Value-creating Roles Played by the Actors in Open Government Data: A Systematic Literature Review

Completed research paper

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Abstract

Government-held data are immensely valuable; as well as providing the information required to carry out tasks related to internal governance procedures, additional value may be generated by publishing and making accessible Open Government Data (OGD). The paper aims to identify the underlying factors that influence or are influenced by value creation, from the perspective of the OGD actors engaged in value-creating roles. A systematic literature review was conducted in order to study OGD value creation from the perspective of OGD actors engaged in value-creating roles. The findings of the metasynthesis approach indicate that the value-creating roles of the actors in the OGD ecosystem initiate the value co-creation necessary to turning data value into social and economic benefits for stakeholders, as the outcome of all actors' efforts and government commitment to OGD initiatives.

Keywords: Open government data, Value creation, Value-creating roles.

1   Introduction

The notion of "public value" was introduced in (Moore 1995) as a means of transferring the concepts of strategic analysis from the private sector to the public sector. The idea emerged as a result of the comparison of the goals of public and private managers. In Moore's view, rather than being committed to creating economic (private) value, government administrators were committed to creating social (public) value. Viewed this way, the public value can be interpreted as an outcome or as consequences of public management behaviour. Later on, Moore (2017) noted that public value starts with the idea that the task of the public entities is to use public assets in order to increase the quality of life at both individual and social levels.

Since 2010, the number of open data projects developed on public platforms has increased significantly. De Chiara (2018) identified a correlation between the development of bottom-up community programmes, private initiatives, and the creation of public policies and priorities related to the release of open data. A range of actors such as citizens, community organisations, NGOs, private corporations and public agencies have shown high interest in utilising the social and economic potential of open data.

Open Government Data (OGD) initiatives are a key factor in shifting the focus of government policies towards an outward-looking approach rather than an inward-looking one, with an increased emphasis on public interests and preferences (Camilleri 2019). However, it is essential to recognise the roles of both government agencies and users in the OGD development and value creation processes. Ultimately, value creation is rooted in the interaction between data providers and users. In the private sector, value creation and co-creation have previously been extensively explored. However, only a few researchers have discussed value development from a public sector point of view. We contend that in order to establish the conditions for generating value co-creation activities involving the different OGD ecosystems, actors are required to be involved in the early stages of ecosystem creation.

The research presented here aims to identify the underlying factors that influence or are influenced by value creation, from the perspective of the OGD actors engaged in value-creating roles. The existing processes of value creation on OGD, as investigated by several scholars, were analysed in order to identify OGD ecosystem aspects that influenced or were influenced by value creation. We also focused on how to discriminate between the specific role-creating interests of the participating actors.

2   Theoretical Background

2.1   Open Government Data

The Open Knowledge Foundation's Open Data Handbook (Foundation 2009) states that open data can be freely accessed, re-used and shared by anyone, with no limitation to use. The purpose of open data projects is to encourage transparency, productivity and citizens' engagement, and lead to gaining social and economic benefits. A working paper from The Organisation for Economic Co-operation and Development-OECD (Ubaldi 2013) notes that governments create OGD with public funds and aim to increase openness and improve accountability and value creation. Every actor in the OGD ecosystem has a role to play and a relationship to form with other actors (Teece 2010; Ubaldi 2013). The ecosystem creates a value chain to allow each entity to engage in the network. It ensures the consistency and integrity of published data that emerges through the OGD value creation process (Kitsios et al. 2017).

It is important to note that open data and data sharing refer to different concepts. Data sharing agreements are generally concerned with private data transfer between agencies or between agencies and private entities, while open data are made accessible to all without limitations (Gil-Garcia and Aldama-Nalda 2011). In open data, data sharing is conceived as a process for gathering data across information technologies, information systems and organisational boundaries (Dawes et al. 2009; Gil-Garcia et al. 2009). In the public sector, the overarching aim is to use open data in order to improve policy decisions and obtain a measure of their effectiveness as well as to gain organisational efficiencies, including in government agencies.

