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# TRANSPARENCY-ORIENTED DIGITAL TRANSFOR-MATION: REASERCH ISSUES FOR OPEN GOVERNMENT DATA FROM POLICY DOCUMENTS

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# EXTRACTING OPEN GOVERNMENT DATA RESEARCH AREAS AND TOPICS FROM POLICY AND LEGAL DOCUMENTS

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## Abstract

*The digital transformation of government initially focused on the internal processes and work practices of government agencies, and then on the channels and ways of services provision to citizens and firms, as well as on the services themselves, and aimed mainly to increase efficiency. However, later it was extended towards the enhancement of government transparency and accountability, by exploiting the digital technologies in order to provide large amounts of information to citizens and firms about the activities and plans of government agencies, and recently to open and publish large datasets of them. This constitutes a big innovation/transformation, since previously government data were regarded as highly secret, and could be accessed only by limited numbers of competent public servants. The Open Government Data (OGD) have a great potential to promote not only government transparency and accountability, but also economic development (especially concerning the emerging data economy), scientific research as well as efficiency and effectiveness of other government agencies (beyond the one who publishes them). However, the OGD domain is relatively new, rapidly evolving, and has not reached and realized its full potential, so extensive research is required in order to support and facilitate progress in this direction, and finally increase the social and economic value generated from the large amounts of published OGD. So, it is quite important to define rationally the research agenda in this OGD domain: the main research areas as well as the particular research topics of each of them. For this purpose, some research has been conducted, which however is based exclusively on the review and analysis of previous scientific papers in this domain. In this paper we investigate the exploitation of recent OGD-related policy as well as legislation documents, as an additional and complementary source for extracting areas and topics in the OGD domain that require research in the near future. A methodology for this is developed, which is used in order to we analyse the 'OECD Open Government Data Report – Enhancing Policy Maturity for Sustainable Impact' and the EU Directive 2019/1024 on 'Open Data and the Re-use of Public Sector Information'. This results in the identification of interesting new areas and topics of required OGD research, which are highly important and have not been identified by previous relevant research based on the review and analysis of scientific papers in this domain.*

*Keywords: open government data, policy, legislation, digital transformation, transparency*

## 1 Introduction

The digital transformation, defined as the use of digital technologies in order not simply to support (as we did in the first stages of the use of digital technologies in organizations), but to change radically and finally transform the main functions of organizations (both the internal ones, as well as the 'extrovert' ones, which concern their transaction and in general interaction with their external environment), initially started in the private sector; it was driven by the increasing competition, the wide adoption of digital technologies by their existing and potential customers, and the rapid decrease of the costs and at the same time improvement of capabilities of these technologies (Vial, 2019; Konopik, 2022). The impressive success stories of digital transformation in the private sector, which revealed its great potential, in combination with the declining trust of citizens in government, and the strong social pressures for efficiency and effectiveness improvements of government agencies, acted as strong drivers for the application of these digital transformation ideas (with appropriate adaptations) in the

public sector as well (Omar et al., 2017; Pedersen, 2018; Plesner et al., 2018; Alvarenga et al., 2020; Mergel et al., 2019).

The digital transformation of government initially focused on the internal processes and work practices on government agencies, and then on the channels and ways of services provision to citizens and firms, as well as on the services themselves, aiming mainly to increase efficiency (Mergel et al., 2019). However, later it was extended towards the enhancement of government transparency and accountability as well, by exploiting the digital technologies in order to provide large amounts of information to citizens and firms about the activities and plans of government agencies, and recently by opening and publishing large datasets of them (Dawes et al., 2016; Charalabidis et al., 2018; Zuiderwijk et al., 2019; Reggi and Dawes, 2022; Van Ooijen et al., 2022). This constitutes a big innovation/ transformation, since previously government data were regarded as highly secret, and could be accessed only by limited numbers of competent public servants. The Open Government Data (OGD), defined as data that are provided/published free of charge, openly licensed, and in an open, machine-readable format (Charalabidis et al., 2018), have a great potential to promote not only government transparency and accountability (which was initially the main objective), but also economic development (especially concerning the emerging data economy), scientific research as well as efficiency and effectiveness of other government agencies (beyond the one who published them). According to widely cited and recognized relevant policy document 'The Emergence of a Third Wave of Open Data' developed by the Open Data Policy Lab of the New York University (Verhulst et al., 2020) there has been significant evolution in the area of OGD, and we can distinguish three 'waves of OGD': the first of them has been influenced mainly by the 'freedom of information' ideas and laws, and aims mainly to promote government transparency and accountability; the second wave has been influenced by the web 2.0 and open government ideas, and aims to promote, beyond government transparency and accountability, the use of OGD for enabling citizens to improve their everyday life and solve problems; the third wave of OGD is more ambitious, as it aims, in addition to the abovementioned objectives, at the use of OGD for promoting on one hand the innovation and entrepreneurship, and in general the economic activity (and especially to contribute to the development of the data economy) in the private sector, and on the other hand the evidence-based policy making in the public sector.

However, it is widely recognized that the initial enthusiastic expectations from OGD have been realized only to a limited extent, and the social and economic value that has been generated from the large amounts of OGD that have been published by governments of numerous countries, as well as by international organizations, has been much lower than expectations (Zuiderwijk et al., 2019; Van Loenen et al., 2021; Reggi and Dawes, 2022). In general, the OGD domain is relatively new, it is rapidly evolving, and has not reached and realized its full potential. For these reasons extensive research is required in the OGD domain, in order to increase its maturity, and finally the social and economic value generated from the large amounts of OGD that have been published (which has required a considerable investment). So, it is quite important to define rationally the research agenda in this OGD domain: the main research areas as well as the particular research topics of each of them that need to be investigated. For this purpose, some research has been conducted, which however is based exclusively on the review and analysis of previous scientific papers in this domain (published in scientific journals and conferences) (Charalabidis et al., 2016; Zhang et al., 2018; Corrales-Garay et al., 2019; Mohamad et al., 2022). However, these scientific papers on OGD incorporate only the relevant perspectives and knowledge of the academic world concerning OGD, and also identify mainly the OGD-related topics and areas that have been researched most in the past, assuming that they should define the future research agenda as well; however, this approach does not take into account the relevant perspectives and the valuable knowledge of the government practice world (i.e. of the government agencies who are responsible for the design and implementation of OGD policies and activities) and also cannot identify new topics and areas that have to be researched for addressing new realities, evolutions as well as new problems and challenges in this domain.

Therefore, in order to achieve a more comprehensive identification of future OGD research areas and topics that have to be investigated, it is useful to extend our analysis beyond the academic world, towards the government practice world. It is quite important to analyse not only the previous scientific publications on OGD, but also additionally the OGD-related policies, activities and legislations of government agencies, as they can reveal important OGD research topics and areas that require

investigation in the near future. Such OGD-related policy, activities and legislation documents incorporate valuable information and knowledge from government agencies, who design and implement practically in 'real-life' the opening of government data, concerning their relevant activities, achievements as well as problems and challenges, and also future directions/plans in this domain, so they reveal quite important OGD-related research areas and topics (rooted on 'real-life' and practice) that have to be investigated in the near future; many of these research needs might be new, posed by recent activity and practice, as well as by new realities, evolutions, technologies, as well as new problems and challenges, or by future directions/plans in this domain, so they might have not been dealt with (or have been minimally dealt with) in previous academic research. This is in line with the more general strong trend that exists in the wider organizational information systems domain for more 'relevant' research, which is more closely connected with 'real-life' practice, needs and challenges/problems (Nunamaker et al., 2015; Lee et al., 2021).

