Competitive Capability Framework for Open Government Data Organizations

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ABSTRACT

Open data-driven organizations compete in a complex and uncertain environment with growing global competition, changing and emerging demand and market, and increasing levels of analytical tools and technology. For these organizations to exploit open data for competitive advantage, they need to develop the requisite competitive capabilities. This article presents an open data competitive capability framework grounded in theory and practice of open data. Based on extant literature and insights from domain experts, we identify and describe four dimensions of competitive capabilities required for open data driven organizations. We argue that by implementing the proposed framework, organizations can increase their chances to favorably compete in their respective markets. We further argue that by understanding open government data as a strategic resource for enterprises, government as producers or suppliers of this resource become key partners to data-driven organizations.

CCS CONCEPTS

Information systems, **Model development and analysis**, **Reference models**, *Business rules*, *Business-IT alignment*, *Performance*, *Implementation management*

KEYWORDS

Competitiveness in open data businesses, competitive strategies, organizational capabilities, competitive advantage, open data organization, open data capabilities

1 INTRODUCTION

As data volumes grow exponentially and becoming the lifeblood of many organizations and flows behind almost every decision, Open Data (OD) driven organizations must know how they can manage this complex mass of data in a way that leads to competitiveness [1]. A comparison between data leaders and laggards [1] show that competitive capabilities is a key competitive weapon. An exploratory research of 33 companies in UK [2] also show that competitive capabilities play significant role in the success and profitability but, the same study recommended further study to fully explore these capabilities.

While value and dynamic capabilities of OD-driven organizations have been explored, competitive capabilities for OD driven organization are yet to be investigated. Consequently, we investigate other elements that can equally influence competitiveness of an OD-driven organization.

Our study investigates that the importance of resources in creating competitive advantage but, other elements are also influencing competitiveness. Our study proposes an OD competitive capability framework consisting of four strategic capability key areas - infrastructure, offering, business, and relational rent - that help these organizations to create competitive advantage. The capabilities reported are extracted from the literature and are common to both public and private OD-driven organizations. Capabilities addressed in the developed framework can best serve the purpose of the reported OD business models in [6].

Section 2 presents the theory background. Section 3 presents the methodology. Section 4 presents the proposed framework – OD Competitive Capability Framework. Section 5 presents the discussion, implications, and future research. Finally, in section 6, we conclude the study.

2 THEORY BACKGROUND

2.2 Competitive Capability Model

2.2.1 IT Competitive Capability. IT strategy allows organization 1) to mobilize and deploy IT-based resources in combination with other resources and capabilities [8] and 2) to align IT with the business strategy and ensures that IT is being used to meet business goals [9]. Adopting Gartner's classification scheme, IT strategic capabilities are classified into the following [10]:

Infrastructure strategy. Enables an organization to more effectively recommend and deploy appropriate infrastructure [10].

Service strategy. Assists organization to defines the portfolio of services to be offered and the customers to be supported [11] and to know what service to push into the market and how [10].

Application strategy. Application strategy allows organization bent on transforming itself into a new business model, changing most of its applications in the process [9], [10].

Integration strategy. The degree to which the organization's activities and processes operate as a single unit [10].

Sourcing strategy. People (internal or external) who perform the work and execute strategy [10].

2.2.2 Manufacturing competitive capability. A pattern of decisions which determine the capability of a manufacturing system and specify how it will operate to meet manufacturing objectives [12], [13] and are divided into the following four categories [12], [15]:

Quality. Producing a product and service that performs well to specifications defined and accepted by the customer.

Delivery (channel and speed). Refers to achieving delivery targets, i.e. reacting quickly to customer orders to deliver fast.

Flexibility. Ability to cope with change or uncertainty and variety in terms of flexibility in design and volume.

Response or Delivery lead time. Delivering the product within a short lead time.

2.2.3 Business competitive capability. Business strategy refers to how organizations compete in a market [16] and how services are organized and populated with resources [10], [17]. There are two dominant frameworks: 1) the Miles and Snow typology [18], which focuses on intended rate of product-market change, and 2) the Porter typology [16], which focuses on customers and competitors. We adopt Porter's typology that includes two basic sources of competitive advantage: differentiation and cost advantage [16], [19]. To complement Porter's typology, we also include other business strategies reported in the literature.

Pricing Strategy. Allows the organization to develop a competitive price through which organization build market share and consequently profitability [20].

Differentiation strategy. Allows organizations to differentiate their product and service offerings [21] that is perceived as being unique based on brand image, technology, features, customer service, dealer network [11], [22] and, product innovations [4] etc.

Growth strategy. Provides an avenue for an organization to generate more and sustainable revenue [23].

Commercialization strategy. An important strategic choice on how to commercialize products and services [24].

Market strategy. Allows organization to go to a new market or staying competitive in the existing market [25].

Management strategy. This strategy involves the formation of partnerships or alliances across organizations that represent collective, joint activity; the formulation of a collaborative strategic plan; and the implementation tactics employed, at both the collaborative and organizational levels [26].

