Emerging Business Models for the Open Data Industry: Characterization and Analysis

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ABSTRACT

Business models for open data have emerged in response to the economic opportunities presented by the increasing availability of open data. However, scholarly efforts providing elaborations, rigorous analysis and comparison of open data models are very limited. This could be partly attributed to the fact that most discussions on open data business models are predominantly in the practice community. This shortcoming has resulted in a growing list of open data business models which, on closer examination, are not clearly delineated and lack clear value orientation. We address this problem by 1) consolidating reported open data business models in both academic and practice literature, 2) describe the models based on a business model framework, and 3) determine open data business models patterns. In addition, we identified the emerging core value disciplines for open data businesses. Our results help to streamline existing useful models, and link them to the overall business strategy through value disciplines.

Keywords

Open Data Business Models, Open Data Industry, Values Disciplines, Business Models, Business Model Framework

1. INTRODUCTION

During the last decade, businesses across the globe have struggled to comprehend and adapt to the changes brought on by the ubiquitous growth of Information Technology and the Internet [1], [2]. One of the changes is the emergence of open data which resulting from opening up and sharing of non-sensitive information with other businesses and general public [3], [4]. Open data movement is a great deal of excitement around the world for its potential to empower citizens, businesses, change how government performs, and improve the delivery of public services [5]. Open data takes different shapes and forms, and is

located in different parts of the government and may be related to public services or related to internal processes [6], [4], [7].

Drivers for opening up data include ensuring accountability, delivering quality services, reducing operating costs, and stimulating innovations [6], [8] [9], [5]. E-Government can play a major role in enabling these drivers by opening up data and publishing open data on regional, national and international portals.

Recently, attention of major stakeholders in the open data community, including policymakers have shifted to the economic value of open data assets. For instance, the European Commission estimates that the economic gains from opening public sector information or government data could amount to €40 billion a year. This has spurred a growing number of small and medium enterprises seeking to tap into the potential of open data. As new entrants flood the marketplace, businesses are seeking to uniquely position themselves through specialization to create and capture value for their stakeholders [10].

Business models and business architectures are conceptual instruments for describing how value is created for customers [10], [11], [12], [13], how revenue is generated, and how value is captured [14], [15], [16]. Business models developed to harness the potential value of open data are increasingly available but not well understood. There are very few scholarly studies on business models for the open data industry. The lack of rigour (e.g. the use of a proper conceptual framework) in describing and analyzing existing Open Data Business Models (ODBMs) makes delineation and comparison of the models difficult. In fact, ODBM are used interchangeably with revenue models, pricing strategies, distribution models, marketing techniques and architectural models [15], [17]. For example, while Howard [19] claims that Open Source is an ODBMs, The 451 Group [20] claims otherwise. Yet another example is the use of different names and labels for very similar business models making analysis difficult.

We address this problem by consolidating reported ODBMs in both academic and practice literature, rigorously describes the models based on a business model framework, and determining the ODBMs patterns. In addition, we identified five emerging value disciplines for open data businesses. Our contribution in this work is three-fold: 1) Consistent elaboration of existing ODBMs based on a business model framework we constructed grounded in traditional business models literature, 2) Determination of core open data business patterns, 3) Determination of value disciplines for the open data business.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature on ODBMs. Section 3 presents the conceptual framework. Section 4 presents the models elaboration based on the conceptual framework. The research analysis is presented in Section 5. Discussion and conclusions are presented in Sections 6 and 7 respectively.

2. LITERATURE REVIEW

In this section we describe business model frameworks and ODBMs. In section 2.1, four well-known general business model frameworks and their components are described. In section 2.2, we describe business models for businesses with specific focus and purpose.

2.1 Business Models

A business model describes how value is created and captured by an organization through the decisions made and the resulting consequences [21]. In our study, we adopt the notion of business model provided by Osterwalder [22] which considers a business model as a conceptual tool that contains a set of inter-related elements that allows a company to earn money. It comprises a description of the value a company offers to one or several segments of customers, the architecture of the firm, and its network of partners for creating and delivering this value in order to generate profitable and sustainable revenue streams.