This paper contributes to filling the abovementioned gap, by investigating the exploitation of recent OGD-related policy as well as legislation documents, as an additional and complementary source for extracting areas and topics in the OGD domain that require research in the near future. A methodology for this is developed, which is used in order to we analyse the 'OECD Open Government Data Report – Enhancing Policy Maturity for Sustainable Impact' (a highly important policy document in the OGD domain) and the EU Directive 2019/1024 on 'Open Data and the Re-use of Public Sector Information' (a highly important legislation document in the OGD domain). This results in the identification of interesting new areas and topics of required OGD research, which are highly important and have not been identified by previous relevant research based on the review and analysis of scientific papers in this domain.

Our paper consists of five sections. In the following section 2 previous relevant literature is briefly reviewed, and then in section 3 our methodology is described. Next, in section 4 the results are presented, while in the final section 5 conclusions are summarized and future research directions are proposed.

## 2 Literature Review

As mentioned in the Introduction the OGD domain is relatively new, rapidly evolving (especially with respect to the objectives and directions of OGD exploitation we can already distinguish three different 'waves' (Verhulst et al., 2020)), has not reached high levels of maturity yet, has not generated the expected levels of benefits, and in general social and economic value, and has not realized its great potential. So extensive research is required in order to increase the maturity of the OGD policies, activities and practices, and finally the levels of social and economic value from the large amounts of OGD published by government agencies in most countries (and the big investments made for this). Some research has been conducted in order to 'direct' this required extensive future research, which aims to identify the main areas and topics of future research in the OGD domain (Charalabidis et al., 2016; Zhang et al., 2018; Corrales-Garay et al., 2019; Mohamad et al., 2022). However, these studies have been based on reviews of previous scientific papers (published in scientific journals and conferences) in the OGD domain: initially they are searching large and widely recognized databases of papers (e.g. Scopus, Web of Science, etc.) for OGD-related papers (having 'open data' or 'open government data' in their title or sometimes even in their keywords); then they are processing either the keywords of these papers, or the main topics they are dealing with, in order to identify the main OGD topics researched, and then group into higher-level OGD research areas.

It is worth mentioning the main results of the study by Charalabidis et al. (2018), who developed a comprehensive taxonomy of OGD research topics, which includes four areas of OGD research, and specific research topics for each of them (mentioned in parentheses):

i) OGD Management and Policies (Policy & Legal Issues for OGD, OGD Anonymisation Methods, OGD Cleaning Methods, OGD Quality Assessment Frameworks, OGD Visualisation Methods and Tools, OGD Linking, OGD Publishing, OGD Mining, OGD Rating and Feedback).

ii) OGD Infrastructures (OGD Portals Architecture, Open Web Services/APIs, OGD User Profiling and Service Personalisation, OGD Long-term Preservation, OGD Storage, Cloud computing for OGD, Citizen-generated Open Data, Sensor-generated Open Data).

iii) OGD Interoperability (Metadata for OGD, OGD Multi-linguality, OGD Service Interoperability Standards, OGD Semantic Annotation, OGD Ontologies, OGD Platform Technical Interoperability, OGD Organisational Interoperability, OGD Controlled Vocabularies and Codelists Preservation).

iv) OGD Usage and Value (Skills Management for OGD, OGD Stakeholders' Reputation Management, OGD Use, OGD-based Entrepreneurship, OGD Value and Impact Assessment, OGD Needs Analysis, OGD-based Accountability, OGD Readiness Assessment, OGD Portals Evaluation Frameworks, OGD Innovation).

Also, recently a study by Mohamad et al. (2022) developed a taxonomy of OGD research topics, which has some similarities at least at the level of identified research areas; it includes the following four OGD research areas, and specific research topics for each of them (mentioned in parentheses):

a) OGD Implementation & Management (OGD Adoption Factors and Barriers at country, organization and local government level and Strategies to Mitigate Barriers, Assessment of OGD Portals with respect to data quality, functionality, usage and trust, OGD ecosystems).

b) OGD Architecture (OGD Metadata, Ontologies, Linked Open Data, Semantic Web, Data Mining and Visualization, Big Data Analytics, Data Integration and Interoperability).

c) OGD Users & Utilization (OGD Usability, Usage Barriers, Motivations and Awareness).

d) OGD Benefits (Economic, Social, Governance, Transparency/Accountability, Citizen Participation, Value Creation and Co-creation, Innovation).

However, these studies have the following weaknesses:

- They are based on analyses of previous scientific publications (in scientific journals and conferences), so they incorporate relevant perspectives and knowledge mainly of the academic world concerning OGD, but do not the ones of the government practice world (i.e., of the government agencies who are responsible for the design and implementation of OGD policies and activities).

-They identify the OGD-related topics and areas that have been researched most in the past, but they do not identify new research areas and topics in the OGD domain, which are posed by new realities, evolutions as well as new problems and challenges, or by future directions/plans of competent government agencies in this domain.

# 3 Methodology

In order to address the abovementioned weaknesses, it is necessary to extend our analysis beyond the academic world, towards the government practice world: it is quite important to analyse not only the scientific publications on OGD, but also several different types of relevant government practice/activity documents, as they can reveal important OGD research topics and areas that require investigation in the near future. The most important types of such documents to be analysed are:

a) OGD-related policy documents, as they include extensive information concerning existing policies, activities and achievements concerning OGD, as well relevant problems and challenges, which reveal research areas and specific topics that have to be investigated;

b) OGD-related legislation documents, as in their initial 'recital' part they include a wide range of relevant objectives concerning OGD that have to be achieved/promoted, and then their articles are dealing with important relevant topics and aspects of OGD that are considered as important and needing regulation (in order to maximize the benefits for the society and the economy from OGD, or eliminate/mitigate possible negative impacts and risks), which also reveal research areas and specific topics that need to be investigated.

For analysing these documents and extracting from them areas and specific topics that require research, a Document Content Analysis methodology (Krippendorff, 2004; Neuendorf, 2017; Toll et al., 2019) has to be adopted, which includes the following steps (shown in Figure 1):

I) Each document is read in order to identify relevant sentences or paragraphs that describe OGD-related objectives, policies, activities that are implemented, or have to be implemented, as well as issues, problems and challenges that have to be addressed, which require to be researched/investigated.

II) For each of these sentences or paragraphs the corresponding research topic is defined and expressed briefly, condensed in a few words.

III) In this way an initial list of research topics is developed, which is then examined in order to identify groups of similar research topics, which are merged.

IV) The research topics of this final list (after the merging of the similar topics) are grouped into research areas.

V) For each of the research topics of the final list produced in step III, and the research areas developed in step IV we examine to what extent it is included in ones identified by the study of Mohamad et al. (2022) or it is new.