2.2.4 Relational rents competitive capability. Relational rent happens when organization's critical resources extend beyond the organization boundaries. Group affiliation [28] and inter-organization linkages is a source of relational rents and competitive advantage [27]. One study [29] investigates the relational or alliancing capability from two perspectives: 1) the dynamic capabilities view and 2) the network management view. The first defines relational capabilities as the capacity of an organization to purposefully create, extend, or modify its resource or capabilities through alliances. The second points out to the willingness and ability of an organization to partner. This includes the following four categories.

Intra-firm collaboration strategy. Attempts to bring openness, knowledge transfer, and cooperation at the organization level between employees [29], [30].

Business interactions strategy. Makes it possible for organizations to maintain effective business interactions with other businesses [31].

Customer relationship strategy. Allows organizations to manage and maintain interaction with current and potential future customers [32].

Network strategy. Allows organizations to increase and strengthen organization's relationship with its business partners [33].

3 METHODOLOGY

3.1 Phase One – Content Analysis

Our first attempt in understanding concepts in the domain and the topic under study is the review of the existing literature. We used keywords such as "open data strategic capabilities", "competitiveness in open data businesses", "big data competitive strategies", "competitive capability building", "organizational capabilities", "competitive advantage", "open data organization", and "open data capabilities" to search for relevant articles, reports, and other written materials. Business capability types and models are also reviewed in this research. To complement the information gathered during the research, website contents related to the OD competitive capabilities were also considered to be useful given the paucity of scholarly work on OD-driven organizations and related organizational competitive capabilities. During the review of the literature, coding is done by first highlighting the exact words from the text that appear to capture key concepts related to competitive capabilities. We captured 117 capabilities from literature but all of them were unstructured, untie to any other capabilities, and the real nature and the purpose each supposed to serve was unclear. Next, we make notes of our impressions, thoughts, and initial analysis on each code. This process is repeated until labels for each derived code are

extracted. Subsequently, these codes or labels are sorted into categories and subcategories based on how different codes are related and linked. These emergent categories are used to organize and group codes or labels into meaningful areas. To help in organizing these categories into a hierarchical structure, we developed a tree diagram. Next, as areas and categories are of high-level and general, we provided existing definition for each area and categories. In the second step of our approach, we employ the Delphi technique to provide concrete relationship between areas, categories, and subcategories.

3.2   Phase Two – Delphi Process

In this study, we opted to use the Classical Delphi technique where participants (experts in a field) are physically present for each iteration [35] to form consensus and make judgments [34], [35]. The reason why Delphi is selected is because it provides rich data and ideas over several rounds or iterations and also allows participants to feel free to provide their opinion, views, and decisions on identify, classify, and define OD competitive capabilities without being concerned about others' opinions and decisions.

Study participants and recruitment. Participants were recruited at Insight Centre for Data Analytics, Galway, Ireland. We were interested in procuring domain experts for the study. We explained that a commitment of approximately 1 hour average per session for two times in two weeks maximum would be necessary to participate in the study. No incentives were provided. We first provide and review a list of potential participants with expertise in OD and strategy management. Three domain experts very familiar with the Delphi technique were selected and agreed to participate.

Brief background of the Study Participants. The aim was to combine one pure technology expert, one pure management expert and one with strong knowledge on both areas – business and technology. Specifically, Coder1 has a strong background in both technology and OD business. Coder 2 has a strong background in technology and has been involved in many related large-scale projects. Coder 3 comes from a business and finance domain with a pure business and OD business knowledge.

Iterations of the Delphi Process. We first emailed each participant the spreadsheet including all the categories. In the first iteration, each participant had an equal time frame of two weeks to provide opinion, views, and decisions on aligning the subcategories to the categories and areas without being in contact with the other participants. After the two weeks, responses were returned back to the authors by email. Following the first iteration, authors met to discuss the data collected from each participant. It appeared that not all responses were similar therefore, authors decided to proceed with the next iteration. During the second iteration, the goal was to reach group consensus when there are divergence in views. One of the authors led a session with the three participants to discuss dissimilar alignments. In addition, participants were also invited to make comments. The research team met again and read and discusses all responses and comments. We then scheduled several meetings to reflect on and analyze the data. At the end of the Delphi process, all the

subcategories were assigned to only one category and one area and the definitions of areas and categories were updated which removed ambiguity.

Agreement between coders. Question of consistency or agreement among these individuals immediately arises due to the variability among observers. Researchers use inter-rater reliability as a generic approach to measure agreement [36]. Despite other three common indexes of inter-rater agreement, we used both Cohen's Kappa and Correlation Coefficient as they are more rigorous measures than the other ones because it corrects for the likelihood that some agreement between evaluators will occur by chance. As Kappa is a 2x2 measure therefore, it has been used to measure agreement between each two coders (Coder1*Coder2, Coder1*Coder3, and Coder2*Coder3) therefore, three separate and independent tests are required. In this way, Kappa provides more insight about agreements between each two coders which can help us to draw some conclusion. Whereas, Correlation Coefficient can test the reliability between the three coders in one test and provides one result. For both techniques, we used SPSS to test the inter-rater agreements.

