of the City of Chicago, released by the Mayor in 2013, stated that the vision of the city was "to become a city fueled by technology" and specified broader strategies and initiatives, including those focusing on open data, to realize this vision (City of Chicago 2013). The plan highlighted the relevance of engaging diverse stakeholder groups for achieving the mission and facilitating actions related to open data and the open data portal. The establishment of multiple private-public partnerships between government, businesses, academic institutions, non-for-profit organizations, and philanthropic organizations was critical for achieving success in this case (City of Chicago 2015). A list of the partners acknowledged in the progress report of the technology plan is provided in Figure 3. The open data portal in this case was designed to address the needs of different stakeholders, to provide supporting information for each stakeholder group, and to encourage feedback for further improvements.

Initiatives supporting the implementation of the open data order are continuously being developed and executed to facilitate open data publishing and re-use by multiple stakeholders.

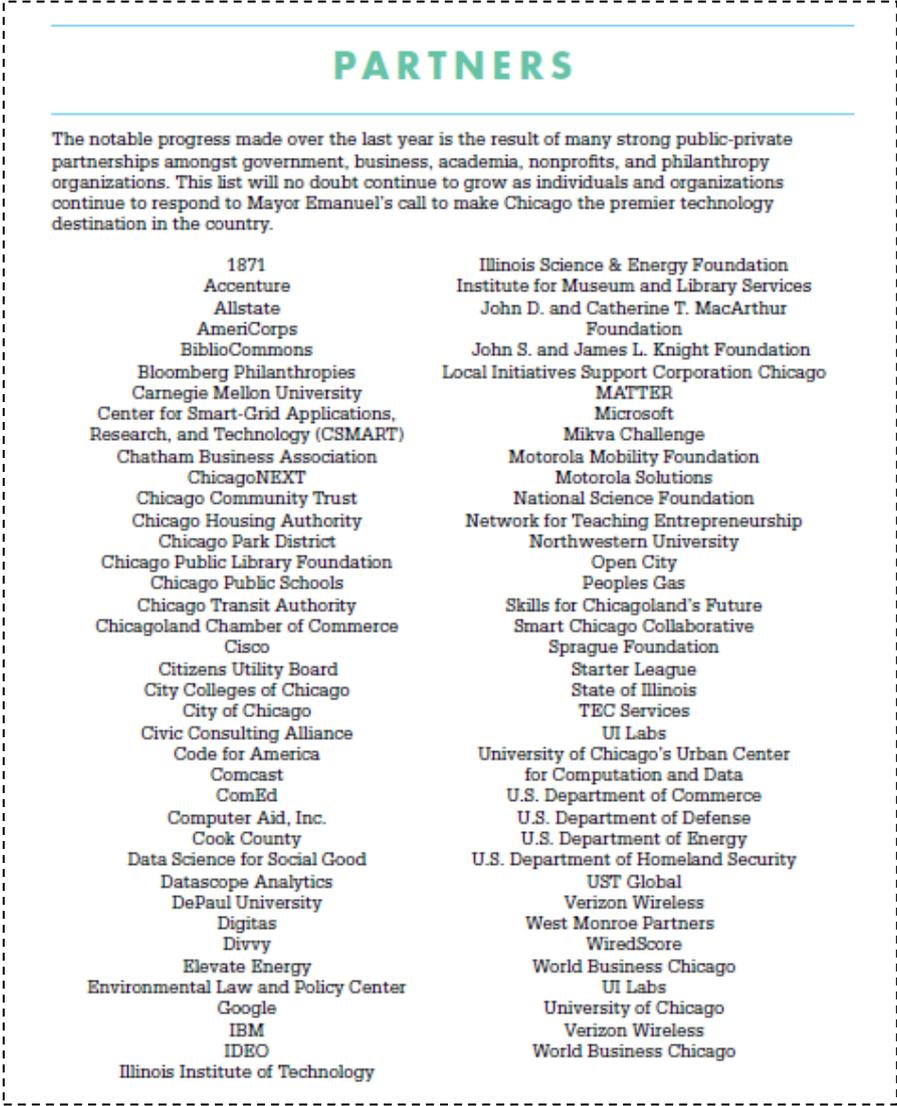


Figure 3. Chicago Tech Plan, 18 Month Update. (City of Chicago 2015, selection; p. 48; https://techplan.cityofchicago.org/wp-content/uploads/2015/06/techplan_progressupdate.pdf; accessed September 25, 2018)