We review four major BMs in this section.

Osterwalder and Pigneur Business Model
Osterwalder and Pigneur [23] presents a business model canvas with nine building blocks. Model is presented in figure 1. The model includes, key partnership, key activities, key resources, value proposition, relationships with the customers, customers, channels, revenue stream and cost structures.
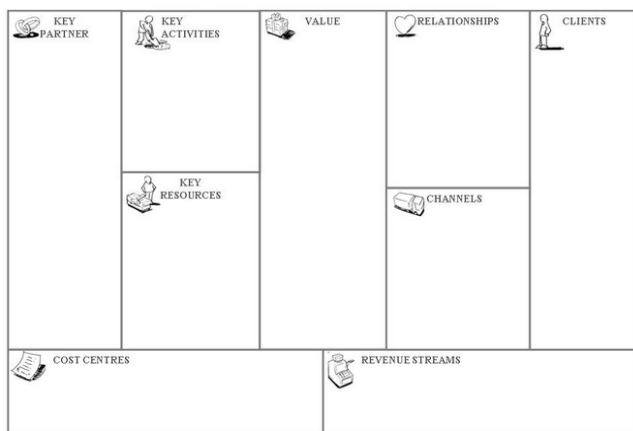

Figure 1. Osterwalder business model canvas [23]

Customer: The Customer Segments Building Block defines the groups of people or organizations a business aims to reach and serve.

Value proposition: The Value Propositions Building Block describes the bundle of products and services that create value for a specific Customer Segment.

Channel: The Channels Building Block describes how a company communicates with and reaches its Customer Segments to deliver a Value Proposition.

Relationship: The Customer Relationships Building Block describes the types of relationships a business establishes with specific Customer Segments

Revenue stream: The Revenue Streams Building Block represents the cash a business generates from each Customer Segment (costs must be subtracted from revenues to create earnings).

Key resources: The Key Resources Building Block describes the most important assets required to make a business model work.

Key activities: The Key Activities Building Block describes the most important things a company must do to make its business model work.

Key partnership: The Key Partnerships Building Block describes the network of suppliers and partners that make the business model work.

Cost structure: The Cost Structure describes all costs incurred to operate a business model.

Shafer, Smith and Linder Business Model
Shafer, Smith and Linder [24] based their framework on the four major categories common to most business model definitions: Strategic choices; value creation; value network; and capture value. Figure 2 presents the model.
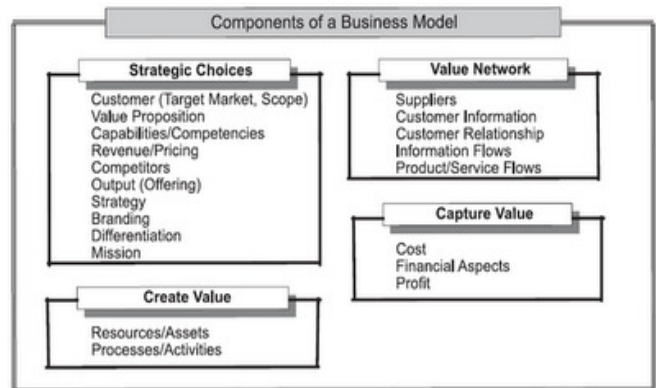

Figure 2. Four components of a business model [24]

Strategic choices: The Strategic choices block defines strategies a business has to be able to offer a unique product to the customer. This is an element of the strategy formulation process. Strategic choice adds value to a strategy.

Value network: The Value Network Building Block defines network of suppliers and partners that make the business model work.

Create value: The Create Value Building Block is about creating substantial value by doing things in a different way.

Capture value: The Capture Value Building Block defines the process of recovering some or all of the value from the customer.