When evaluating the Correlation Coefficient, we want the average measures to be greater than .7. Our average measure is .849>.7. Therefore, there is high inter-rater reliability. In addition, our lower limit for Correlation Coefficient of 95% confidence interval is .793>.7 and our upper limit for Correlation Coefficient of 95% confidence interval is .891>.7. Based on the analysis, between the three coders/domain experts, we have high inter-rater reliability.

4   OPEN DATA COMPETITIVE CAPABILITY FRAMEWORK

We elaborate on the different OD-related competitive capabilities obtained from the process described in Section 3. These capabilities offer ways to identify, improve, and implement OD strategic decisions in the areas related to Infrastructure, Offering,) Business, and Relational Rent [37], [38]. In Table 1, we re-conceptualize the strategic capability presented in section 2 in the context of OD.

Table 1: Definition of open data competitive capability areas

OD Competitive Capability Areas	Definitions
Infrastructure	**This capability area includes all the decisions an OD-driven organization makes to plan technical infrastructure, applications, integration tasks, services, and people performing tasks for producing and handling OD products and services and guides the organization's overall objectives.**
Infrastructure	This strategy guides the organization to decide what technology components to use that connects everything and, possibly, the amortized cost of development of OD products and services.
Service	This strategy supports what the IT components and the organization's units can offer. For example, offering service for delivery and offering data in the portal.
Application	This strategy supports all what is running on top of infrastructure to allow organization run its business. For example OD analytics

	applications, OD process modelling, automated data reading, metadata generation, and data conversion.
Integration	This strategy supports the effort required for integrating new source of data into applications, services and infrastructure.
Source	This strategy supports acquiring the right human knowledge and skills for handling the task of IT from infrastructure level to the integration level.
Offering	**This strategy allows OD-driven organizations to ensure that the data that is being used and transformed from one form to another, to produce innovative products and services is in its best form and can be with the customer in a short lead time.**
Quality	This strategy makes sure that the produced OD products and services are of quality the consumer expects which is the 'data that is fit for use'. The poor quality data or inefficiencies that may reduce the profitability of an organization.
Delivery	This strategy makes sure that the OD products and services are delivered with a sufficient delivery method. For example, using OD Portals to reacting quickly to large number of consumers.
Fee/Price	This strategy makes sure that the OD products and services are priced accordingly –if price or fee applies.
Flexibility & Volume	This strategy allows the OD-Driven Organization to cope with change or uncertainty and variety in design and having the ability to supply fluctuating volumes without compromising lead time.
Response Time	This strategy makes sure that the OD products and services are delivered within a short lead time after being requested by the users. For example, timing of data release.
Business	**OD Business strategy development is concerned with matching customers or consumer's needs and buying patterns to the capabilities of the organization, based on the skills and resources available to the organization, leading to the issue of core competence. It can simply be described as a long-term business planning. A key element in this long-term business planning is to design and implement a program or set of strategies that can secure the business for a longer period of time.**
Differentiation	This strategy allows an OD-Driven organization to be unique at some factor that is valuable for the customers. For example, offering a high quality sector specific datasets, having access to critical and high value data assets which can generate unique products.
Pricing Method	This allows an OD-Driven Organization to employ the right method for pricing data products and services. For example, an algorithm that generates the price based on specific factors.
Growth and Commercialization	This strategy allows an OD-Driven Organization to grow locally and globally. Through implementation of commercialization strategic capabilities, an OD-Driven organization will find out where the commercial interest of the developed OD products and services is and therefore can move push them to the marketplace.
Market	This strategy allows an OD-Driven organization to effectively utilize their inside and outside resources and capabilities to show and deliver OD value to customers, suppliers, and partners. This strategy also allows an OD-Driven organization to enhance and maintain its position in the OD ecosystem.
Management	This strategy is all about overall management solutions and tasks for implementing goals, top level decisions, and strategies at the tactical and operational level.
Relational Rent	**OD relational rent strategic capabilities treat OD business groups as a form of inter-organizational network that generates relational rents among affiliated organizations as compared to independent organization. As a member of an OD inter-organizational network, group affiliated organizations can share, exchange, and combine their unique and valuable data resources and capabilities, and improve their overall performance.**
Intra-firm Collaboration	This strategy allows an OD-Driven organization to enhance collaboration at the intra level and ensures that OD resources, capabilities and knowledge generated within organization are exchanged and communicated inside the organization.
Business Interaction	This strategy allows the OD-Driven organizations to build and maintain effective business interaction with other organizations.

Customer Relationship	This strategy, strengthen and enhance positive relationship between the OD-Driven organization and the OD products and service customers.
Partner Network	Therefore, this strategy allows an OD-Driven organization to expand the network of partners and provide knowledge and resource exchange within the network.

