Open Government Data (OGD) Framework for Sustainable Development

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Abstract—In the last few years, we have seen the production of data via companies, organizations, or even directly by citizens/consumers increase exponentially. In this new era where almost every aspect of human activity entails the production and consumption of data, Governments play a key role in leading the way to opening up data to stimulate innovation, but also to facilitate transparency and accountability. In this paper, we advocate for this critical role that Governments have to play and the need for a concerted effort in providing a guiding framework to support the opening up of Government Data for the wider benefit of society, but in particular to support the Sustainable Development Goals (SDGs). The SDGs, a universal call to action to end poverty, safeguard the planet, and promote prosperity for everyone, are inextricably linked to the appropriate use and dissemination of data. By using the potential of accessible government data, we not only advance the SDGs but also create a more fair and sustainable future for all.

Keywords—Open Government Data, Open Solutions, Sustainable Development Goals

I. INTRODUCTION

Open Government Data (OGD) is a philosophy that encourages openness, accountability, and value creation by making public data, owned by governments, accessible to anyone and shared over the Internet freely. Data is considered an essential building block for the creation of knowledge and the provision of various types of services. By opening up their data, governments can create new opportunities for innovation and value-added service creation for government organizations/departments, the private sector, and society. In addition, OGD facilitates transparency, accountability, and trust between governments and citizens and supports citizenship participation and understanding of government policies and decision-making. OGD can facilitate the use of data for the public good and for the benefit of individuals, communities, and societies. OGD and Open Data are fundamental elements in the UN's Open Solutions framework [1]. According to UNESCO, Open Solutions are initiatives, contents, tools, and technological processes that are created and shared openly using licenses and standards in order to promote sustainable development [1]. Typically, these solutions are intended to address social, economic, and environmental concerns, with an emphasis on enhancing the quality of life for communities, enhancing livelihood opportunities, and fostering the exchange of knowledge. In addition, OGD can also facilitate the development and application of Artificial Intelligence (AI) technologies to extract value from open data.

Governments worldwide have embarked on their OGD journey making varying degrees of progress. In this effort, developing countries lag behind this development due to challenges such as a lack of strong ICT infrastructures and the appropriate policy frameworks required to establish and promote OGD. Despite the imperative for OGD, there is still significant work that needs to be undertaken by a range of stakeholders if we are to reach a state where OGD datasets are freely available through the Internet and enable the construction of Open Solutions including novel open analytics to support sustainable development. We argue that an essential cornerstone for OGD is the creation of a comprehensive data governance framework that ensures data availability, usability, integrity, security, privacy, fairness, and ethical use while promoting compliance with relevant laws and ownership of responsibilities within a country-specific context. This includes the following:

1. Ensure effective data governance, and develop a thorough comprehension of data requirements, including the stakeholders, processes, and systems involved. Align them with applicable laws and regulations regulating data management to adhere to principles such as transparency, accountability, and inclusiveness.

2. Promote data fairness, enhance understanding of data requirements and the potential impact of data on its stakeholders, and develop capacities to implement and enforce data fairness policies and procedures.

3. Protect data privacy, and enhance applicable laws and regulations for data privacy as well as ethical principles such as transparency, accountability, and informed consent.

4. Establish data standards, implement, and enforce data standards policies and procedures, as well as allocate sufficient funds and resources to support data standards activities.

5. Establish data ownership, and strengthen capacities to identify data requirements and the categories of data.

6. Establish and enable responsible and secure cross-border data flows.

In developing these open government data guidelines as a position paper, we have undertaken a systematic literature review on openness in government. We have examined the topic from multiple perspectives in order to provide the reader with a holistic view of the underlying challenges and issues in adopting and fostering openness. The remainder of this paper is organized as follows. Section II discusses related work in the literature which was used in the development of this position paper. Section III proposes open government data guidelines, and Section IV summarizes the conclusions

II. LITERATURE REVIEW

Open Government Data is essential in enabling government but also non-government organizations to draw value from the data through the application of Artificial Intelligence and Data Science methods.