2.2   Value Creation

The current literature typically views value creation as value co-creation, with an emphasis on the process that involves actions by service providers, service users, and other actors (Grönroos 2008). Investigations of the value co-creation process focus on understanding how the interaction between

the service provider and the service users contributes to user satisfaction. It highlights the role of user experiences in the value co-creation process and considers as well as service provider and service user activities both before and during the process (Grönroos and Voima 2013). For example, discussing the value co-creation process from the perspectives of the service provided as well as from the service user, Holmqvist et al. (2020) identify three significant aspects, namely the role of the service provider, users' independent value creation, and value-in-use.

Value creation and co-creation are at the heart of information technology adoption within the public sector. Interaction between the actors is an effective way to create data value, promote and accelerate organisational learning. Governments can facilitate value creation for their stakeholders' benefits. For example, government actors are gradually applying diverse approaches and forms of open government innovation (Brunswicker & Johnson, 2015). They openly reveal policy data that had historically been withheld from the public in order to promote creativity: since 2009, all government departments in the U.S. have been ordered to disclose official data previously concealed from the public in order to provide OGD benefits (Janssen, Charalabidis, & Zuiderwijk, 2012). As pointed out in (McKinsey 2014) the enhanced reliability of OGD based on their granularity, precision and quality are one of the critical success factors that lead to the development of new product and service offerings, combined with a higher degree of transparency.

3   Research Methodology

A systematic literature review was conducted in order to identify the relevant studies published in the most pertinent information system research journals indexed in the Scopus and Web of Science databases in the last decade. As shown in Figure 1, the literature review process followed an adaptation of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram (Moher et al. 2009).

The following inclusion criteria were formulated: (i) the article was written in English; (ii) the publication was either a journal article, a book chapter, or a conference paper; (iii) the study represented completed research; (iv) the study focus was on value creation in OGD, involving different stakeholders. Study identification and screening were performed in July 2020. All abstracts found in the bibliographic repositories were screened for eligibility.
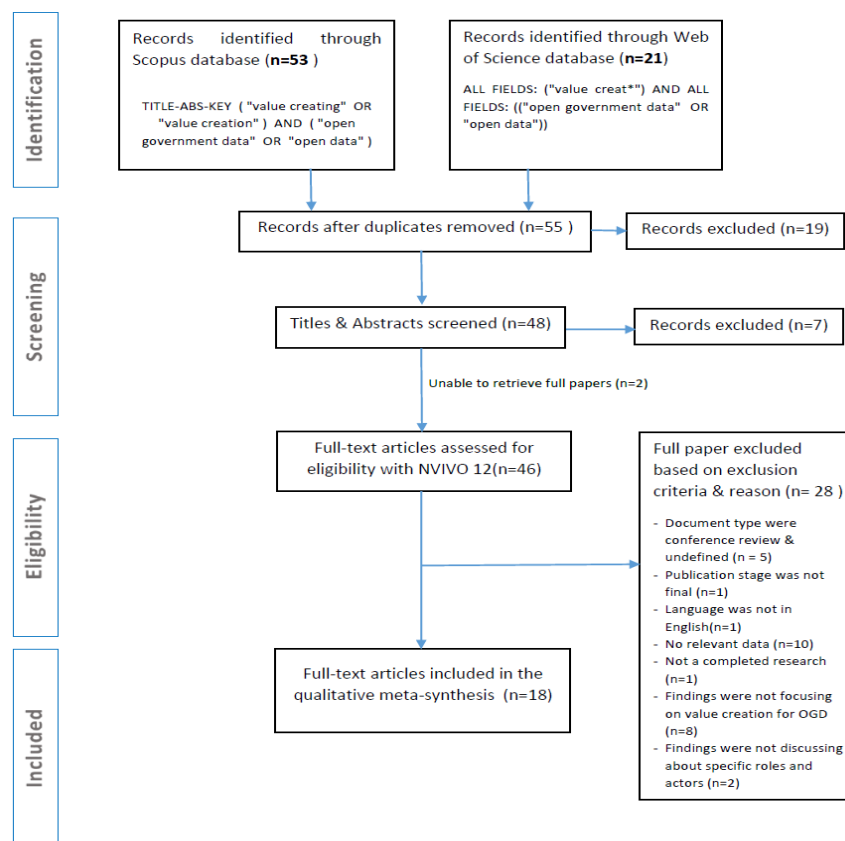

Figure 1: The systematic literature review process. Adapted from Moher et al. (2009)

Out of the 74 studies identified, a total of 18 were identified as meeting the inclusion criteria. A summary of the characteristics of the publications selected for analysis is shown in Table 1.