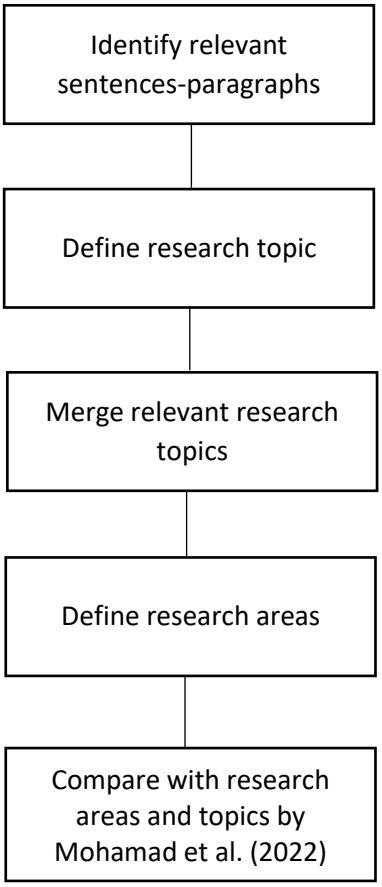



*Figure 1. Steps of our Document Content Analysis methodology*

In this study we have focused on OGD-related policy and legislation documents of large international organizations, mainly OECD and EU, as they incorporate extensive useful information and knowledge from many countries. In particular, initially we analysed one of the most important policy documents of OECD, which proposes policies and specific activities to be undertaken by its member countries in the OGD domain, based on a detailed analysis of relevant policies, activities, achievements as well as challenges/problems of all its member countries:

OECD (2018). *OECD Open Government Data Report – Enhancing Policy Maturity for Sustainable Impact*. OECD Better Policies for Better Lives Initiative. Paris: OECD Publishin,.

Furthermore, we analysed a highly important and influential legal document of the European Union concerning the OGD: the EU Directive 2019/1024 on Open Data and the Re-use of Public Sector Information':

European Union (2019*). Directive EU 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information*. Luxemburg: Official Journal of the European Union.

For each of these documents we developed a taxonomy of the extracted OGD research areas, and corresponding topics of each area, which was then compared with the ones of the most recent of the relevant previous studies (see section 2), which have been based on the review and analysis of previous scientific papers about OGD: the study of Mohamad et al. (2022).

# 4 Results

## 4.1 OECD Policy Report

The 'OECD Open Government Data Report – Enhancing Policy Maturity for Sustainable Impact' describes the extensive experience and knowledge of OECD in the domain of OGD, which has been developed through its long and extensive analysis of the relevant activities, achievements as well as problems and challenges of its numerous member and partner countries, in co-operation with representatives and experts these countries. It is structured in eight chapters, and each of them consists of some of sections, which correspond to the main issues-challenges that have to be successfully addressed in order to have a high level of positive impact on the economy and the society from the opening of government data. Therefore, the chapters of this OECD Report and their sections enable the extraction of a wide range of required future research areas, as well as specific research topics in each of them, that need to be investigated, which are based on the analysis of the 'real-life' activity and experience in the OGD domain of a large number of countries with different levels of economic and technological development. Eight OGD research areas, and their corresponding research topics were extracted, which are shown in the Appendix 1. For each of these extracted OGD research areas and topics extensive research is required: on one hand descriptive research (describing the existing situation) and on the other hand development research (aiming to improve the existing situation, through new innovative developments).

The first OGD research area extracted is 'OGD governance', and includes as main research topics the OGD policies, strategies and action plans (their objectives, contents-elements as well as alignment with other broader government policies and strategies and also with United Nations 'Sustainable Development Goals'), OGD institutional set-up (existence of a central government agency responsible for the formulation of the central OGD policy/strategy and its cross-government implementation and co-ordination, and specific competences/responsibilities of it), OGD political, administrative and technological leadership, OGD officer/steward roles, OGD cross-government collective bodies, steering committees and networks, OGD legal and regulatory framework (contents, mandates/requirements), OGD – 'Open by Default' culture development and OGD policy funding models.

The second OGD research area extracted is 'OGD use for new citizens' services', and includes as main research topics novel OGD-based private sector services/apps, OGD intermediaries, OGD use for finding novel solutions to social problems, OGD-based services/apps by government agencies, use of OGD for public policy making, use of OGD for innovating public procurement, use of data analytics (especially predictive analytics) and visualization for OGD, promoting collective learning, collective intelligence and public participation through OGD, and also development of capacity for OGD impact measurement and monitoring, and finally OGD 'Open by Default' and 'Publish with Purpose' strategies.

The third OGD research extracted is 'OGD quality and accessibility', and includes as main research topics the OGD quality characteristics-criteria, standards, guidelines and support instruments for government data publication, protection of personal, private and sensitive data and data anonymization, OGD catalogues, OGD metadata contents, standards and their adoption/use, OGD interoperability

(standardization of data formats and structure), OGD real-time publication, OGD licencing, OGD pricing models, historical government data provision, OGD disaggregation and granularity.

The fourth research area extracted is the effective 'implementation of OGD policies', and includes as main research topics the challenges (policy-related, technological, organizational/institutional, cultural, legal and financial) to the implementation OGD and 'Open by Default' policies and initiatives, public sector OGD implementation capacity building (for the effective implementation of OGD policies), incentives for data opening/publishing, dissemination and communication of OGD initiatives to priority communities, strategic (top-down) policy-driven data opening/publication, demand-based user-driven (bottom-up) data opening/publication, consultation with OGD user communities, maturity models for OGD policies, and capacity building among internal and external groups for OGD re-use.

The fifth research area extracted concerns the 'OGD portals', and includes as main research topics the functionalities/features offered by central one-stop OGD portals, taxonomies of OGD provided, metadata provision, OGD visualization capabilities provision, OGD quality control processes and tools, mechanisms and tools for broken links detection, interconnection of OGD portals, automated harvesting of OGD, OGD-related liabilities of public officials – protection, user data request capabilities, user feedback and datasets evaluation functionalities/features, user discussion, collaboration and community building functionalities/features, user data upload/data crowdsourcing functionalities/features, and OGD and promotion of 'Government as a Platform'.

The sixth research area extracted concerns the 'publication and use of OGD for promoting good governance and public trust' and includes as main research topics the OGD and anti-corruption strategies, OGD and emergency response (e.g., in case of earthquake, flood, hurricane, cyberattack, etc.), opening public procurement data and opening budget data.

The seventh research area extracted is the promotion of 'OGD re-use for value co-creation', and includes as main research topics the understanding of potential OGD users' communities, initiatives for promoting OGD re-use (general as well as targeted (oriented towards specific policy problems)), establishment of partnerships with potential OGD users' communities (business incubators, businesses, academia and research organizations, civil society organizations), partnership with local governments for value co-creation from OGD, development of wide OGD ecosystems, OGD publication and use for problem-solving and OGD-driven business opportunities.

Finally, the eighth research area extracted is the 'monitoring/measurement of the implementation, performance and impact of OGD policies and initiatives', and includes as main research topics the development of metrics and performance indicators, identification of barriers to OGD re-use and assessment of overall OGD policies impact/value (economic, social, good governance).