In their study of the development of the open government data ecosystems, Reggi & Dawes [2] recommended focusing on the linkage between public issues and the OGD ecosystem. According to Park & Kim [3], it is crucial to combine open government initiatives with other administrative and/or legal anti-corruption methods when governments embrace them in an effort to reduce government corruption. A model for public sector decision-making was provided by Wilson & Van Der Velden [4], and they suggested that it be aligned with the SDG policy framework to dramatically increase policy recognition and salience in the public sector. Also, Park & Kim [3] recommended taking into account additional measures to determine data quality that apply to non-tabular datasets. Instead of merely considering OGD from one country, the framework might take into account OGD from multiple nations. The work by Miasayedava et al. [5] provides a variety of potential study directions. With alerting, scenario- and impact-modeling, forecasting, and early warning capabilities, OGD systems can be improved. Francey et al. [6] suggested that there should be a framework, criteria, or metrics established to quantify the effects of OGD. Zuiderwijk et al. [7] recommended various improvements in how researchers handle OGD barriers and how policymakers address them. In addition, it was suggested by Wang et al. [8] that it would be helpful to determine whether data protection acts - such as the General Data Protection Regulation (GDPR) in the European Union, have any influence on how government entities behave with regard to the release of OGD. Zhenbin [9] suggested that public organizations may effectively acquire IT, financial, and human resources through the use of open data. Therefore, public agency managers could consider taking part in OGD initiatives as a way to get over the lack of internal resources. The most recent work by Alexopoulos et al. [10] focused on building an OGD framework for government e-services quality dimensions, however, this passion paper is presenting a holistic framework for OGD.

III. FRAMEWORK FOR OPEN GOVERNMENT DATA

Based on the findings of the review conducted, a new guidance framework has been developed to support the adoption of OGD as shown in Fig. 1. The proposed framework may be used in practice by governments developing a framework for OGD.

The framework involves 5 domains of action that should be considered as part of developing Open Government Data which are further explained below.

Fig. 1. Guidance Framework to support implementation of OGD.

A. Domain 1: Leadership and Commitment

Government leadership/Senior Management and strong political will are necessary for the government to take the lead in the ongoing opening of government data to achieve long-term improvement. Therefore, the government senior civil servants and management must give OGD focused and continuous attention, vigorously promote it, and offer the necessary technical and policy support to ensure its success. In addition to fostering transparency and accountability, which support SDG 16 (Peace, Justice, and Strong Institutions), this commitment to open government data also encourages innovation and data-driven solutions, which help advance progress towards a number of other SDGs, including those pertaining to sustainable cities, high-quality education, and economic growth (SDGs 8, 4, and 11).

This can be achieved through action in the following areas:

Developing an Open Government Data Strategy and Culture. This is in order to ensure that Open Government Data permeates all aspects of government and public administration. Governments should consider developing an OGD strategy explicitly committing them to collecting and making available high-quality data to be used and reused within government departments, but also by non-government organizations. A strategy is the first essential step in enabling a culture shift within the organization and placing openness at the heart of government operations, making clear the expected benefits so that department managers feel empowered to divert the necessary resources and invest in developing skills within their teams to support openness.

Improving Data Analytics Capacity and Skills. Government data owners and other stakeholders may lack awareness of the benefits of opening up government data or the data analytics skills and understanding required to do so. This can be a significant barrier to the adoption and fostering of OGD, hence, it is recommended that governments invest in education and training to promote the importance of open data. UNESCO has highlighted the need to increase open data awareness, and improve technical proficiency in digital data and systems, information security, procedures for personal data anonymization, data analytics, digital curation, and semantic web technologies. It is also recommended that governments mobilize their expertise in risk management, environmental impact assessment, and privacy impact assessment. In a world of open government data, it is

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imperative to ensure that data literacy, information, and record management abilities are fit-for-purpose and put to good use for wider benefit.

Encouraging Stakeholders Participation. Governments should encourage the participation of stakeholders (for example, citizens, businesses, etc.) and incorporate their views into the processes for improving the release of open data and increasing the extent of sharing in order for an OGD initiative to be developed successfully and in line with governmental principles. Engaging with stakeholders early in the process raises awareness of the value of open data, enables stakeholders to consider how they can use OGD to develop value-added services and products, and hence ensures the value of open data can be realised while also informing the public of the government's work and improving accountability and transparency.

B. Domain 2: Open Data Governance and Management

In creating and enabling Open Government Data ecosystems, governmental entities play a vital role in providing OGD and promoting its use by local populations and stakeholders such as data producers, consumers, and intermediaries. Different actors' interests in the specific function of the ecosystem may have an impact on the type and level of participation they have. Effective local data use can be facilitated and encouraged by national data availability, as evidenced by co-location, which is a strong predictor of the development of new linkages among actors of all types. Encouragement of interaction and mutual support amongst governing elements across the ecosystem is recommended in order to spur growth by enabling advantageous cross-side network effects. However, to facilitate a strong ecosystem, open data governance and management issues need to be considered carefully and appropriate underlying policies need to be put in place to ensure proper use of data.