4.1 Open Data Infrastructure Strategic Capabilities

OD Infrastructure Strategic Capabilities. This strategy assists organizations to decide and put in place necessary infrastructure to be used for data storage systems such as Hadoop, access methods such as APIs and applications, and transformation of datasets to Linked Data [39], [40]. OD-driven organizations are increasingly looking to simplify their data architecture - while focusing on modern big data architecture - and decease the time to value from data. For this, organizations need to decide quickly to invest in data, IT, and data analytics infrastructures [41]–[43] and expand agility in adopting and utilizing data platforms [38], data visualization tools [43], and data management infrastructure [37], [41]. In regard to the OD platforms and visualization tools, unlike a traditional way of doing business, OD-driven organizations need to understand and exploit OD platform and data visualization tools effects throughout all aspects of their businesses. OD platforms are one of the primary sources of data, resources, and capabilities that allow organizations to use to create value [44].

OD Service Strategic Capabilities. Generating return from OD is not simply a matter of generating new technology, integrating technology with the existing architecture. It is also about creating new services that can be used by business units and external entities. One of the simplest ways to begin experimenting is through cloud services which treat Data-as-a-Service (DaaS) [40]. DaaS enables organizations to access data within an existing data centers. Using these services, organizations can have access to shared data to quickly develop and publish OD services and products [38]. APIs for example, cut the cost of using existing stocks of data capital in new ways, increasing the potential value of data [40]. It is very critical that publishing organizations ensure quality of these services [45] and that these services can generate new data when used [46]. To achieve these goals, OD-driven organizations must put in place required strategies to improve developing and launching DaaS capabilities [47].

OD Application Strategic Capabilities. OD-driven organizations should invest in new and powerful analytic applications that can handle analyzing large data. Today's and tomorrow's approach is to embed analytics in applications so that it encourages users toward desired outcomes [40]. There are a variety of alternative approaches to embed analytic functionality to their applications. There is one commonly accepted strategy which is "build, borrow, or buy" strategy which tells 1) build and integrate analytics functions using in- house development resources, 2) borrow analytic functionality by leveraging and integrating available open source code, and 3) buy a commercially available integrated solution or components. Depending on the available resources, capabilities, and relationship with other

organizations, OD-driven organization can come up with the right strategy among these three [48].

OD Integration Strategic Capabilities. This category of capabilities allow OD-driven organizations to explore the potential value of datasets [40] by adopting and integrating tools to consolidate and integrate data from different data sources [1]. However, the integration task is challenging as these data sources generate diverse data of different format. To reduce the integration barriers, OD-driven organizations should 1) simplify the process of reshaping diverse data for a variety of endpoint algorithms, analytics, and applications [40], 2) increase ability to integrate performance analytics [43] with risk analytics [1], 3) create data warehouses to integrate multiple databases and sources into a "single version of the truth" [1], 4) use of APIs and REST to connect applications with variety of data sources [38], and 5) create ways for applications to grab data on demand [40]. After twitching to a new expert systems and processes, legacy systems may still hold large amount of useful data for example on business processes, performances etc. Extracting this data is proven to be beneficial for management to evaluate organizational performance before and after the new systems are in place.

OD Source Strategic Capabilities. Piecing together data scattered across an organization is difficult and challenging. It takes a lot of time to find and fit the pieces together to create value. Therefore, people working in an organization should be equipped with the skills needed have data literacy [49] to work with the data [38]. Therefore, employees and the data management team needs to implement a broad portfolio of data related skills to accelerate and automate data and data management tasks to solve a problem [38]. As data becomes increasingly central to organization's strategic concerns, organizational investors should continue to invest in training and strengthen their internal human resource skills [44].

4.2   Open Data Infrastructure Strategic Capabilities

OD Quality Strategic Capabilities. There are accepted practices and strategies that help organization to increase quality. Defining the right data quality framework is the initial step towards an organization wide data quality strategy that aligns with the sectors existing strategies and policies. OD-driven organizations should develop and update the organization's action plan for quality development [14]. Data stewards, along with data quality administrators, should manage data quality functions, including evaluating source data, defining data quality rules, defining data latency requirements, identifying, standardizing and consolidating duplicate records, matching records from identical households, implement data quality dashboards with data quality metrics, monitoring and reporting data quality metrics [38], defining data quality attributes [14], [50] and measurements [45], identifying data quality priorities [14], [50], and assessment tool with good characteristics [14] which are all aligned with business value [50]. To sustain the data quality, an organization should actively re-measure quality at a regular basis [14], evaluate existing data quality levels [14], [45], [50], and monitor ongoing effectiveness

of data quality process [45]. Metadata standards and licensing issues which remain the most problematic areas for most organizations if properly managed can have major impact on competitiveness [37].

OD Delivery Strategic Capabilities. OD-driven organizations should put in use required data management tools to ensure the delivery of consistent, high-quality data that's aligned with business strategies and initiatives. In addition, the delivery team should identify what is the best delivery channel for a particular product or service. If the right channel is not selected, the product and service may not reach to the potential consumers [51].