5.3. Case 2 – Open Data BCN by Barcelona City Council

<http://opendata-ajuntament.barcelona.cat/en/> (Barcelona City Council 2018a)

The Open Data BCN by Barcelona City Council is a new portal that celebrated its first anniversary in February 2018 (Barcelona City Council 2018a). The project supporting the development of this portal was initiated in 2010 (Barcelona City Council 2018b). The portal plays an important role in the implementation of the digital city strategy of Barcelona. This case demonstrates the importance of having a clear focus on making a social impact, designing an effective platform that facilitates the re-use of open data, and developing an effective strategy for engaging and empowering citizens. The portal is designed with and complemented by

various activities supporting the fulfillment of the main objective of the open data movement, which is to “maximize available public resources, exposing the information generated or guarded by public bodies, allowing its access and use for the common good and for the benefit of anyone and any entity interested” (Barcelona City Council 2018b). The core values of the Open Data BCN include “promotion of transparency in management, improvement of services to citizens, generation of business activities and social impact, in search of efficiency in governance” (Barcelona City Council 2018b). The portal has high functionality, facilitated by integrated data visualization and statistics. The portal endorses activities supporting the re-use of open data and encourages the engagement of different stakeholders for making a positive social impact. Figure 4 provides an overview of one activity involving an open data challenge that promotes educational engagement and citizen empowerment.

The screenshot shows the Open Data BCN website interface. At the top, there is a search bar and a language selector. The main navigation menu includes 'ABOUT THIS SITE', 'DATASET CATALOGUE', 'PRESENT', 'REUSERS', 'STATISTICS', and 'BARCELONA DADES OBERTES CHALLENGE'. The page title is 'Barcelona Dades Obertes Challenge Second edition 2019'. The main banner features a woman's profile against a background of binary code, with the text 'Repte Barcelona Dades Obertes' and 'Fomentem l'ús de les dades obertes als centres educatius de la ciutat'. Below the banner, a section titled 'We foster open data usage in the city's schools' includes the registration deadline 'Registration: until 1/10/2018'. A sidebar on the right contains a purple graphic with the challenge title 'Repte Barcelona Dades Obertes' and 'Segona edició_2019'.

Figure 4. Open Data BCN. Barcelona Dades Obertes Challenge Second edition 2019. (Barcelona City Council 2018c, selection; <http://opendata-ajuntament.barcelona.cat/en/repte-2019>; accessed September 25, 2018)

5.4. Case 3 – Open Data Institute in London

<https://theodi.org/> (Open Data Institute 2018a)

The Open Data Institute is an independent non-profit company founded by Sir Tim Berners-Lee and Sir Nigel Shadbolt “to show the value of open data, and to advocate for the innovative use of open data to affect positive change across the globe” (Open Data Institute 2018b). This case demonstrates the importance of building a strong brand, developing a large service portfolio, applying an efficient revenue model for supporting operations, and establishing a strong network involving multiple stakeholders.

The screenshot displays the 'Membership & networking' page on the Open Data Institute website. The page is divided into several sections:

- Header:** Includes the ODI logo, navigation links (Knowledge & opinion, Projects & services, Events, Global network directory, About the ODI), a search bar, and utility links (Subscribe, Join the ODI).
- Navigation:** A secondary navigation bar with links for Projects, Data as Culture, Membership & networking (active), Startups & fostering innovation, Research & development, Tools & resources, Consultancy & advice, and Booking a call with an ODI Expert.
- Hero Section:** Features a large ODI logo with a heart icon and the text 'Membership & networking'. A quote from Sarah Hitchcock, CEO of GetLyft, states: "Being an ODI Supporter has led directly to a revenue-generating partnership of £50,000-£100,000".
- Text:** A paragraph invites users to join a global network of over 2,000 businesses, startups, data experts, and government leaders.
- Network Directory:** A section titled 'Browse our network directory' lists three key contacts: Hannah Foulds (Head of Marketing and Membership), Julie McMahon (Membership Administrator), and Mike Rose (Head of Business Development).
- Membership Tiers:**
 - Supporter:** 'Pay what you can (annual from £1)'. Benefits include a bi-weekly newsletter, 30% off events, and a goody bag. A 'Join from just £1' button is present.
 - ODI Member:** 'SME: £720; Corporate: £2,200'. Benefits include staff attendance at events, listing in the directory, specialist workshops, sponsorship opportunities, and product demos. Buttons for 'Join for £720' and 'Join for £2,200' are shown.
 - ODI Partner:** 'Pricing on request'. Benefits include training/tech help, joint events, exclusive dinners, e-learning packages, and presentation opportunities. A 'Get in touch' button is provided.

Figure 5. Open Data Institute, Membership & Networking. (Open Data Institute 2018c, selection; <https://theodi.org/service/membership-networking/>; accessed September 25, 2018)

The brand of the Open Data Institute has a high degree of recognition and many positive associations. The brand guidelines regulate the brand identity and brand use. The brand building efforts of the Open Data Institute have resulted in the creation of a strong organizational brand that represents the core values of the organization and plays a central role in marketing and communication activities. The service portfolio of this organization includes consultancy, advising, courses, training, and research and development, among many other activities. Furthermore, the organization develops and provides free tools and practical guidelines for issues related to managing, publishing, and using open data. The Open Data Institute has successfully integrated a revenue model in its business model. Figure 5 gives an overview of different membership options offered by the Open Data Institute. Additional revenue is generated through consultancy, courses, events, and other paid activities. The extensive network of the Open Data Institute includes organizations from the public and private sectors, comprising an effective ecosystem. Overall, the Open Data Institute has developed a successful business model in the open data context.

5.5. Case 4 – OpenLab in the region of Stockholm

<http://openlabsthlm.se/> (Open Lab 2018a)

The OpenLab in the region of Stockholm represents an alternative case demonstrating how collaborative efforts among different organizations can lead to the establishment of a lab in Sweden that aims to facilitate innovation. The OpenLab was founded by the City of Stockholm, the Stockholm County Council, the Stockholm County Administrative Board, the KTH Royal Institute of Technology, Stockholm University, Södertörn University, and the Karolinska Institute with the mission “to create conditions that make the Stockholm region a global centre for societal innovations improving quality of life” (Open Lab 2018a). The lab has a portfolio of projects and collaborations, including an ideation platform for developing the City of Stockholm. The activities of the lab are integrated with education and include Master’s and professional courses. The lab uses design methods to engage multiple stakeholders and pursue research projects. Figure 6 shows the design approach endorsed by the lab. The lab focuses on four areas contributing to achieving its mission: sustainable urban development, the ageing population, health, and education. The facilities of the lab include offices, meeting rooms, open spaces, a maker space, and other working rooms. This case indicates an alternative option for developing a strategy and initiating the operations of a data-driven lab. The OpenLab in the region of Stockholm does not explicitly focus on initiatives related to open data. Nevertheless, this case serves as a practical illustration of organizing a lab that engages multiple stakeholders in the Swedish context.