The bibliographic information and the key findings of each paper were coded using inductive (In Vivo) coding (Saldaña 2016). The coding method was selected as it made it possible to identify and extract meanings related to actors and their roles while retaining a close link to the actual text in the selected papers where these were described or discussed.

Paper code	Author/year	Paper type	Research methods/methodology	Key concepts
2	Albino (2018)	Conference paper	Exploratory technological research	To create applications using open technology to make them more explicit creating value open data
3	Attard et al. (2016)	Conference paper	Systematic literature review	To identify the dimensions that impact, or are affected by value creation of OGD
4	Attard et al. (2017)	Conference paper	Value chain model	To identify the various activities and roles within a data value chain, to provide Data Value Network models
5	Brunswicker et al. (2018)	Book chapter		To propose a socio-technical infrastructure that supports ecosystem generativity of an open data innovation.
6	Callinan et al. (2018)	Conference paper	Systematic literature review	To develop knowledge of how public value can be co-created with open data
7	Corrales-Garay et al. (2020)	Journal article	Systematic literature review	To propose a conceptual model for analysing entrepreneurship through open data
8	Cranefield et al. (2014)	Conference paper	A qualitative method with semi-structured interviews	To progress understanding of benefits and barrier of OGD
9	Craveiro and Albano (2017)	Journal article	Open-ended interviews and document analysis	To identify roles of stakeholders, characteristics, resources and partnerships within an OGD ecosystem
10	De Chiara (2018)	Journal article	The GovLab's OD500 methodology with online questionnaires	To investigate the economic and social value of open data in Italy
11	De Tuya et al. (2017)	Journal article	Smart I.T. approach (serial of workshops & focus study groups)	To investigate data needs and requirements for value creation
18	Janssen and Zuiderwijk (2014)	Journal article	An interpretive-multiple case study research	To investigate the existing infomediary business models drove by open data & social media
20	Magalhaes et al. (2014)	Conference paper	Method of content analysis with data sample 500 firms	To understand how open government data is used to develop commercial products and services
28	Roa et al. (2020)	Conference paper	Qualitative method of semi-structured interviews	To focus on the forces driving or hindering the adoption of OGD in a developing country at its early stages
29	Saxena (2019)	Journal article	Extant literature analysis for TQM model (portal and document analysis)	To advance total quality management (TQM) model for the open government data (OGD) initiatives
31	Shang and Chen (2015)	Conference paper	Design science	To evaluate how Big Data creates value in the industrial development process
37	Yu (2016)	Journal article	Comprehensive literature review and practical case studies	To introduce an ODA applicable value-centric Business Model (ODA-vBM) framework for guiding the development of operational business models
39	Zeleti et al. (2016)	Journal article	Qualitative research approach with design science research	To identify business model patterns and emerging core value disciplines for open data businesses
41	Zuiderwijk et al. (2016)	Journal article	Qualitative research method with semi-structured interviews and a survey	To study the wicked problem of commercial open data value creation

Table 1. The characteristics of the studies included in the qualitative metasynthesis

The coding method was applied by creating nodes in NVivo 12. A total of 158 codes were identified and categorised in seven categories, based on similarity: Actors in Data Value Network, Actors in Value Chain Model, Roles in Data Value Network, Roles in Value Chain Model, Value Creation, Value Data Network Process, and Value Chain Model Process.

Next, qualitative metasynthesis was used to interpret and synthesise the results of the systematic literature review in a cohesive and comprehensive way while preserving the differentiation between the sources (Erwin et al. 2011). The method allowed to identify the characteristics of the value-creating roles played by OGD actors.

4   Findings

Based on the analysis of the associations emerging from the coded data and the relationships between the selected studies, two main themes were identified. They capture the processes of creating value from OGD as investigated in the studies analysed. The first theme, Data Value Network clusters together five data related processes involved in OGD value creation: data discovery, data curation, data interpretation, data distribution, and data exploitation (Attard et al. 2017). The second theme, Value Chain Model, comprises value-creating activities that connect government agencies as the data providers to data users (Attard et al. 2016). This theme clusters together four data value chain activities: obtaining the right data, data quality management, deriving information and knowledge from raw data, and using information and knowledge to satisfy customers and generate profit.