OD Fee/price Strategic Capabilities. Pricing of OD products and services can be complicated. Many organizations believe that OD products and services should be charge at zero cost as they are made of open and free datasets, while others are of the opinion that these products and services need to be priced and new business models need to be developed.

OD Flexibility and Volume Strategic Capabilities. Data products and services have shorter lifecycle than other physical products in the market. This is due to the fact that data is generated every second and clients will have new needs therefore, this calls for upgrading the offering or producing new offering that incorporates new data. OD-driven organizations should be prepared to expand the stock of data capital in the data management system by using big data integration technologies [40]. To do that, OD-driven organization need to increase flexibility in data infrastructure that can keep pace with evolving client needs and new regulations [1]. By implementing the above strategies or capabilities, OD-driven organization can enhance the ability to use data to provide OD products and services to clients in a flexible manner [1] and in a visualized form [38].

OD Response-time Strategic Capabilities. One of the other important factors in the OD ecosystem is how fast the product and service can be delivered to the consumers. Therefore, delivery within a short lead time is very essential. Here, the goal is to shorten the organization's response time to the requests and needs of the consumers. Strategies such as 1) Data products and service being available in the market in reasonable amount of time [38], 2) Schedule a release and meet the release time [38], 3) Focus on more timely data products and services [1], 4) On-demand and on near-real time delivery and timeliness data [50], [52], and 5) Collect data once and use numerous times to reduce the cost of business processes, decrease service times and increase accuracy [37] can help OD-driven organizations to improve the response-time.

4.3   Open Data Business Strategic Capabilities

OD Differentiation Strategic Capabilities. This tells to the OD-driven organizations that the organization needs to do something at least as well as other organizations, or preferably better than, any other organization in the ecosystem. One best strategy is that they develop a product or service that is based on core competencies that define the organization's value proposition in each target market. By focusing on core competencies, organizations better understand the relationship between the

organization's internal strengths and weaknesses, as well as the potential effects on their organization's competitive advantage and performance. In this ecosystem, differentiation strategy involves the organization to collect and use the right data with the right method and technique of analysis to create an OD product and service, which is considered unique in some aspect and can satisfy consumers. They can achieve that if they have and develop 1) leading-edge data [1] and analytics capabilities that can be used for creating something unique [1], [31], 2) knowledge of relationships between data [53], and 3) network effects, low distribution costs, and data-driven learning curves to grow digital services [40]. Moreover, having access to large volume of data is very vital as it allow them to exploit the available data for innovation. To obtain the greatest access to any data, consumers need to trust that information about them will be well stewarded, meaning that it will be used for the purposes allowed [54]. In such organizations that excel at creating trust allow them to increase the amount of data they can access by at least five to ten times in most countries. The resulting torrent of newly available data will meaningfully shift market shares and accelerate innovation for these organizations [31].

OD Pricing Method Strategic Capabilities. A number of Researchers indicate that 'cheap data yields higher (economic) growth' [55]. There is a link between the pricing of OD and (SME) small to medium sized organization' sales growth [56]. Business growth is 15% higher in countries where for example geographic data is freely available or sold at a considerably reduced price. However, it was claimed that marginal cost pricing has not generated notable growth among the large organizations; it has been small organizations benefiting most from cheaper geographical data. Another view is the government view. Governments receive income from commercial licensing fees, but at the same time lose taxation and employment benefits from the potential higher volumes of commercial activities that could be generated if they abandoned upfront charges for obtaining OD in the first place. According to the article 4.1.2 of the EU PSI Re-use Guidelines [57], "charging itself comes at a cost (invoice management, monitoring and policing payments, etc.)". Therefore, the directive recommends that public sector bodies regularly assess the potential costs and benefits of a zero-cost policy and a marginal cost policy. According to the cost reduction business model [6], OD-driven organizations can generate costs that meet the demand. However, for any extra demand–since OD is free- the organization should not charge more, since the cost has already been recovered based on the initial demand [40], [56], [58].

OD Growth and Commercialization Strategic Capabilities. A good commercialization strategy can lead to revenue generation and profitability. OD-driven organizations should develop commercialization and growth strategy so that they can successfully commercialize their OD offerings. The right strategy would be that OD-driven organizations to make OD products and services that are usable by all [45] otherwise, the opportunity to communicate with the market and consumer and data innovation is lost. To do that, the organization need to identify appropriate

data sources that truly have an influence on the organization's decision in making OD products and services [31]. The organization should strategically decide what type of innovation suits the existing market. According to MIT research [40], to increase chances, an OD-driven organization should use data to introduce disruptive innovation so that the new commercialized product and service can introduce a new market and value network. However, introducing new innovation is risky as it can also cause bad reputation if the expected outcome is not generated. In such situation, OD-driven organizations need to overcome the risk by building models that predicts and optimize outcomes [38]. Such decisions if made accordingly can be so beneficial to the organization as it can allow them to take over the market and implement new growth strategies such as 1) producing large volume of data by allowing business partners access and use the commercialized and innovative products and services [46], following number one, organization can then 2) identify strategic partners that can help unlock new economic opportunities [41]; 3) moving from local data ownership towards shared data and stewardship [37]; 4) colonizing new data lands by providing other organizations with tools, applications, products and services that can generate data when used [46], 5) packaged and sell data to partners and suppliers to create new revenue streams [59], and 6) open up discrete data resources and challenge customers or the wider public to submit ideas or develop solutions in exchange for financial rewards [60].