Successful businesses create value by doing things in ways that differentiate them from the other businesses or competitors. For this, businesses develop different core competencies, capabilities, and positional advantages to perform work activities in different ways. This is what is called a differentiation. In the end though, business viability is tied both to the value they create and to the way they capture value and resultantly generate profit [24].

Hamel Business Model
The business model framework described by Hamel [25] defines that a business model contains three main components: Customer benefits (link between the strategy and the customer needs), Configuration (company-specific combination of resources, skills and procedures, which is used to support a given strategy) and Company frontiers (decisions regarding activity, which require recourse to the added value of an external network). Figure 3 presents the framework.
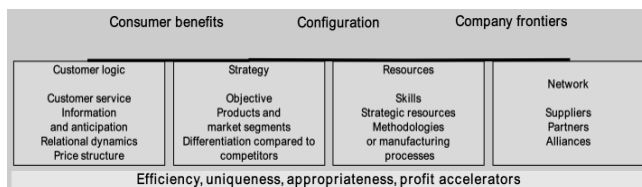

Figure 3. Hamel business model [25]

Customer logic: The Customer Logic Building Block defines segment of group of people a business aim to reach and serve. The Logic part defines all the activities that help a business to maintain and improve the segment.

Strategy: The Strategy Building Block defines strategies a business has to be able to offer a unique product to the customer. This is an element of the strategy formulation process. Strategic choice adds value to a strategy.

Resources: The Resources Building Block describes the most important assets required to make a business model work.

Network: The Network Block defines network of suppliers and partners that make the business model work.

2.2 Open Data Business Models
Open data is any machine-readable information, particularly government data, that is made available in common standards to others [5], [3]. The data can take different shapes and forms and are located in different parts of the government. Data can be raw or processed data. It may be related to public services or related to internal processes [6], [4], [26], [7], [27]. However, there are also limits to what can be released [6].

Since the demand for open data is increasing [28] the idea for businesses is to be able to develop an ODBM to capture the value [27]. Using open data can help companies improve the productivity of current business processes and can lead to new products, services, and entire lines of business for both established companies and entrepreneurs [29], [5]. For open data to be useful and beneficial to businesses, it needs to be structured, supported, timely, accurate and data releases need to be reliable and sustained over time [30], [5]. Therefore, open data publishers or open data businesses need to have suitable business models that enable their activities to be self-sustaining [31].

A number of ODBMs have been identified in literature, mainly in the practice community. These include: Howard [19], Ferro and Osella [32] identified eight ODBMs: Premium, Freemium, Open Source, Infrastructural Razor & Blades, Demand-Oriented Platform, Supply-Oriented Platform, Free as Branded Advertising and White-Label Development. Models identified by Musings [31] are: Cost Avoidance, Sponsorship, Dual Licensing, Support and Services, Charging for Changes, Increasing Quality through Participation, and Supporting Primary Business.

Suhaka and Tauberer highlight business model for re-use of open data. They include: Advertising, Pay Services, Start-up, Crowdfunding, Non-profit, NGO, Multi-Agency, Academia, Consortia and Government [33].

Aforementioned models are not clearly defined and mix many concepts. Below, we describe the first 15 models mentioned above to enable us for further analysis:

Freemium: In this business model, the product is given away for free [34]. The main idea is that customers are hooked on the free product and then subsequently converted into paying customers [35]. In the open data industry, data is published in a basic form; data with some limitations on formats; and offer advanced access to data to those who are willing to pay. For those who pay the freemium price will receive enhanced data (e.g. data in different format, unconstrained numbers of API calls, more sophisticated querying, and early access to data). In addition, loyalty is important to maintain the free users who understand the value of the service and are therefore willing to opt for the paid version [36], [31] [19], [32], [18], [37], [38], [39], [40], [41].