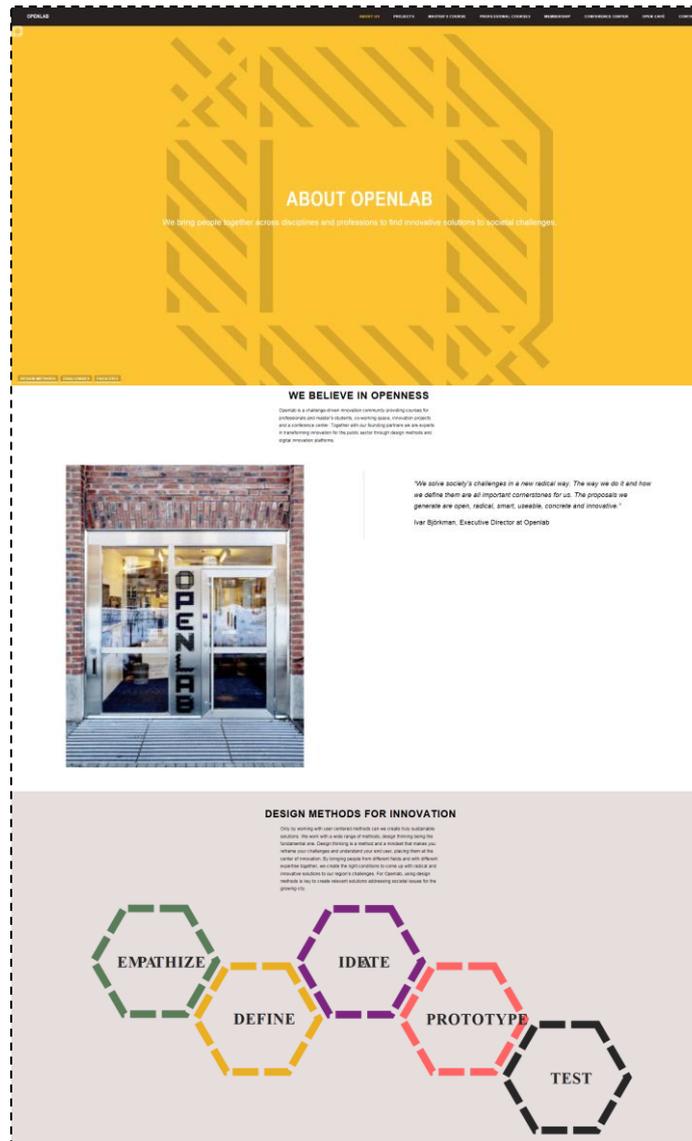


Figure 6. OpenLab. (Open Lab 2018b, selection; <http://openlabsthlm.se/about>; accessed on September 25, 2018)

5.6. Case 5 – Botnia Living Lab at Luleå University of Technology

<https://www.ltu.se/research/subjects/information-systems/Botnia-Living-Lab> (Luleå University of Technology 2018a)

The Botnia Living Lab at Luleå University of Technology represents another alternative case that shows how to utilize opportunities for establishing a lab in Sweden and developing an ecosystem by engaging different stakeholder groups. The Botnia Living lab aims to create a “world-leading environment for user-centric research, development and innovation (RDI), instrumented by methods, tools and experts, for interaction with user groups” (Luleå University of Technology 2018b). The lab has a portfolio of finished and ongoing projects investigating diverse phenomena relevant to smart cities and regions, such as the Internet of Things, energy efficiency, digital innovation, sports and culture, and eBusiness. The lab has established a

unique user panel for conducting research and has developed a FormIT methodology that has been adopted by other Living Labs in the European Network of Living Labs. Figure 7 illustrates the methodology developed by the Botnia Living Lab. Similarly to the previous case, this lab does not explicitly focus on open data initiatives, but it does demonstrate how a lab can contribute to a larger network of organizations and work proactively with developing an ecosystem that involves diverse stakeholder groups in the public and private sectors, as well as end-users and citizens.

The screenshot shows the Botnia Living Lab website. The header includes the Luleå University of Technology logo and navigation links for Education, Research, and Meet the University. A sidebar on the left lists various project categories, with 'The FormIT Methodology' selected. The main content area is titled 'The FormIT Methodology' and contains a circular diagram with four quadrants: EXPLORE, EVALUATE, IMPLEMENT, and CREATE. Below the diagram, there is a detailed text description of the methodology, its theoretical foundations, and its iterative process.

The FormIT Methodology

The methodology applied in Botnia Living Lab innovation processes is called FormIT and has been developed to fit into the Botnia Living Lab approach.