OD Market Strategic Capabilities. Implementing market strategy requires investment and acquisition of resources [61]. In this regard, studies [37], [38], [50] highlight the importance of availability and publishing relevant and critical data and data assets. This allows organizations to increase the value of market strategy and also help acquiring organizations to create return value from the data and data assets. In addition, [38] includes the importance of availability of data products and services with specific characteristics that meets the market niche. However, the prerequisite market strategies to enable the above two market strategies are publishing openly to the market and supporting the published data with data quality dashboards supplemented with quality metrics [38]. Whenever implementing market strategy requires acquiring data and data assets, the organization must first identify the best data resources from the market (fragmented vs. internally controlled) [38] and whenever implementing market strategy requires outsourcing data and data assets, the organization must plan, sponsor, and oversee the market for data related projects and needs [37]. According to the theory of economics, OD-driven organizations must assemble a market dynamics analysis to improve ability to adapt to changing market needs and to tightening customer expectations [33], harvesting new market demands by creating products and services that leverage data relationships [33], work with variety of suppliers focusing on technology and market niche [38], and packaged and sell data to partners and suppliers [59].

OD Management Strategic Capabilities. To optimize performance, management team needs to balance strategy by bringing opposite forces together for example short term and long

term; enterprise and department; top down and bottom up; speed and standards; creativity and structure; and control and openness [38]. In another study, the author claims that it is vital for the management team to have a clear understanding of what the strategic management capability is and what value is created for the organization [59]. Strategic management capabilities enable an organization to proactively manage its data asset and resources to help deliver its business objectives. Part of this strategic decision is to increase dependency of organizational goals to processes [38], careful management of linkages [51], identifying and aligning available data resources, toolset, and infrastructure around organizational objectives and performance [62] and with projects needs and articulate different strategic activities that occur under management strategy [38]. Strategic activities such as: assess, develop and implement infrastructure best practices [37], operational efficiencies [38], follow and manage legal framework (policy, legislation, and regulations [37]) and data protection acts [50], and managing data resource strategy [1]. Eckerson (2011) further highlights that the management team needs to decide on what level –central vs. department– data assets should be managed in the organization. To ensure quality, all the decision making must be based around a common set of KPIs [59], data requirements, administration, and metadata must be well managed [1], [14], [50], and roles and responsibilities [51] including appointing data stewards [37] need to be well identified. To increase efficiency, monitor productivity, and expanding observations about these activities, activities can be digitized and datafied by involving sensors or mobile apps in the activities [46]. Investment decisions specifically in OD industry is asymmetric [33]. One investment decision that can bring value to the organization is the investment in managerial knowledge acquisition and training for affiliated firms without or with R&D units [33], [43], [63]. Another investment decision the management team can make is investing and outsourcing data related technological capabilities, R&D, and human capital [42]. A good OD business model based on the data and organizational capabilities can effectively support the investment decisions and gaining integrated view of and managing risks across multi-asset portfolios [1].

4.4   Open Data Relational Rent Strategic Capabilities

OD Intra-organization Collaboration Strategic Capabilities. In OD context, intra-organizational collaboration varies depending on the types of gaps found within the organization. Management team is required to identify these gaps and fill them with right strategic decisions. Most of the times, this gap is related to the lack of knowledge generation and transfer within the organization due to the lack of proper collaboration between the professionals and collaborative environment in the organization. It is fairly cheaper to acquire, transfer and use knowledge and capabilities generated within the organization than outside the organization [64] therefore, it is critical to plan and create strong links, frequent dialogue and ongoing collaboration between professionals within the organization [41] and develop virtual collaborative

environment, data sharing and communication programs between departments and individuals to transform from a "need to know" to a "responsibility to provide" mindset [37], [43]. Another potential area for strengthening intra-organizational level collaboration is to create internal data marketplace to exploring the potential value of organizational data capital [46] and to create internal data warehouse for key decision-making activities [50].

OD Business Interactions Strategic Capabilities. In OD context, business interactions are all the inter-organizational interactions that an organization establish and maintain with other organizations. Strategies implemented can interest other businesses to interact with the organization. An OD organization needs to strategically pick those organizations to exchange data with that their data is highly valuable for enhancing and optimizing the organization's offerings [40]. However, this requires an OD organization to develop and maintain data sharing [37], to open up and update organizational data warehouse [50], to increase volume of data (foregone data) from interaction activities [46], and to commit/use vast amounts of data to/from data brokers [50]. Moreover, by sharing best practices internationally [45] and participating in a big-data ecosystem [41], [43], an organization can access to the vast resources of data from other organizations [31]. This can provide the organization with an opportunity to alter the way other organizations use data [31]. Another smart and strategic move is to be a party to an activity between organizations so when an activity happens, your chance to capture its data is not lost [46].