This proactive approach to data governance contributes to SDG 17 (Partnerships for the Goals) by fostering collaboration between the public and private sectors as well as civil society actors to harness the potential of open data for sustainable development. SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals) are both supported by this approach to data governance.

Data Sharing. The scope of data sharing within government departments/sections may be limited by how sensitive government operations are and also the nature of the data itself pertaining to individuals' sensitive information. As a result, public organizations that handle sensitive data may need to consider what datasets or portions of datasets can be made available as OGD. Developing high-level principles and policies for data sharing can help government organizations consider opening up their data in a principled way making it easier to navigate the complexities of determining which data to share. It is also recommended that some mixed strategies, such as publishing some portions of the data to an open knowledge base while reserving the entire data for a dedicated or shared triple store, be taken into consideration.

Data Privacy and Misuse. Public agencies provide data to attract outside innovators to innovate with the shared data when they rely heavily on external resources for innovation.

However, this can leave room for abuse, such as data distortion or privacy violations. Governments should have robust policies in place for data sharing, while also considering having processes in place to revoke the rights to use open data, should the need arises, such as in instances of data misuse, even if public agencies may have less control over the types of resources that external innovators provide, or even if this restricts third party's ability to use the data to innovate - the right to privacy of individuals and their data should be the overriding principle.

Open Data Security. The concept of security is broad, underpinned by the values of data protection, privacy, and data quality. Data security is essential in preventing unintentional or malicious exposure, modification, or destruction of records and datasets. Databases may include sensitive personal information. In order to prevent privacy violations, the opening of such data should be done strictly in accordance with privacy principles. In other words, the security of the data is of paramount importance and needs to be maintained at all times.

Data Standardization. Setting a metadata standard is a crucial goal that must be taken into consideration if organizations are to attain a high degree of data management, accessibility, and sharing. Furthermore, standardization is essential to the success of any Open Data initiative. Without a metadata standard, the management of metadata would be chaotic.

Assessing the Value of Open Government Data to Society. Government departments that are involved in the development of the OGD principles and frameworks would greatly benefit from developing metrics to evaluate the worth and impact of OGD in terms of societal benefit and quantify outcomes. In addition to this, metrics to calculate the data quality of the developed datasets would also provide an indication of value. It is recommended that governments invest in evaluating and assessing the societal impact of open data policies and activities. Where data has been used outside of government by non-government organizations and the private sector, it may be more challenging to accurately measure the value created by information sharing across networks. Policymakers should take into account innovative methods for measuring the value of data given that increased data and information use is a key component of competitiveness for enterprises and society.

In this regard, governments can leverage the support of academic and research networks with expertise in outcome and policy evaluation.

C. Domain 3: Resource Management

In delivering successful OGD initiatives, appropriate investment in people, skills and infrastructure needs to be made. This investment may be substantial depending on the current state of digital infrastructure and skills. However, although there may be an initial investment required in OGD, in the longer term, OGD can deliver tangible benefits in terms of minimizing operational costs, improving service delivery, and allowing the re-use of data within governments and beyond, thus enabling additional economic value to be derived. Therefore investment in resources to support OGD should be seen in the context of the use of open data by public organizations for acquiring IT, financial, and human resources as an efficient strategy. Therefore, it is recommended that leaders of public agencies consider investment in OGD activities as a longer-term strategy to derive economic efficiencies and as a way to overcome the shortage of internal resources but also to deliver better outcomes.

Public agencies should proactively look for and gather feedback on the types of data that outside innovators are looking for. To encourage more participation from outside innovators, public organizations should share their data through OGD initiatives (with sufficient resources).

By encouraging investments in digital infrastructure and skills, this strategy directly supports SDG 9 (Industry, Innovation, and Infrastructure). Additionally, it supports SDG 17 (Partnerships for the Goals) by encouraging cooperation between the government and outside innovators for sustainable development.

D. Domain 4: Risk Management in Open Data

There are risks associated with opening up government data and it is recommended that government organisations carefully consider associated risks at the appropriate level.

The values of SDG 16 (Peace, Justice, and Strong Institutions) are in line with a proactive approach to risk management in open data since it encourages responsibility and transparency in the processing and sharing of data. Government agencies can facilitate confidence among data consumers and stakeholders by effectively recognising and reducing risks, thereby helping to achieve sustainable development objectives relating to peace, justice, and strong institutions.

Pre-Assessment with Regard to Rules and Regulations. As a starting point, it is recommended to develop an assessment model to evaluate whether current laws, rules, or standards have any influence on how government organizations behave with regard to the release of OGD and whether these are appropriate in supporting an OGD ecosystem. While there need to be appropriate enabling policies in place to support the release of OGD this needs to be balanced out by the necessary regulation to ensure data privacy and appropriate uses of data.