EXPLORE
EVALUATE
IMPLEMENT
CREATE

FormIT is a human-centred approach to develop IT-based smart city solutions with an iterative and interactive process with strong stakeholder engagement. It aims to facilitate development of innovative smart city solutions that are based on a holistic understanding of people's needs and values, paying due considerations to issues of equality, autonomy and control in relation to actual use situations. FormIT is grounded in the theoretical streams of soft systems thinking (Checkland, 1991; Checkland & Scholes, 1990), appreciative inquiry (Cooperrider & Avital 2004, Norum, 2001) and needfinding (Patnaik & Becker, 1999).

The process consists of three cycles: Concept Design, Prototype Design and Innovation Design. Each of these cycles has four phases, Explore, Create, Implement and Evaluate. In these phases the aim is to focus on identifying and working with the strengths in a particular situation and to build on that to ensure that future smart city solutions will create value. Hence, the core of FormIT is to focus on the opportunities that a specific situation holds and to build on the strengths in a situation to ensure that the future smart city solution will create value and not only solve a problem.

FormIT is also centred on understanding people's needs and values and to use these as basis for the development of the innovation. Hence, a specific target is to gain deep insights into people's thoughts, dreams, values and wishes and to co-create solutions with the stakeholders. In addition, FormIT actions are implemented in real world contexts which mean that people's real experiences from interacting or being exposed to a smart city solution guide the creation of the smart city innovation. The Basic Shape of FormIT reflects the different phases carried out in all FormIT cycles independent of particular focus.

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Figure 7. Botnia Living Lab. The FormIT Methodology. (Luleå University of Technology 2018c, selection; <https://www.ltu.se/research/subjects/information-systems/Botnia-Living-Lab/FormIT?l=en>; accessed September 25, 2018)

6. PRACTICAL RECOMMENDATIONS FOR A REGIONAL DATA-DRIVEN LAB

The practical recommendations for a regional data-driven lab presented below are developed as a result of the analysis of the empirical evidence collected during the research project. Based on the reviewed theoretical perspectives, practical examples, and empirical findings, a sustainable business model for a data-driven lab should include the following core elements:

- Strategic choices, ecosystem, and value proposition;
- Value creation and value delivery;
- Value capture.

The first element addressing *strategic choices, ecosystem, and value proposition* lays the foundation for all the other elements of a sustainable business model for a data-driven lab. The choices and decisions made regarding this element are especially important, since the lab is still in its initial ideation stage. A clear decision to initiate operations is critical for making further strategic choices and planning tactical operations. The presence of a visionary leader and management group are important for defining the mission of the lab and its core values, as well as for promoting the lab to the wider society. Branding and communication strategies are important for developing an attractive value proposition that engages different stakeholders. The strategic directions of the lab and its stakeholders are important considerations for specifying the value proposition. The active involvement of representatives of different stakeholder groups is recommended for formulating the value proposition. Designing an effective ecosystem and engaging vital stakeholders are both critical for future success of the lab.

The second element focusing on *value creation and value delivery* is strongly affected by and derived from the first element. The prioritized focus areas and strategic directions of a lab are important for value creation and value delivery. The atmosphere in the lab and its competences will affect stakeholder perceptions about value delivery. Furthermore, the lab's capacities for value creation will be determined by data requirements, quality assessment, licensing, ethical standards, software, tools, applications, and other factors.

The third element concentrating on *value capture* is closely intertwined with the first and second elements. While many practical business models applied in the open data context emphasize the revenue model, a data-driven lab involving public and private organizations needs to consider the non-monetary dimensions of value as well. If the lab will be funded by public organizations, it is important to emphasize social value and to contribute to the achievement of core public values, including democracy and citizen participation. The lab's contributions to facilitating data-driven innovation, enhancing sustainability, and creating public value are important aspects of value capturing.