Further analyses were conducted in order to identify the actors and their roles as associated with the activities within each theme. Actor type definitions and associated role type descriptions were synthesised and compared with each theme and across the themes. The table in the Appendix shows the activity cluster of each of the two themes, the actor types, the roles each actor type may engage in, and the activity (or activities) the role is related to the actor. As shown, 23 actor types (involved in a total of 47 roles across the two themes) were identified.

4.1   The Data Value Network Theme

For the Data Value Network theme, the data supporting the types of actors and roles, and their relationships were coded in NVivo 12 as three categories: Actors in Data Value Network, Roles in Data Value Network, and Data Value Network Process. It was found that some actors (e.g., producer/provider, translator/coordinator, service designer) have roles that may be performed within the context of more than one activity belonging to this particular theme. For example, the role of the data producer/provider as an entrant to the data market may be assumed as a critical one since it permeates the while range data value network activities; any additional value derived from the data will depend on the quality of the data provided to other actors. Therefore, the role of government agencies, as the data producer/provider, is critical to the exploitation of OGD for the benefit of the other OGD stakeholders. Data quality and decisions about what data should be published as OGD have a significant effect on OGD value; government agencies should carefully consider the choice of OGD provided to the data market as it has a significant impact on, and determines the outcomes of the activities following.

It was also found that there is a certain flexibility in terms of how the different roles were described in the literature. For example 'entering the data market for income growth' and 'obtaining, creating, and adding value' (two of the data producer/provider's roles) were somewhat similar in the context of the activity 'data discovery'. This may be explained with the adaptive nature of the OGD ecosystem and the value creation and co-creation processes where value can be added in several different ways, as discussed previously.

Finally, it was also found that not all roles may contribute significantly to creating value. For example, the data broker's role for balancing the supply and demand is not always needed because most government agencies publish open data not only for using and re-using them but also for the purposes of transparency and accountability to citizens.

4.2   The Value Chain Model Theme

For the Value Chain Model theme, the data supporting the types of actors and roles, and their relationships with were coded in NVivo 12 in the categories: Actors in Value Chain Model, Roles in Value Chain Model, and Value Chain Model Process. The Value Chain Model theme describes value-adding activities that connect a government entity as the OGD provider to other public entities such as citizens, private companies, NGOs, government agencies, researchers, and governance activists. For example, the data consumer actor type refers to the role of end-users using the OGD provided by the data provider/producer actor type (see Appendix). At the same time, end-users may be involved in the role of 'data prosumer', e.g., developing partnership agreements between public and private parties involved in value co-creation in order to boost the economic benefits of OGD.

Similar to the data value network, the first activity in the value chain model is capturing the right data. This is a vital step in the process of developing a data chain that supports value creation and co-creation. Again, data producer/providers have an influential role as market entrants and publishers. However, there is also an important but separate actor, the data publisher whose role (searching for data to be opened) contributes to the same activity.

The activities in the value chain model offer significant opportunities for collaboration. For example, data producer/providers may collaborate with data publishers and data brokers as participants in the activity of obtaining the right data. In specific cases, data publishers may work together with data facilitators, for example, to create a government portal that makes open data available for re-use. The data processing chain formed as a result of the collaboration demonstrates how the interrelated activities within an OGD ecosystem can enrich the value of OGD.

4.3   Value-creating Roles

The coded data related to the OGD value creation and co-creation processes were categorised under the NVivo 12 node Value Creation. As also supported by the analyses above, the metasynthesis of the data in the Value Creation category provided some primary insights into how actors participated in the process of creating and deriving OGD value (termed here 'data process') trough specific roles that we identified as value-creating roles.

We define value-creating roles as those actor-related activities within the OGD initiative which focus explicitly on creating, exploiting and delivering OGD value, through a data process that aims to provide social and economic benefit. While all roles contribute to gaining benefits from OGD, actors engage in their respective value-creating role as part of a specific operational context (or contexts) which provide the operational framework of the data process.