Risk Assessment and Treatment. The government sections should focus on assessing the risks of open data while lowering their susceptibility to disaster or data loss. The following steps should be considered in undertaking a risk assessment:

1. Identify the different types of data.

2. Analyze and evaluate the risks of Open Data.

3. Define a mitigation strategy and create a contingency plan.

4. Implement Open Data risk mitigation strategies to reduce disaster risk.

E. Domain 5: Implementation Guidelines for Open Data

Government organizations should make an effort to encourage OGD implementation, which can benefit from improved data security and risk mitigation strategies. Senior leadership and other key related staff awareness and support for OGD is important for successful implementation, but this also requires appropriate structures to be put in place to ensure proper implementation. For instance, determining responsibility within the organizational structure is important and this could be done through the implementation of a top-down Chief Data Officer structure to focus the necessary responsibility and support for the creation, management, and promotion framework for OGD. Another essential step is a comprehensive analysis of OGD and pertinent laws and regulations, especially with regard to data security and privacy concerns. The focus should be placed on developing OGD implementation regulations by each government department. It is recommended that governments adopt this framework and develop guidelines for the implementation of OGD initiatives so that there's consistency of implementation across different departments and sections while also facilitating compatibility and cross-linkage of datasets both across government sections and potentially with external datasets.

Such coordinated initiatives enhance sustainable development by promoting openness, accountability, and the effective use of data for societal benefit. They are in line with the objectives of SDG 16 (Peace, Justice, and Strong Institutions).

IV. CONCLUSIONS

The pandemic necessitated new policies for data governance and management. Governments/Public Sector organizations are especially important in this regard because they collect, store, secure, process, share, use, and reuse massive amounts of data. International/Cross-Border data flows are critical for developing and developed economies to foster resilience, growth, and innovation.

Openness promotes greater engagement with and use of technology, allowing individuals and societies to benefit from it. It is critical that government data collections be made open so that individuals, corporations, academic institutions, civil society, and other organizations can use them to achieve their own goals while also supporting societal-level goals such as the implementation of the Sustainable Development Goals (SDGs).

The barriers to openness are significant, and potential solutions are diverse and almost always context-dependent. Leadership, privacy, access, availability, findability, usability, quality, understandability, compatibility, and other factors, according to current research, are common barriers faced by organisations. Open Government Data is critical for both government and non-government organizations to derive value from data through the application and advancement of Artificial Intelligence and Data Science methods.

Based on the findings of a review of open government data, this paper proposes a framework that can be used by government organisations to consider and structure their open government data initiative. In practice, the proposed framework can be used by governments developing open government data to generate more precise policy recommendations and useful leads for policy design and implementation guidelines. Government actors are strongly encouraged to take these findings into account and to use the proposed framework as the basis to take appropriate actions to open up their data and support the development of infrastructures and open ecosystems. The framework provides direction to governments to take the lead in the ongoing opening of government data and achieve long-term improvement. Government leadership and strong policy direction are required. Governments should consider developing an explicit OGD strategy to ensure that Open Government Data pervades all aspects of government and public administration. A strategy is the first critical step in enabling an organizational culture shift and putting openness at the heart of government operations. It is recognised that government entities as the data owners and stakeholders of the OGD initiative may lack awareness and the skills to

successfully implement OGD initiatives and this is a significant challenge; therefore, governments should invest in education and training to promote the importance and adoption of open data while also upskilling relevant teams within departments and sections. It is recommended that governing elements across the ecosystem encourage interaction and mutual support in order to spur and facilitate growth by enabling advantageous cross-side network effects.

Initiatives involving open government data and the SDGs clearly align. Governments can directly support a number of SDGs, including those associated with economic growth, innovation, quality education, sustainable cities, peace, justice, and strong institutions, as well as partnerships for the goals (SDGs 8, 9, 4, 11, 16, and 17) by fostering transparency, improving data accessibility, and encouraging collaboration. Governments and other stakeholders play a critical role in pushing the global agenda for sustainable development as they embrace the idea of open data and its revolutionary potential.

The advancement towards attaining the SDGs will be fueled by a common commitment among a variety of stakeholders, not just governments, as we move forward. In this joint effort, open government data acts as a potent weapon, encouraging cooperation, creativity, and data-driven decision-making. By embracing openness, we not only unleash the power of data but also open the door to a more just and sustainable future for everyone.

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