A comparison of the above extracted OGD research areas and topics from this OECD Policy Report with the ones of the study of Mohamad et al. (2022) indicates that many of the former are new (they are shown with an asterisk in Appendix 1). Three new research areas have been identified concerning:

- OGD governance (including some highly important research topics, such as OGD policy funding models, OGD legal and regulatory framework and OGD 'Open by Default' culture development),
- OGD use for new citizen services (including highly important research topics, such as OGD-based private sector services/apps, OGD intermediaries, OGD use for finding novel solutions to social problems, OGD-based services/apps by government agencies, use of OGD for public policy making, use of OGD for innovating public procurement, use of data analytics and visualization for OGD, promoting collective learning, collective intelligence and public participation through OGD and OGD 'Open by Default' and 'Publish with Purpose' strategies)
- OGD for good public governance and trust (including the highly important research topics, such as OGD and anti-corruption strategies, OGD and emergency response, opening public procurement data and opening budget data).

Moreover, for all the remaining five research areas extracted important new research topics have been identified, such as OGD real-time publication, OGD licencing, OGD pricing models, OGD-related liabilities of public officials, strategic (top-down) policy-driven data opening-publication, demand-based user-driven (bottom-up) data opening – publication, maturity models for OGD policies, automated harvesting of OGD, user discussion, collaboration, community building functionalities, user

data upload/data - crowdsourcing functionalities-features and OGD and promotion of 'Government as a Platform'.

## 4.2 EU Directive 2019

The EU Directive 2019/1024 on 'Open Data and the Re-use of Public Sector Information' is a legal document, which enables the extraction of some important research topics, mainly from its initial 'recital' part (including 74 'whereas' clauses that describe a wide range of objectives it aims to achieve/promote, as well as its background and context), and to a smaller extent from its main content (consisting of 19 articles). We have initially extracted some 'implied' research topics, and then we attempted grouping them into research areas.

Five OGD research areas, as well as the corresponding research topics of each of them were extracted, which are shown in the Appendix 2. For each of these extracted OGD research areas and topics extensive research is required: on one hand descriptive research (describing the existing situation) and on the other hand development research (aiming to improve the existing situation, through new innovative developments).

The first research area extracted is 'OGD Policy', and includes as main research topics the 'Open by design and by default' data policies, and also the 'As open as possible, as closed as necessary' data policies', high-value datasets opening – criteria and methodology of identifying/specifying high- value datasets, special conditions of their provision (technical (formats, metadata, provision through APIs), legal (licenses) and also economic (charging)), opportunities, assessment of their impact (economic, social, environmental, etc.), opening research data (from research performing organizations or research funding organizations), opening digitized cultural resources, opening data of private undertakings fulfilling public service obligations (e.g. air carriers, shipowners, etc.) and provision of real-time access to dynamic data (meant as data frequently changing, rapidly becoming obsolete, or sensor-generated data, whose value depends on their immediate opening and provision).

The second research area extracted in 'OGD Economics', and includes as main research topics the effects of OGD provision on competition (strengthening, restriction, distortion effects), OGD and 'first-mover' advantages and policies for mitigation of them, OGD and information markets (national, international, EU-wide), OGD, economic development and high-quality job creation and OGD charging principles and models (free, marginal cost, return on investment pricing models) – differentiation among commercial and non-commercial uses.

The third research area we extracted is 'OGD Legal Framework', and includes as main research topics OGD and protection of personal data, OGD and protection of intellectual property rights, OGD and protection of legitimate commercial interests – trade secrets, alternative licenses for OGD provision – risks of discrimination and competition restriction and comparison-harmonization of OGD laws, rules and practices of EU member states.

The fourth research area extracted is 'OGD Use and Value Generation', which includes as main research topics the barriers to the re-use of OGD, the access and use of OGD by SMEs and micro-enterprises for new services and applications, the access and use of OGD by civil society for promoting government transparency and accountability, the cross-border use/exploitation of OGD - barriers and opportunities, the development of innovative novel electronic services and applications by using, aggregating, combining OGD and the advanced use of OGD for digital innovation based on advanced digital technologies, such as Artificial Intelligence, Internet of Things, Distributed Ledger Technologies, etc. – barriers, opportunities, innovative services and applications.

Finally, the fifth extracted is 'OGD Technologies', which includes as main research topics new advanced machine-readable OGD provision formats, new OGD datasets' formats/structures and metadata structures for promoting discoverability, accessibility and interoperability, OGD anonymization technologies and technologies for long-term preservation of OGD.

A comparison of the above extracted OGD research areas and topics from the EU Directive 2019/1024 with the ones of the study of Mohamad et al. (2022) indicates that many of the former are new (they are shown with an asterisk in Appendix 2). Two important new research areas have been identified concerning:

- OGD economics (including some highly important research topics, such as the effects of OGD on competition, economic development, creation of jobs, information markets, and OGD charging principles and models).
- OGD legal framework (including some highly important research topics, such as OGD and protection of personal data, protection of intellectual property rights, protection of legitimate commercial interests – trade, and alternative licenses for OGD provision),

Furthermore, for all the remaining three research areas extracted important new research topics have been identified, such as 'Open by design and by default' data policies, 'As open as possible, as closed as necessary' data policies, opening of data of private undertakings fulfilling public service obligations, provision of real-time access to dynamic data, access and use of OGD by SMEs and micro-enterprises, access and use of OGD by civil society, cross-border use/exploitation of OGD and technologies for long-term preservation of OGD; and also advanced use of OGD for digital innovation based on novel 'disruptive' digital technologies, such as Artificial Intelligence (AI), Internet of Things (IoT), Distributed Ledger Technologies-Blockchain, etc.

# 5 Conclusions

The opening of data possessed by government agencies constitutes one of the most important dimensions of the digital transformation of government, which can provide highly important benefits, concerning the promotion of transparency and accountability of government agencies, economic development (making a great contribution to the development of data economy) as well as scientific research, and also the increase of the effectiveness and efficiency of other government agencies (beyond the one who publishes them). However, these high expected benefits have not been realized yet. In general, the OGD domain in relatively new, rapidly evolving, and has rapidly evolving, and has not reached and realized its high potential. The above make it absolutely necessary to conduct extensive research in the OGD domain, in order to increase its overall maturity, and therefore the benefits and value (both social and economic) that the opening of government data (and the big investments made by governments for this purpose) generate. However, in order to optimize the effectiveness and finally the outcome of this required research on OGD (and of the resources (financial, human, etc.) to be mobilized for this) it is necessary to define rationally the specific areas and topics to be researched.

This paper makes a contribution in this direction. Some research has been conducted in order to identify the main research areas and topics in the OGD domain, which however is based on the review of previous scientific publications (in journals and conferences) on OGD. This approach has two weaknesses: i) it is based on the scientific research that has been conducted in the past, and does not take into account new research needs (posed by new realities, evolutions, technologies, as well as new problems and challenges); ii) it does not exploit perspectives, needs, knowledge and experience of relevant government activity and practice (i.e. of the government agencies who design, implement and monitor the opening of government data) (the more general strong trend that exists in the wider organizational information systems domain for more 'relevant' research, which is more closely connected with 'real-life' practice, needs and challenges/problems (Nunamaker et al., 2015; Lee et al., 2021). Our study contributes to addressing the above weaknesses, by investigating the additional exploitation, beyond previous OGD-related literature, of recent OGD-related policy and legislation documents as well, as an additional and complementary source for extracting areas and topics in the OGD domain that require research in the near future.