Premium: In the premium business model, the offering is high end products and services. The customer willing to use the product or service has to pay. Brand image is an important factor in the premium business model, as quality is often a subjective matter. This business model seeks a higher profit margin on a lower sales volume [41], [32]. In open data industry, data is published in a complete form but not free [19] [32], [42], [43].

Dual Licensing: Dual licensing is based on the idea of simultaneous use of both open source and proprietary licenses [44], [45]. This means that data are published in an open license for certain purposes and under a closed license for others. This technique has worked for some open source products. The 'certain purposes' might not be simply 'non-commercial': publishers could still encourage start-up use of the data by charging based on the size or revenue of the organization. Or the license could state that the data can be used in products but cannot be used in further "added value" data feeds without being licensed [31], [42].

Support and Services: In the open data industry, data publishers could offer paid packages with guarantees on data availability; prioritization on bug fixes (both in data and its provision) for paying customers; timely help for customers using the data; services around data visualization, analysis and mashing with other data. These kinds of services tend to be coupled with licenses in the data world, whereas in open source they have been successfully disentangled [31], [46].

Charging for Changes: Administrative cost that public bodies charge individuals or organizations who are obliged to provide information to public bodies to be available within government and in society for publishing data. In these cases, those who supply the information to the register are bound to by law, so it would be possible to charge them whatever it took to support the

provision of the data as open data. Indeed, supplying the data as open data is likely to increase its usage (both within government and more widely), and therefore the political pressure to retain the registry and thereby maintain its longevity [31].

Increasing Quality through Participation: Increasing integration and participation of the customer is a new organizational choice aimed at generating higher margins, either by increasing revenues or by reducing costs. In this model, customers are considered as the producers of the network externalities to enhance the value proposition without being involved in the value adding process. This model will increase the customer satisfaction and loyalty, therefore, increases margin due to a decrease in costs and increase in revenues [47]. This model involves engaging other parties who would benefit from having up-to-date to participate to increase the quality of the data published. There are any number of potential contributors, including publishers, lawyers, academics, and government itself.

*Supporting Primary Business***:** This model is used when releasing open data naturally supports the primary goal of a business or organization. For instance releasing open data can heavily contribute to the development of Apps by other businesses or developers [31]. Organizations that publish the data can also use the data to improve its own use of its data by using the third-party tools that are created. There is a great opportunity for the public sector to create a market place for tools that enable it to work more efficiently, by opening up its data.

Demand-Oriented Platform: This model involves charging developers the added value such as advanced services and refined datasets or data flows provided upon the original raw open data. Platforms owners enable easier access to the data resources stored on proprietary servers having high reliability. Once collected from source, "datasets are then catalogued using metadata, harmonized in terms of formats and exposed through APIs, making it easier to dynamically retrieve data in meaningful way. This approach commoditizes and democratizes data. In addition, the business may reap the benefits given by the "one stop shopping" nature of such platforms: they may resort to one supplier and access a variety of information resources through standardized APIs - even beyond the borders of the PSI - without having to worry about interfaces connecting to each original source. This "procurement" approach is crucial to minimize search costs and, by consequence, transaction costs. To sum up, re-users are charged according to a freemium pricing model that sets the boundary between free and premium in light of feature limitations" [32], [32], [19].

Supply-Oriented Platform: This business model entails the presence of an intermediary business actor having an infrastructural role. Contrary to the previous case, according to this logic PSI holders are charged in lieu of developers. In fact, the enabler, following the golden rules of two-sided market, fixes the price according to the degree of positive externality that each side is able to exert on the other one. Consequently, this approach is beneficial for both sides of the resulting arena: from developers' perspective, their barriers are wiped out (i.e., they can retrieve data without incurring cost) while, from the governmental angle, PSI holders become platform owners taking advantage of some handy features such as cloud storage, rapid upload of brand-new datasets by public employees, standardization of formats, tagging with metadata and, above all, automated external exposure of data via APIs and GUI. Public agencies that adhere to such programs in order to dip their toes into the water of Open Data establish

long term relationships with providers and are required to pay a periodic fee that depends on the degree of sophistication characterizing the solutions purchased and on some technical parameters" [32], [32], [19].