OD Customer Relationship Strategic Capabilities. Understanding customer and customer behavior can enable the organization to target right products and services for the right segment of customers. Data may not be replacing common sense as a decision-making tool and it is becoming an irreplaceable strategic weapon to create customer relationship [65]. Therefore, organization can use OD to inspire customer engagement [60]. A virtual collaborative environment can better facilitate collaboration and sharing between customers such as developers [37]. The organization can then articulate the benefits of the data use by customers to enhance features, improve products, useful advertising, and so on [41]. Another strategic action is that the OD organization can tap into the resources of the crowd to find out which of the organization's many datasets has more value to the organization and the customers [60]. Data related to customers should be packaged for further analytics and developing customer relation innovation. Customer data analytics and analyzing the right data can aid the organization to positively change customer behavior, reduce customer churn and increase loyalty, increase satisfaction, and provide transparency into new uses of customer's personal data [54].

OD Partner Network Strategic Capabilities. OD organizations that are nationally and internationally focused, have to integrate and work with other organizations. According to [66], partner network emerged from globalization process has an increasing impact on the organization and its practice. In the emerged network of partners, OD organizations can achieve a data advantage by outsourcing aspects of data management to

specialist partners [1]. OD organizations can also scale data capabilities across their network of partner organizations. For example, by participating in data analytics capabilities, partner organizations from across multiple organization units can contribute to decisions on analytics tool development. Through this engagement, partner organizations become actively involved in making the vision a reality. Participation calls for true collaboration between partners. Managers in the network do not simply push their ideas down, but bring all the partner organizations into the effort [67].

4.5   Summary and the Benefits

Fig. 5, presents OD competitive capability framework that includes the four key areas and the value activities. Fig. 6, presents the four key areas, strategic capabilities and value activities that create competitive advantage in OD-driven organizations. From the organization point of view, the proposed framework (Fig. 5) can familiarize OD-driven organizations and management team with the areas where the organization must plan and develop a comprehensive vision and actionable foundation to successfully harness and exploit OD-related resources and capabilities to increase competitiveness. The developed framework can also be used to link organization's business and technology expectations and support them with strategies. Moreover, via the relational rent framework, the organization can establish direct and effective business stakeholder's relation and thus, help to reduce both business and technology related risks.
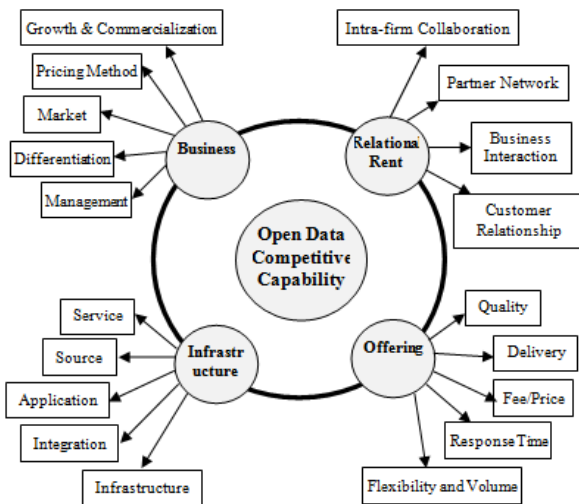

Figure 5. Open data competitive capability framework

From the government point of view, governments can establish a clear understanding of the dependency of OD-driven organizations on governmental OD which can result in opening up more data by government, increase OD use, and enabling data-driven innovation. Also, government can understand a trend in

organization's and public's demand in relation to data products and services. This trend can help government to know what matters to organizations and general public and develop demand-driven public services. Government can then develop principles on what sector to help first and how to do it to achieve it. Government can understand what infrastructures are needed by these organizations to create a competitive environment from OD use. Government can then contribute in providing infrastructure that eases searching for and utilizing data that is being held by the government to develop products and services or even to generate data resources for other organizations. Data usage and regeneration can help government to measure performance of governmental data on innovation. Government can also learn from the organizations the commercial capabilities across government. From the collaboration point of view, government can use the framework to implement collaborative platforms that can strengthen controversial debate between organizations in both public and private sector to support public-private partnership and true aggregated analysis and better problem solving. In general, governments should move from faith-based approach to OD to more evidence-based approach to OD.

5   DISCUSSION

To the best of our knowledge, there has been no previous scholarly work has attempted to articulate competitive capabilities for OD driven organizations. Past works are limited to studies and reports presented by some organizations such as Deloitte [60]. Deloitte and many other organizations show that these organizations are strongly concerned about the competitive capabilities and their influence on the competitiveness of the organization [1], [2], [41], [68], [69].