Four different operational contexts were identified: the government agency or other public entity context, the IT infomediary context, the end-user context (comprising citizens, private and public entities), and the intermediary context (including NGOs and other local or international organisations). Figure 2 shows the 18 value-creating roles and the actors involved, mapped along the data process.
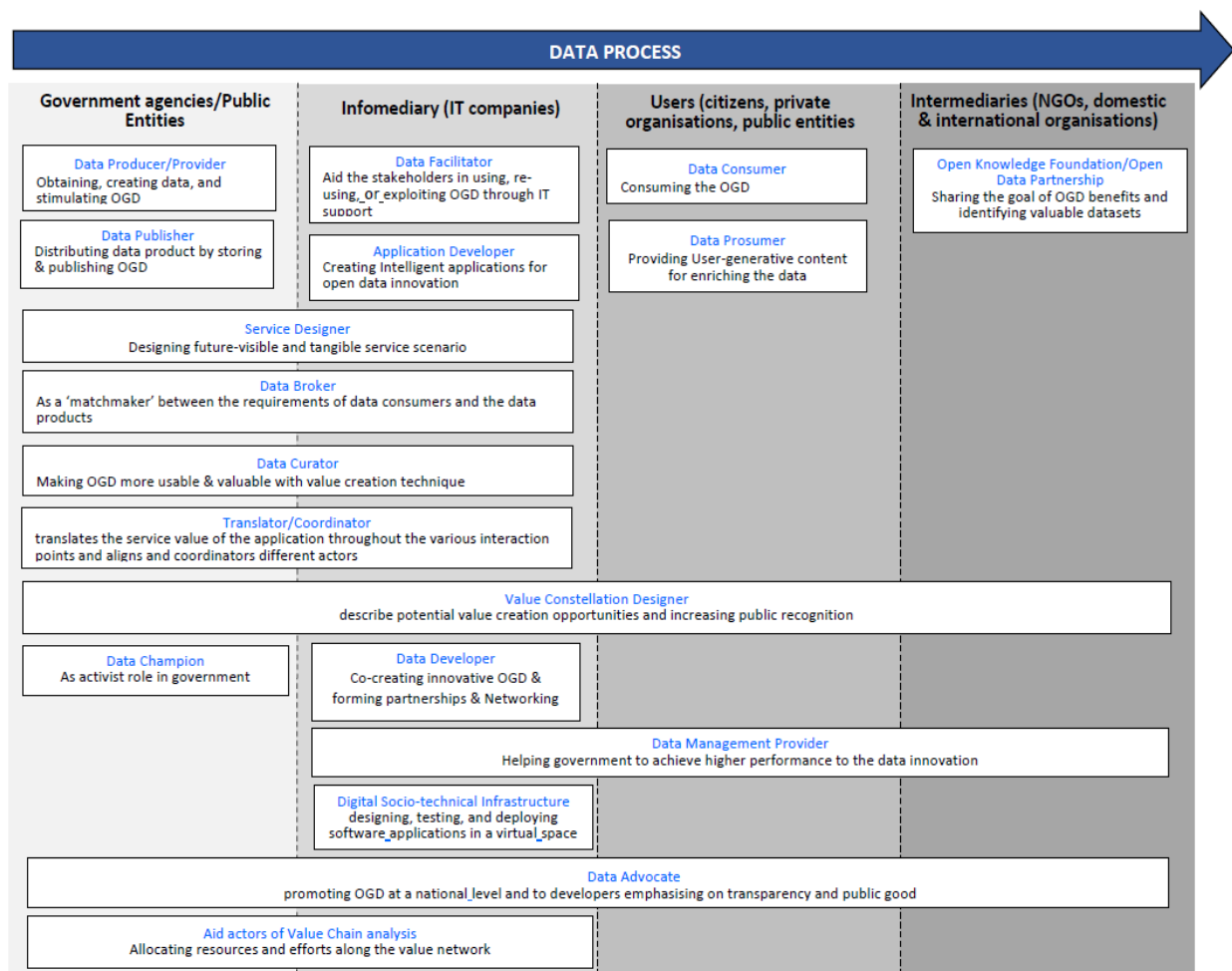

Figure 2: The value-creating roles and the actors involved mapped along the data process

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entities), and the intermediary context (including NGOs and other local or international organisations).