For this purpose, initially a methodology is developed, which is adopts a Document Content Analysis approach (Krippendorff, 2004; Neuendorf, 2017; Toll et al., 2019). This methodology is used in order to we analyse the 'OECD Open Government Data Report – Enhancing Policy Maturity for Sustainable Impact' and the EU Directive 2019/1024 on 'Open Data and the Re-use of Public Sector Information'. Our results are quite positive. This analysis reveals a) many important new areas of required research in the OGD domain, which have not been identified by the previous 'traditional' research on OGD research areas and topics (based on the analysis of previous scientific publications in this domain): OGD Economics, OGD Legal Framework, OGD Governance, OGD Use for New Citizen Services, OGD for good public governance and trust; and b) numerous new topics of required research in the OGD domain

in its previously established areas. The new OGD research areas and topics we identified are associated with the recent activities, problems and challenges, and also the future plans/direction in the OGD domain of competent government agencies, as well as with new evolutions and trends in this domain, and emerging new technologies.

This first analysis we conducted provides strong evidence about the usefulness of exploiting such OGD-related policy and legislation documents as well, for a more comprehensive, 'real-life' and practice rooted, and also future oriented identification of OGD research areas and topics. Limiting our analysis to previous scientific publications on OGD only cannot reveal the wide range of OGD research areas and topics, which have to be investigated, in order to advance the OGD domain, increase its maturity, and generate more social and economic value from the opening of government data (and the big investments made by governments for this purpose).

Our study has interesting implications for both research and practice. With respect to OGD research, it develops a novel approach for defining the future research agenda, including specific areas and topics of high research priority, on OGD, which can possible be used for other dimensions/forms of the digital transformation of government as well. This novel approach exploits both previous relevant research and at the same time relevant government documents, such as relevant policy and legislation documents. With respect to OGD practice of government agencies, it provides a sound mechanism for defining its real needs for future research, which are based on their relevant 'real-life' activities and practices, as well as the evolutions in this domain, the emerging new technologies (such as AI, IoT), as well as new problems and challenges, or their future directions/plans in the OGD domain; the above can possibly be used for other dimensions/forms of the digital transformation of government as well.

The main limitation of our study is that we have analysed only one policy document and one legislation document on OGD, both from international organizations (OECD and EU respectively). So further research is required: a) analysis of more OGD-related policy and legislation documents (or even other kinds of relevant government documents, such as evaluation/assessment/benchmarking documents), from international organizations, as well national and even regional and municipal government organizations, in order to extract OGD research areas and topics; b) use of the above approach for other dimensions/forms of the digital transformation of government as well (e.g. digital transactional services provision to citizens and firms).

# References


Alvarenga, A., Matos, F., Godina, R. and CO Matias, J. (2020). "Digital transformation and knowledge management in the public sector". *Sustainability* 12(14), 5824.

Charalabidis, Y., Alexopoulos, C. and Loukis, E. (2016). "A taxonomy of open government data research areas and topics". *Journal of Organizational Computing and Electronic Commerce* 26(1-2), 41-63.

Charalabidis, Y., Zuiderwijk, A., Alexopoulos, C., Janssen, M., Lampoltshammer, T. and Ferro, E. (2018). *The World of Open Data - Concepts, Methods, Tools and Experiences*. Switzerland: Springer International Publishing.

Corrales-Garay, D., Ortiz-de-Urbina-Criado, M. and Mora-Valentín, E. M. (2019). "Knowledge areas, themes and future research on open data: A co-word analysis". *Government Information Quarterly* 36(1), 77-87.

Dawes, S., Vidiasova, L. and Parkhimovich, O. (2016). "Planning and designing open government data programs: An ecosystem approach". *Government Information Quarterly* 33(1), 15–27.

European Union (2019). *Directive EU 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information*. Luxembourg: Official Journal of the European Union.

European Commission (2021). *Open Data Maturity Assessment Report 2021*. Luxembourg: Publications Office of the European Union.

Konopik, J., Jahn, C., Schuster, T., Hoßbach, N. and Pflaum, A. (2022). "Mastering the digital transformation through organizational capabilities: A conceptual framework". *Digital Business* 2(2), 100019.

Krippendorff, K. (2004). *Content Analysis: An Introduction to Its Methodology*. Thousand Oaks: Sage Publications.

Lee, J. K., Park, J., Gregor, S. and Yoon, V. (2021). "Axiomatic Theories and Improving the Relevance of Information Systems Research". *Information Systems Research* 32(1), 147-171.

Mergel, I., Edelmann, N. and Haug, N. (2019). "Defining digital transformation: Results from expert interviews". *Government Information Quarterly* 36(4), 101385.

Mohamad, A., Sylvester, A. and Campbell-Meier, J. (2022). "Towards A Taxonomy of Emerging Topics in Open Government Data: A Bibliometric Mapping Approach". In: *Proceedings of the 55th Hawaii International Conference on System Sciences (HICSS)*.

Neuendorf, K. A. (2017). *The Content Analysis Guidebook*. 2nd edition. Los Angeles: Sage Publications.

Nunamaker Jr., J. F., Briggs, R. O., Derrick, D. C. and Schwabe, G. (2015). "The Last Research Mile: Achieving Both Rigor and Relevance in Information Systems Research". *Journal of Management Information Systems* 32(3), 10-47.

OECD (2018). *OECD Open Government Data Report – Enhancing Policy Maturity for Sustainable Impact*. OECD Better Policies for Better Lives Initiative. Paris: OECD Publishing.

OECD (2019). *Open, Useful and Re-usable data (OURdata) Index_2019*. Paris: OECD Publishing.

Omar, A., Weerakkody, V. and Sivarajah, U. (2017). "Digitally enabled service transformation in UK public sector: A case analysis of universal credit". *International Journal of Information Management* 37(4), 350-356.

Pedersen, K. (2018). "E-government transformations: challenges and strategies". *Transforming Government: People, Process and Policy* 12(1), 84-109.

Plesner, U., Justesen, L. and Glerup, C. (2018). "The Transformation of Work in Digitized Public Sector Organizations". *Journal of Organizational Change Management* 31(5), 1176-1190.

Reggi, L. and Dawes, S. (2022). "Creating Open Government Data ecosystems: Network relations among governments, user communities, NGOs and the media". *Government Information Quarterly* 39(2), 101675.

Toll, D., Lindgren, I. Melin, U. and Madsen, C. Ø. (2019). "Artificial Intelligence in Swedish Policies: Values, Benefits, Considerations and Risks". In: *Proceedings of EGOV Conference 2019*, LNCS 11685.

Van Loenen, B., Zuiderwijk, A., Vancauwenberghe, G., Lopez-Pellicer, F. J., Mulder, I., Alexopoulos, C., Magnussen, R., Saddiqa, M., Dulong de Rosnay, M., Crompvoets, J., Polini, P., Re, B., Cesar Casiano Flores, C. (2021). "Towards value-creating and sustainable open data ecosystems: A comparative case study and a research agenda". *JeDEM-eJournal of eDemocracy and Open Government* 13(2), 1-27.