Open Source: In open source, the product is developed by programmers who create freely distributed source code by collaborating and communicating over the Internet [45], [44]. This business model takes place on top of products, services, or simple unpackaged data that are provided for free and in an open format [32]. Data is provided in a totally open format that allows free elaboration, usage and redistribution without any technical barrier [32]. The distribution of source code is governed by an open source license [45]. Besides, exposing company data to the public will improve the quality of the data collected by regulatory bodies [48], [32], [42], [19].

Sponsorship: Sponsorship is when a business is giving its product for free to customers and obtaining revenue from some sponsors. To attract sponsors, business needs to convince its customers to provide something to the sponsors in return [49], [49], [35]. In the data industry, sponsoring people to set up an open data publishing program is essential instead of sponsoring people to publish a snapshot of their data. This provides them the financial resources they need and the process that is cheaper to run than their current process. The data that is published as open data is exactly the same data that is used internally within the department, thus there is no additional task [50]. If there are people who strongly believe that a particular dataset should be open they may want to sponsor its publication. They can pay for the data to be made open, for their own reasons [31].

Infrastructural Razor & Blades: A razor-blade business model is about selling a product for a low price in order to generate revenues from the complementary products [51], [52], [53].

In the open data industry, datasets are stored for free on cloud computing platforms being accessible by everyone via APIs ("razor") while re-users are charged only for the computing power that they employ on-demand in as-a-service mode ("blades"). This business model exhibits another case of cross-subsidization whereby profits accrued from the provision of on-demand computing capacity cover costs attributable to the storage and maintenance of data. However, application of this model is limited to contexts and domains in which the computational costs are significant [32], [32], [19], [54], [55].

Cost avoidance: This model reduces the cost of data publishing by having a sustainable publishing solution. It is common for the same data to be published a number of times and in different formats meeting the needs of different customers. Publishing as open data enables "Publish once, use many times". Different consumers can extract different slices of the data for different purposes therefore, there is no need to publish different views of the data for different users. This will reduce the overall burden of publication therefore, choosing to publish the data as linked data can significantly reduce the overall data publishing costs [50], [31]. Finding sponsor is the reverse of cost avoidance [31].

Free, as Branded Advertising: The main aim of this model is to encourage an audience towards a brand or a company. Businesses applying this model deliver commercial messages through visualized data which is also called "display advertising". This model will provide the customers with the services of general usefulness. Services offered in this way have a positive effect on

economy. The rationale fuelling this "enlightened" business model is twofold. Firstly, it may be based on a powerful advertising boost that leads the company to consider the cost as a promotional investment in the marketing mix. Secondly, it seems to be very convenient in the presence of zero marginal costs, a situation that occurs when the costs of distribution and usage are not significant [32], [32], [19].

White-Label Development: A white-label product is when a company is building a new product or service and other companies buy them and rebrand them as if they made it. This model enables the opportunity for the business to use its capabilities and competencies to build a new product or service and sell it to the people who are interested in. This can increase revenue especially when one app is made by the company which is interested to few clients with a similar taste. This app can then be rebranded and customized numerous times, each time included as part of a package or charged as an additional product. The good thing about this model is that the company or business has the control over how much to charge [56]. Moreover, White Label Apps save development time, budget or offer chance to make money. This business model has not consolidated yet, but some embryonic attempts seem to be particularly promising [32], [19].

3. CONCEPTUALISATION

In this section we first present a comprehensive conceptual model for describing business models. In conceptual model we specify and draw boundaries around terms or concepts we use for this paper to make them tangible and easier to understand. We apply the conceptual model to elaborate the 15 ODBMs discovered in extant literature.