The three proposed elements of a sustainable business model for a data-driven lab are interrelated. It is important to acknowledge that the configuration of a business model does not follow a linear process. The business model is dynamic, and activities relevant for particular elements can be implemented in parallel and are deeply intertwined. The following sections clarifying practical recommendations are structured in a logical order to support the decision-making process concerning the lab. The practical recommendations address all elements of a business model and highlight the core decisions that need to be made to establish a successful regional data-driven lab.

Make the decision to start a data-driven lab in the context of open data.

The first recommendation concerns a clear decision about starting a lab or not. This question is dichotomous in terms of success. For the lab to be successful, there needs to be a unity regarding the decision to start the lab and initiate its operations. If success is wanted, there is no room for hesitation.

Formulate mission, vision, and core values that would affect the future development of the data-driven lab.

In this very early stage, it is essential to have some core guidelines for planning. By formulating a mission and a vision, the organization would have a defined strategic direction. It is also beneficial to identify the core values of this organization. These values are essential in the brand building process. The core values need to be clarified prior to developing branding and communication strategies. Furthermore, decisions about the brand name and the logotype must be made in the early planning stages.

Formulate branding strategy and communication strategy with regard to different stakeholder groups.

These activities are mentioned at this early stage in the recommendation list to emphasize their acute significance for a data-driven lab. Branding and communication strategies would have strong impacts on subsequent activities. However, both of these strategic areas will develop naturally during the process. The branding strategy will help the data-driven lab to establish a strong brand and to continuously increase its value through supportive marketing activities.

Design the first-generation ecosystem.

This activity should occur early in the establishing process. Since the ecosystem would determine the capacities of the lab to create and capture value, it is important to address this issue in the initial stages. The structure of the ecosystem and the relationships between different stakeholders are critical for forming effective partnerships and initiating projects. It is not possible to design a definitive ecosystem, of course, as stakeholders will come and go and their roles will change over time. Furthermore, different individuals might represent the same collaborating organization in different projects. However, there is a need to create a map of the anticipated ecosystem at a very early stage in the establishing process. The specific design of the ecosystem needed for a lab would depend on the vision and strategic directions of the lab. For example, should there be an infrastructure/support system for innovation? If the answer is “yes,” an incubator should be integrated in the ecosystem for developing new ideas and commercializing them. This example of a specific lab stakeholder is presented here in order to show the difference one stakeholder can make to the entire ecosystem.

Decide which stakeholders should be involved in establishing the lab and forming its ecosystem.

A choice must be made about what stakeholders to include in the process of starting the lab. There are two aspects, which need to be considered. First, the stakeholders will anchor the operations of the lab among potential customers. Second, the establishing process should be manageable. Having too many stakeholders involved at this point might hinder the process. One way to look at the situation is to adopt a dynamic view and identify the critical stakeholders depending on the particular stage in the establishing process.

Specify the roles and responsibilities of each stakeholder group.

Specifying the roles and responsibilities of each stakeholder group is essential. It is important to consider that different stakeholders can have varying interests and diverse competences. Therefore, it is natural that each stakeholder would have an individual profile regarding its role and responsibilities.

Choose a person to represent the lab and the brand => a champ.

A visionary leader and management group are crucial for the success of the lab. In the case of the City of Chicago's open data portal, the Mayor acted as a champ in initiating the entire open data movement in the city and engaging multiple stakeholders. The trustworthiness of the person in charge has a significant impact on the success of a particular organization. It is important to stress that the person in charge should arrive with established credibility to make up for the lack of credibility of the lab's new brand. To increase this credibility, the lab could be built through a political decision, such as the open data executive order in the case of the City of Chicago.

Decide on an appropriate focus on revenue or public value.

The decision to focus on revenue or public value must be made at an early stage. This report presented cases where the engagement of stakeholders and the empowerment of citizens were dominant (for example in cases of Chicago and Barcelona). The Open Data Institute was an example of a well-developed revenue model that was integrated in the business model of the organization. All organizations presented in the selected cases had a clear focus on engaging citizens, businesses, or other stakeholder groups. It is important to acknowledge that there will always be a combination of stakeholder groups involved, since the lab will develop solutions that will impact diverse stakeholders. Moreover, data-driven labs will always be conflicted between achieving public sector values and increasing profitability. Therefore, an organization needs to plan how to address these tensions and select an appropriate focus.