Government agencies perform in regular or daily roles as data producer/provider and data publisher actors. IT infomediaries are entities that support government agencies in making OGD more accessible and useful for end-users. They provide data analytics capabilities, facilitate integration with other data, and enable data visualisation and publishing in different formats. Actors such as IT developers operate in this context end-users are using OGD as data consumers, and may also provide user-generative feedback, acting as data prosumers. Intermediaries connect data providers to users; for example, they may support them in articulating demands for OGD. However, the mapping is not static; actors may change their operational context and engage in other value-creating roles depending on the particular national or localised OGD initiatives.

Furthermore, while some of the roles performed by the actors are specific to the operational context in which each actor engages with their value-creating role other actors engage in roles that are relevant to two or more operational contexts. For example, data consumers and data publishers operate in the user context and the government/public entity context, respectively. On the other hand, data management providers are normally IT infomediaries, but their role includes as well providing the ongoing support needed by users and infomediaries. Similarly, while the data advocate actor can belong to any of the contexts, their role as OGD promoter is not limited to any single context.

We contend that the value-creating roles played by specific actors in an OGD ecosystem initiate co-creation between the government and its stakeholders. The interrelated activities the actors across the ecosystem turn OGD value into social and economic benefits for all entities involved, through the commitment and the outcomes of the actors' efforts engaged in value-creating roles.

5   Conclusions and Limitations

Effective and productive delivery of OGD is increasingly based on citizen involvement in value co-creation as facilitated by OGD programmes. This research explores the functioning of the OGD ecosystem through a systematic literature review followed by a qualitative metasynthesis. Although the search for relevant literature was comprehensive, a relatively small number of relevant studies was identified. Given the fact the research in OGD started gaining momentum relatively recently, in 2009-2010, this was not surprising.

The study examined issues related to value-creating roles, actors' empowerment, and overcoming OGD barriers to expose their value and highlight their significance. The research contributes by identifying the key value creation and co-creation roles and the actors engaged in these roles, and by mapping the key value co-creating roles to specific operational contexts. The proposed view of the process of value co-creation using OGD resources may be used to assist governments in promoting stakeholder involvement in the value co-creation roles within the OGD ecosystem in order to maximise the value of the open data.

Ultimately, the goal of the actors is to derive higher value from the access to OGD, for example, by innovative or 'smart' use of the data sets. However, with some of the roles identified through the metasynthesis of the literature reviewed, there was a notable overlap across actors engaged in the role, as well as a multiplicity of operational contexts. Furthermore, the findings of this study indicate that data value-enhancing capacity is not vested in a single actor/role as role deployment and actor involvement may vary across OGD ecosystems; there was a significant variation in the types of actors involved in different OGD initiatives, although they were driven by a similar type of government agencies. Further research may investigate the organisational and managerial structure of different OGD programmes and conduct a meta-analysis to provide descriptions of and compare the relevant OGD value network diagrams.

A possible limitation of the study is that the body of prior empirical studies selected for this analysis originated from a number of different disciplines. Their data may have been gathered and analysed using data collection and analysis techniques of varying reliability. Further research may involve validating the findings of this study applying a case study approach.

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Appendix

A summary of the findings of the qualitative metasynthesis: the shaded table cells show actor/role mapping across the activities of the two themes, with a reference to the relevant source studies.

Metasynthesis Summary										
		Theme 1 : Data Value Network					**Theme 2: Value Chain Model**			
Actors	**Roles**	Data Discovery	Data curation	Data Interpretation	Data Distribution	Data Exploitation	Obtaining the right data	Data quality management	Deriving information and knowledge	Using information and knowledge to satisfy users	**Studies (by paper code)**
Data Producer/Provider	Entering the data market for income growth	▨	▨	▨	▨	▨	▨				Paper 3, 4
	Obtaining, creating, and adding value data	▨					▨				Paper 3,4,8,10, 29,37, 39
	Stimulating OGD initiatives and facilitating business models					▨				▨	Paper 18
	Competing to provide the best data product					▨				▨	Paper 3, 4
	Sharing Code enforcement is associated with the duty of government to protect its citizen's property rights					▨				▨	Paper 11