Van Ooijen, C., da Silva Carvalho, N., Iordache, A. and Osimo, D. (2022). *Measuring data demand within the public sector*. The Lisbon Council. Luxembourg: Publications Office of the European Union.

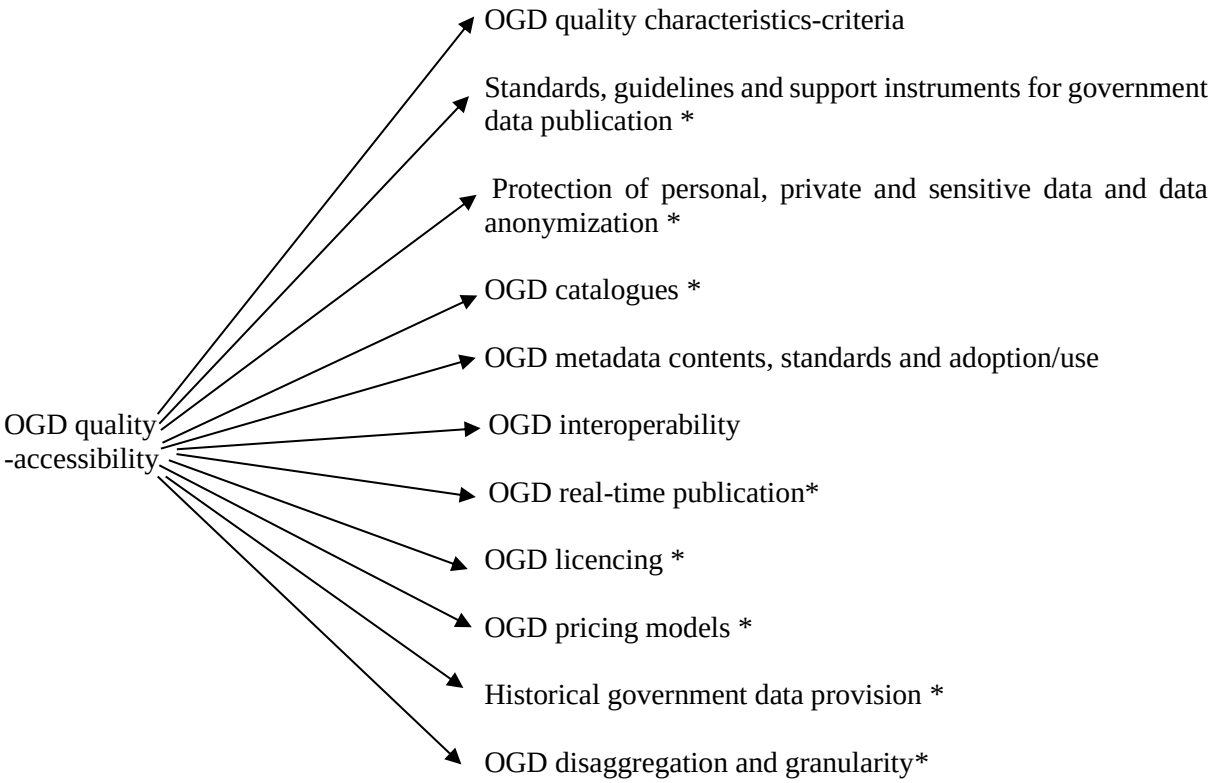
Verhulst, S. G., Young, A., Zahuranec, A. J., Aaronson, S. A., Calderon, A. and Gee, M. (2020). *The Emergence of a Third Wave of Open Data*. New York: Open Data Policy Lab, New York University.

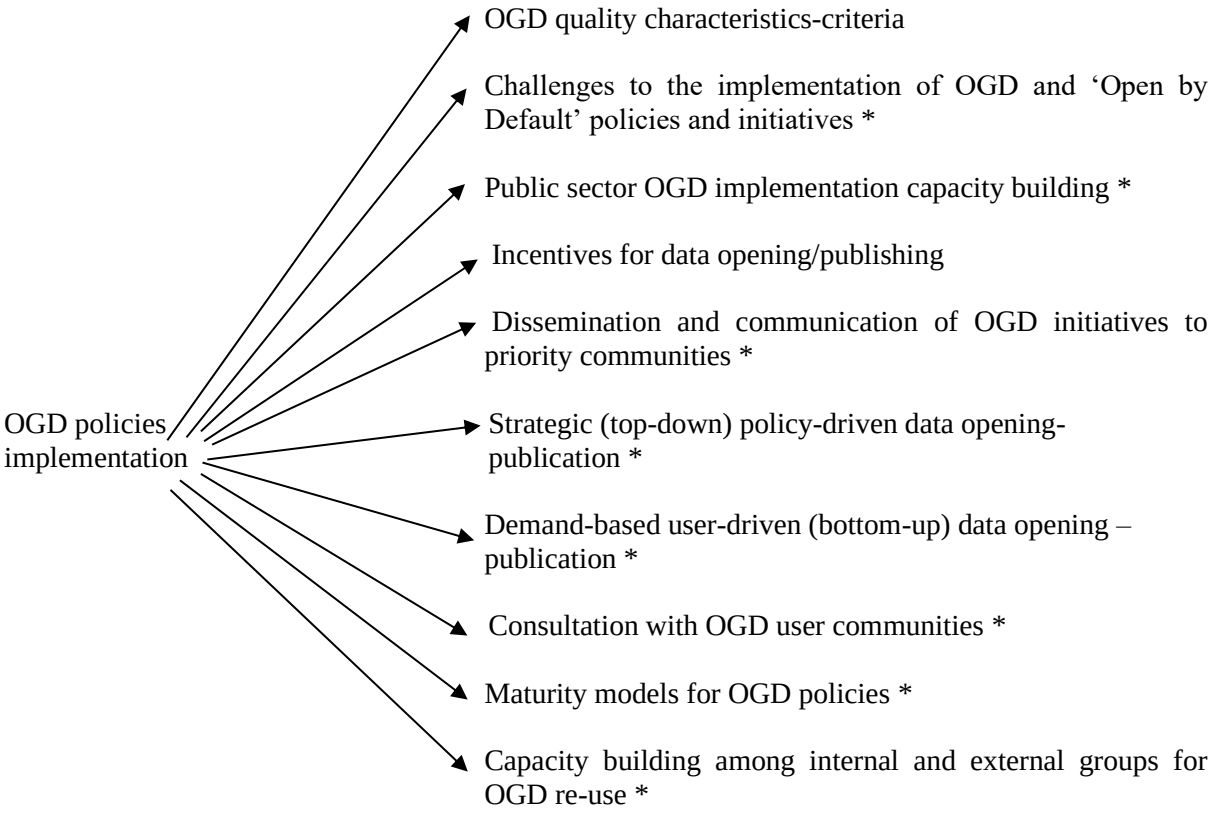
Vial, G. (2019). "Understanding digital transformation: A review and a research agenda". *The Journal of Strategic Information Systems* 28(2), 118-144.