Secure stable funding for the lab.

From the start, the conceptualization of the lab was financed through public funds provided by Vinnova. It is important to secure stable funding for the lab and clarify the interests of potential financiers. An organization financed by public funds needs to comply with public sector values. The strategic directions of the lab and its operations will be affected by the interests of the financing bodies. Most of the organizations that have been participating in the dialogue about a potential data-driven lab within this research project are regional. Thus, there might be some differences at the national level. The workshop participants expressed their views that the market for the services provided by the lab might be very limited or even non-existent. It is thus critical to increase awareness among stakeholders about open data and the opportunities related to a data-driven lab. Public funding might be needed (e.g., from Vinnova) to bridge the gaps in the immature market and develop open data labs.

Determine strategic directions (e.g., smart city, health, energy, transport).

The choice of strategic direction is crucial for a successful data-driven lab. This recommendation is closely related to the discussion about mission. Specifying strategic directions is important for building a strong brand and establishing a complex and relevant ecosystem. Several practical examples in Västerbotten confirm the importance of specifying the lab's foci and creating a supporting ecosystem for achieving the mission. Interviews with the CEOs of four world-leading companies located in Västerbotten indicated that the success of these companies is largely dependent on the cluster and its particular ecosystem. A critical mass of entrepreneurs is needed to establish an effective ecosystem. A certain number of

stakeholders is vital for reaching a significant pace of innovation. A sufficient number of entrepreneurs can guarantee knowledge access. In addition, a number of benefits can be expected to come from being identified as, for example, a “smart city” for open data. For example, one benefit is attraction. Being known would mean that people (e.g., developers) would come to the lab. A knowledge exchange would occur between the developers, resulting in interesting solutions and valuable solutions for the public. Another benefit is infrastructure. For an open data lab, infrastructure can include, for example, complex test beds. It is also important to address questions about the scope of the lab. In many cases, data-driven labs are assumed to stimulate the re-use of open data provided by public organizations. However, there are two alternatives: data generated within the lab itself and data that other organizations make accessible via the lab. Decisions about the scope of the lab should also address the range and depth of the services it will offer.

Develop a code of conduct and ethical guidelines.

The success of a data-driven lab will depend on its code of conduct and its ethical guidelines. An open data lab manages data generated in settings outside the lab. One of roles of the lab is to be a “window” for the data. This secondary use of data will accentuate the possible discrepancy between the data collection and use. The data collection will direct the possibility of use. Challenges will need to be addressed, such as cases where data were collected for one purpose but could be used by the lab for another purpose, which might have ethical implications. Other critical issues include data-use allowances and quality assurance. Possible uses of data for AI would need further regulation and quality control. In such cases, where secondary data will be re-used by different stakeholders, the lab must regulate the use of these data. At the same time, it is necessary to secure the continuous delivery of the data. For example, a smart city application built to coordinate local transport needs to have access to accurate timetables for different transportation modes.

Engage many diverse stakeholder groups.

The number of stakeholders will naturally vary according to the scope of the lab. Even if the scope is limited, a significant number of stakeholders will be involved and affected by the operations of the lab. Many practical cases indicate that a large number of stakeholders is a driver of success. Of course, it is possible to narrow down the number of engaged stakeholders. However, due to the immaturity of the market and the still-emerging demand, this is probably not a fruitful path to success.

Work proactively with branding.

Working proactively with the brand means the opposite of waiting and seeing how the brand establishes itself. The list below provides initial suggestions for actively branding a data-driven lab in the context of open data.

- Build the brand systematically and consistently.
The lab should plan and control its brand building process. It is important to coordinate the different activities in the lab and harmonize them with the values of the brand.
- Create strong associations and develop a positive image for the organizational brand.
The lab needs to work proactively to develop and reinforce its brand identity and brand image through strong and positive associations.
- Construct the brand dynamically and adapt to market maturity.