Insights from a scenario, interviews, and a survey study [70] reveals three areas where the OD-driven organizations need to build capability to gain competitive advantage: 1) Information Technology: Internet, cloud computing, and processing, linking and other tools; 2) Information and Data: database with open dataset, company database, and company products and services; 3) Human: computer skills, finding and accessing OD, tool selection and use, data and result interpretation, and stakeholder network management. Our study also confirms these capabilities but argues other capability areas such as commercialization, data infrastructure and integration capabilities, and relational rent are also vital for competitiveness.

It is very important to stimulate engagement with stakeholders, developer's community, and consumers and disrupts the market following Disruptive Innovation [60]. Our study also confirms this and that if performed accordingly will increase competitiveness in OD-driven organizations.

The Boston Consulting Group's study [41], reveals six level OD capability areas in three top-level components: Data Usage, Data Engine, and Data Ecosystem. Our study also confirms the three components of these levels and all the associated capabilities and confirms that they offers enormous potential and influence competitiveness of the OD-driven organizations.
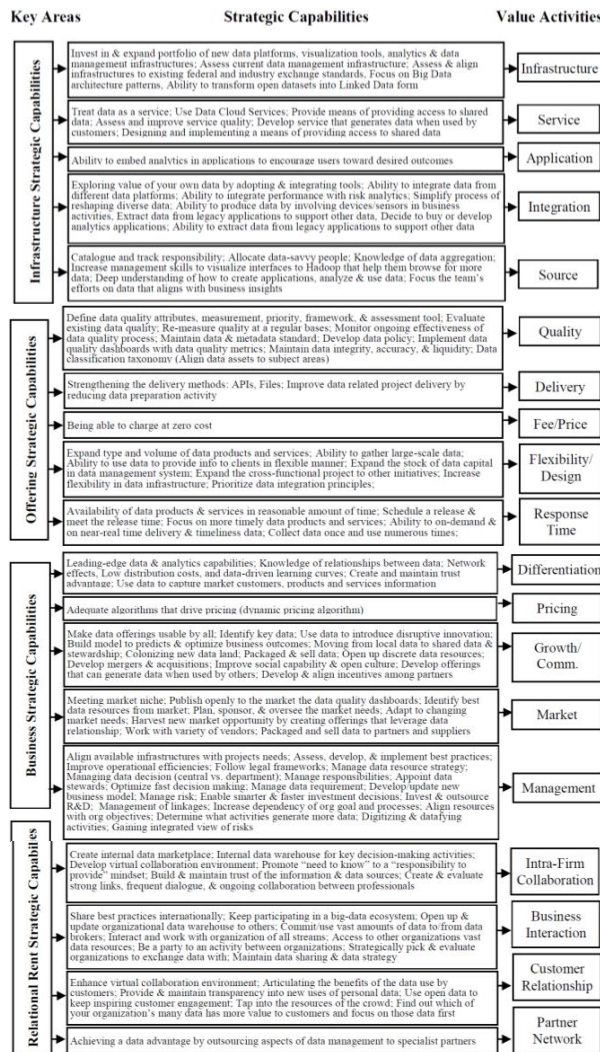
Figure 6. Open Data Competitive Capabilities

An exploratory research of 33 companies in UK [2] reveals two strategic capability areas: cost leadership and differentiation. However, we argue the importance of 'charging at zero cost' strategy while, that study suggests organizations to follow cost leadership strategy to produce a product or service at a lower cost than those competitors. Similarly, in that study differentiation strategy focuses on the different product and service compared to competitors while in this study, we cover multiple dimensions.

Organizations hardly open up their data to other organizations to avoid losing competitive advantage and this can lead to increase in cost and effort associated with maintaining data, lack of understanding of potential utility of others' data, and eventually difficulty in developing strategic decisions and implementing capabilities [60]. To compete, smaller organizations can gain

advantage by imitating competitor's successful capabilities that suits their organization. However, it is not just enough to formulate and implement competitive capabilities to increase return and competitiveness but, it is very critical to open up data to everyone because opening data itself can reduce extra and unnecessary spending on data maintenance. Specifically that implementing competitive capabilities is also a costly process. The economic performance or return of an organization does not only depend simply on whether or not its competitive strategies create competitive advantage, but also on the cost of implementing those strategies [71]. Clearly, if the cost of strategy implementation is greater than returns obtained from creating an competitive product and service market, then, the organization will not obtain normal economic return from their strategizing efforts [72]. Therefore, if organizations share all their data, they can save more and invest in maximizing value of the implemented strategy.

6   CONCLUSION

This study developed an OD competitive capability framework for OD-driven organizations. The framework consists of four capability areas directing and guiding the management team to develop strategic decisions that can lead to competitiveness. The developed framework provides governments with the bases to develop better and more informed strategic decisions to support opening up more data to both public and private organizations and to measure the performance of these organizations and perform benchmarking.

Our future work will focus on implementing this framework in different OD driven organizations for refinement. Other research directions include investigating and identifying competitive capabilities addressing the three typologies: Defender, Prospector, and Analyzer. In addition, it is essential to study what challenges do organizations expect in regard to formulating and implementing competitive capabilities over the next years and what steps to develop that can help organizations to become data leaders rather than laggards.

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