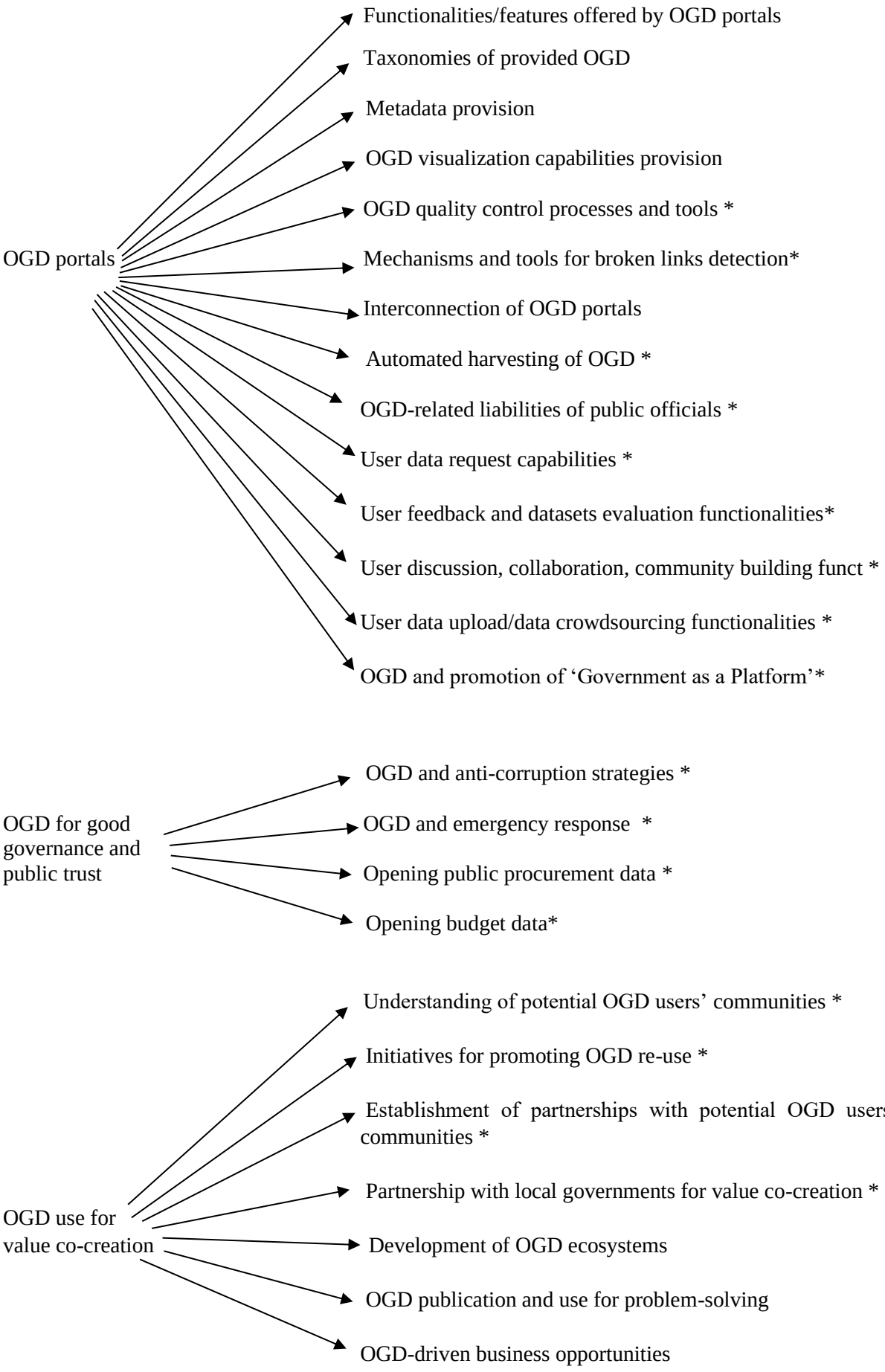
Zhang, Y., Hua, W. and Yuan, S. (2018). "Mapping the scientific research on open data: A bibliometric review". *Learned Publishing* 31(2), 95–106.

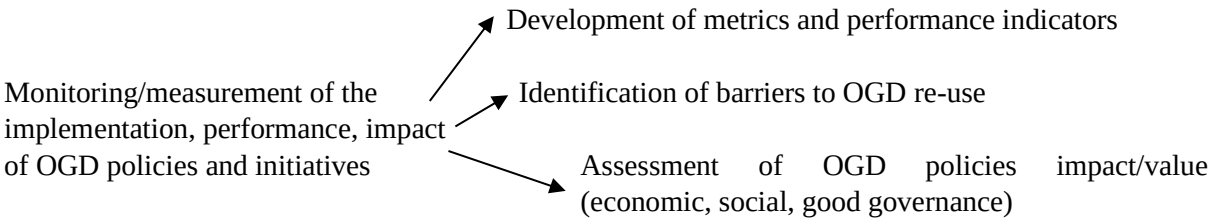
Zuiderwijk, A., Shinde, R. and Janssen, M. (2019). "Investigating the attainment of open government data objectives: is there a mismatch between objectives and results?". *International Review of Administrative Sciences* 85(4) 645–672.