9

Metasynthesis Summary										
Actors	**Roles**	**Theme 1 : Data Value Network**					**Theme 2: Value Chain Model**			**Studies (by paper code)**
		Data Discovery	Data curation	Data Interpretation	Data Distribution	Data Exploitation	Obtaining the right data	Data quality management	Deriving information and knowledge	Using information and knowledge to satisfy users	
Data Curator	Value creation techniques: making the data more usable		X						X		Paper 3, 8, 10, 18, 29
	Structuring & modifying the data in some way or another		X						X		Paper 4, 37
	Extracting information from raw data			X				X			Paper 3, 4
	lifting or lowering data into different formats			X				X			Paper 4, 39
	Enriching an existing dataset with new data		X						X		Paper 3, 8, 18
	Using Machine learning to support data collecting and processing		X						X		Paper 2
Data Publisher	Searching for data to be opened				X		X				Paper 2, 4, 11
	Encompassing the sharing data among govt agencies					X				X	Paper 8, 41
	Opening code enforcement data					X	X				Paper 4, 7, 8
	Discovering potentially useful data products				X		X				Paper 4, 7, 8, 10
	Storing and publishing data				X					X	Paper 4, 8. 11
Data Consumer	Consuming the data as a product.					X				X	Paper 4, 8, 37,39
Data Prosumer	Providing user-generative content					X				X	Paper 18
Data Facilitator	Providing additional functionalities (business)					X				X	Paper 18
	Creating government data portals					X	X				Paper 4, 39
	Visualisation					X					Paper 4
	Using data to influence decision-making					X				X	Paper 4, 7, 8
	Indexing in a knowledge base for easier search & discovery					X			X		Paper 4, 8
	making data available for re-use					X				X	Paper 3
Application developer	Creating intelligent applications			X					X		Paper 2, paper 5, 31, 39
Translator/ coordinator	Translating the service value of the application		X	X	X				X		Paper 5, 8
Service designer	Designing future service scenarios			X	X				X		Paper 5, 8
Data broker	linking the roles of the data producers and the consumers					X				X	Paper 4
	Acting as products of data producers					X				X	Paper 4
	Matchmaker' between data consumers & data re-use					X				X	Paper 4, 11
	Enabling the balancing of the supply and demand					X			X		Paper 4
	providing the data to a relevant consumer						X			X	Paper 4, 7, 11
Data management provider	Helping the government to achieve higher performance in response to the data-intensive challenges	X	X	X	X	X	X	X	X	X	Paper 18, 31

Metasynthesis Summary											
Actors	**Roles**	**Theme 1 : Data Value Network**					**Theme 2: Value Chain Model**				**Studies (by paper code)**
		Data Discovery	Data curation	Data Interpretation	Data Distribution	Data Exploitation	Obtaining the right data	Data quality management	Deriving information and knowledge	Using information and knowledge to satisfy users	
Data developers	Co-creating innovative OGD & decomposing whole Data Value										Paper 3,4,5,8, 18,29,37,39, 41
	Forming partnerships across public and private sectors										Paper 3,4, 18, 29, 37, 39, 41
	Network into the economic structure of the various activities										Paper 2, 3, 4, 5, 8, 10, 18, 29, 37
Value constellation designer	Describing potential value creation										Paper 5, 8, 29
	Increasing public trust										Paper 8, 11
	Explicit the concepts of visibility & additional recognition										Paper 2
Intermediaries	Sharing the goals of demonstrating the OGD benefits										Paper 3
	As intermediaries to identify very valuable key datasets to be opened										Paper 3
The digital socio-technical infrastructure	Helping ecosystem actors to design, test, and deploy software applications in a virtual space.										Paper 5, 7, 41
Data Champion	As activist roles within government										Paper 8
Data Advocate	Approaching OGD with an emphasis on transparency and the public good										Paper 8
Aid actors of value chain analysis	Allocating resources and efforts along with the value network										Paper 4, 8
	Identifying sources of competitive advantage										Paper 4, 8

Table. Summary of the findings of the qualitative metasynthesis

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