The market for services from open data labs is in the emerging stage, but this market will develop very rapidly, as indicated by the examined cases. The corporate brand needs to be built in a way that considers this development—for example, by starting with activities for increasing public awareness of open data.

- **Build brand credibility.**
One of the most important goals when establishing an open data lab is to ensure brand credibility for different stakeholder groups. The different stakeholders' perception of brand credibility will govern their behavior, which can lead to further engagement or not. Therefore, the brand building should consider the impact of different activities on perceptions of different stakeholders and aim to enhancing credibility of the entire organizational brand.
- **Make use of initial interest and curiosity.**
A strong lasting impression taken away from the workshops was the presence of initial interest and curiosity expressed by the participants representing different private and public organizations. Brand building efforts should consider these aspects and use them to promote lab activities and grasp opportunities arising from successful partnerships and collaborations.
- **Show examples.**
Showing examples is important for two reasons. First, due to the nature of the services provided by a data-driven lab, examples can make the organizational brand and lab outcomes more understandable and tangible. Second, examples can also demonstrate that lab work leads to successful solutions. In other words, specific examples would confirm that the lab has the capacity to create value for various stakeholders and society at large.

7. CONCLUSIONS

The main purposes of this report were to investigate the opportunities and challenges for establishing a regional data-driven lab in the context of open data, and to explore the possibility of developing a sustainable business model for a data-driven lab in Umeå (Västerbotten). The report examined conceptualizations of open data that initially emerged in the public sector and highlighted the requirements open data are expected to comply with. The report identified several types and categories of open data, which can be used to provide a variety of benefits for the public and private sectors, stimulate data-driven innovation, and enhance public value. In addition, the report acknowledged the barriers to the publishing and re-use of open data. The review of contextual conditions included prominent examples of international, regional, and national initiatives for stimulating practical activities and policy-making in the context of open data. Furthermore, the report addressed different theoretical perspectives on how to conceptualize business models, ranging from presenting a company's organization and its strategic view to emphasizing the elements required for creating, delivering, and capturing value in a specific context. The report elaborated upon the capacities of sustainable business models to achieve long-term success through business model innovation and to address environmental and social challenges while sustaining economic performance. Furthermore, the report emphasized the importance of considering a complex ecosystem engaging diverse stakeholder groups and the open data lifecycle for developing a successful business model in the context of open data. The report reviewed the business models used in the open data industry and discussed the important practical considerations for a data-driven lab.

The empirical evidence collected and used to prepare this report included materials gathered from two workshops involving participants from public and private organizations, the results of a conference, an examination of five exemplary international and national cases, and in-depth interviews with selected representatives of public and private organizations. The findings illustrated the opportunities and challenges that need to be considered when designing a sustainable business model for a data-driven lab. The report provided practical recommendations for developing a sustainable business model for a regional data-driven lab in Umeå (Västerbotten) by addressing the core elements, which are (1) strategic choices, ecosystem, and value proposition, (2) value creation and value delivery, and (3) value capture. Overall, the report emphasized the critical importance of creating the conditions that will enable the valuable resource of open data to be exploited and prioritizing the establishment of a regional data-driven lab by considering its potential to stimulate data-driven innovation and increase public value for society.

The recommendations presented in this report were based on empirical evidence collected prior to the creation of a regional data-driven lab in Umeå (Västerbotten). To support business model innovation and fully utilize the potential of this lab, future studies should explore its capacities, examine the ecosystem, and assess the relevant contextual conditions. For example, future studies could investigate the following research questions:

- What are the most critical stakeholders in the creation of an effective ecosystem for a data-driven lab? How should different roles be distributed in a successful data-driven lab?
- How can a data-driven lab build long-term relationships with diverse stakeholder groups and increase their engagement?
- How should a data-driven lab build a strong brand?
- What are resources and capabilities needed for brand building in the context of open data?
- How can a data-driven lab organize value creation and value capture efficiently?
- How do different communication strategies influence the performance of a data-driven lab?

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