## Appendix 1: OGD Research Areas/Topics from OECD Policy Report

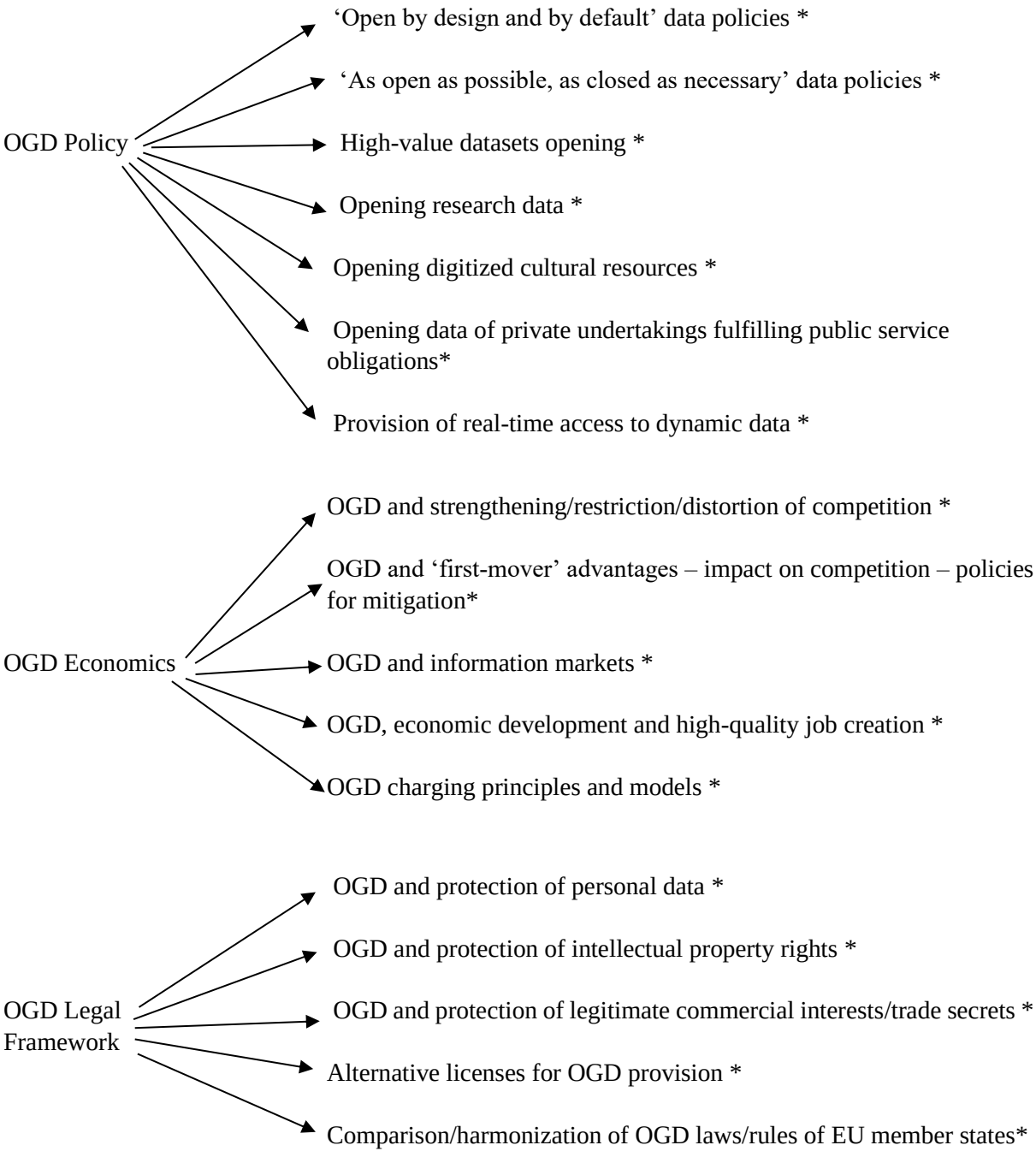

OGD quality -accessibility
OGD quality characteristics-criteria
Standards, guidelines and support instruments for government data publication *
Protection of personal, private and sensitive data and data anonymization *
OGD catalogues *
OGD metadata contents, standards and adoption/use
OGD interoperability
OGD real-time publication*
OGD licencing *
OGD pricing models *
Historical government data provision *
OGD disaggregation and granularity*

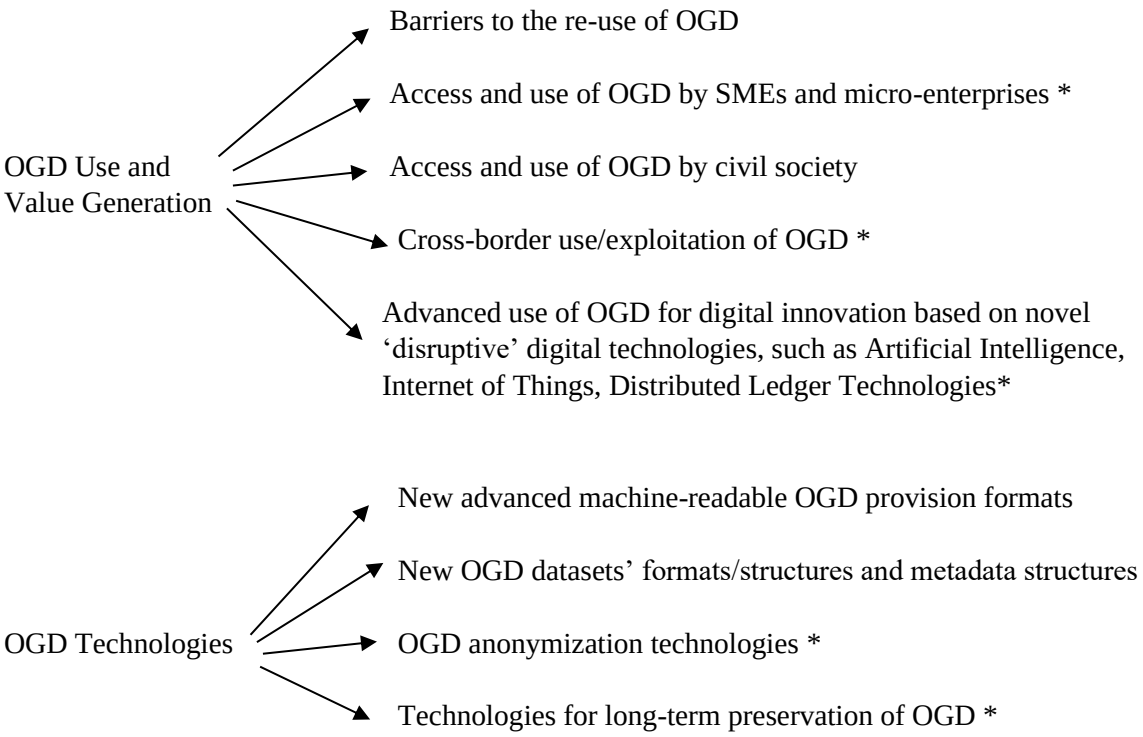

OGD policies implementation
OGD quality characteristics-criteria
Challenges to the implementation of OGD and 'Open by Default' policies and initiatives *
Public sector OGD implementation capacity building *
Incentives for data opening/publishing
Dissemination and communication of OGD initiatives to priority communities *
Strategic (top-down) policy-driven data opening-publication *
Demand-based user-driven (bottom-up) data opening – publication *
Consultation with OGD user communities *
Maturity models for OGD policies *
Capacity building among internal and external groups for OGD re-use *


OGD portals
Functionalities/features offered by OGD portals
Taxonomies of provided OGD
Metadata provision
OGD visualization capabilities provision
OGD quality control processes and tools *
Mechanisms and tools for broken links detection*
Interconnection of OGD portals
Automated harvesting of OGD *
OGD-related liabilities of public officials *
User data request capabilities *
User feedback and datasets evaluation functionalities*
User discussion, collaboration, community building funct *
User data upload/data crowdsourcing functionalities *
OGD and promotion of 'Government as a Platform'*
OGD for good governance and public trust
OGD and anti-corruption strategies *
OGD and emergency response *
Opening public procurement data *
Opening budget data*
OGD use for value co-creation
Understanding of potential OGD users' communities *
Initiatives for promoting OGD re-use *
Establishment of partnerships with potential OGD users' communities *
Partnership with local governments for value co-creation *
Development of OGD ecosystems
OGD publication and use for problem-solving
OGD-driven business opportunities




## Appendix 2: OGD Research Areas/Topics from EU Directive 2019




OGD Use and
Value Generation
Barriers to the re-use of OGD
Access and use of OGD by SMEs and micro-enterprises *
Access and use of OGD by civil society
Cross-border use/exploitation of OGD *
Advanced use of OGD for digital innovation based on novel 'disruptive' digital technologies, such as Artificial Intelligence, Internet of Things, Distributed Ledger Technologies*
OGD Technologies
New advanced machine-readable OGD provision formats
New OGD datasets' formats/structures and metadata structures
OGD anonymization technologies *
Technologies for long-term preservation of OGD *