3.1 Conceptualizing Business Models

Our conceptual model is grounded in the extant literature of business models, as shown in Table 1. By consolidating elements of the different business model frameworks in the table, we identified Six core elements of a typical business model. We refer to our resulting framework as the 6-V business model Framework (see Figure 4). The elements of the 6-V framework include: Value

proposition, Value adding process, Value network, Value in return, Value capture, and Value management.

o *Value proposition*: specifies the value that business is offering. Value proposition included product, services, distribution channel, information and price.

o *Value adding process*: delivering value requires value adding process including the key activities and resources. Activities and resources include elements like physical resources, human resources, supply chain management, partnerships, and technology. Value adding process is classified into three: operational which includes activities, organizational structure, technologies and logistics systems, revenue model, resources and assets and financial model; strategic planning includes market or the target customer, competencies, capabilities, pricing and the control of costs, branding, differentiation, legal issues, mission and trust; knowledge management includes innovation and documents.

o *Value in return*: what is received from the value adding process either monetary or non-monetary value including revenue, advertising space, future contracts and opportunities and rent or commission.

o *Value capture:* Value capture is the process of retaining some percentage of the value provided in every transaction. This allows the business to use the output from the value in return to rethink and redesign to support the value proposition.

o *Value management*: top managers play a significant role to the whole process. Therefore, this includes mind-set, organization, governance, stakeholders and shareholders.

o *Value network:* all the business performance is done within the value network. This includes customers, suppliers, information flow, product flow, service flow and partner businesses.

The sources of each element and their details are shown in Table 1 on the next page.
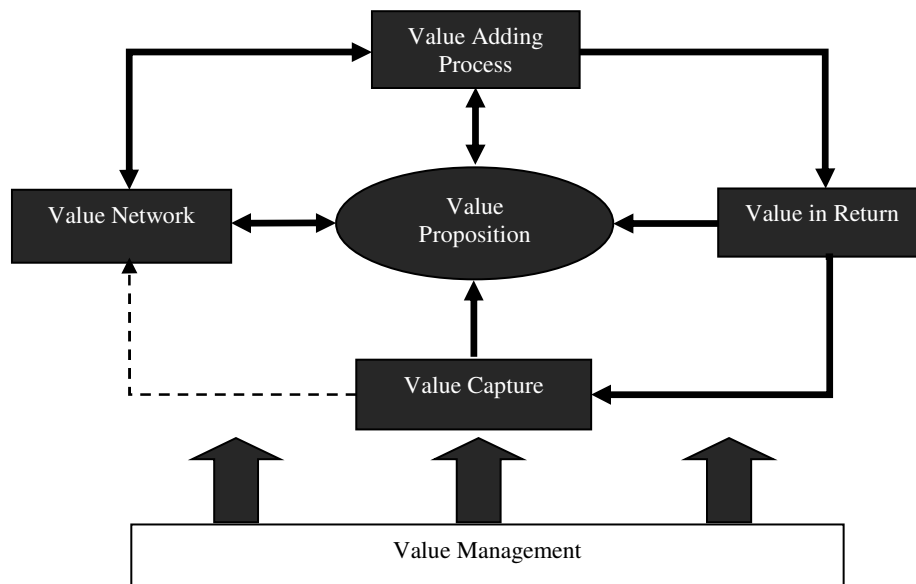

Figure 4. The 6-V framework

Table 1. Components of business model

Context	Lambert, 2008	Shafer et al., 2005	Hamel, 2000	Languna et al., 2004	Sandberg, 2013	IBM Bus. Cons., 2005	Goethals, 2009	Casadesus & Ricart 2010	Boons & Lüdeke, 2013	Chesbrough & Rosenbloom, 2002	Klievink & Janssen, 2012	Hamel, 2000	Demil & Lecocq, 2010	Chesbrough & Rosenbloom, 2000	Teece, 2010	Brettel et al., 2012	Massa, Zott, & Amit, 2010	Closs, 2011	Osterwalder, 2004	Yip, 2004	Wikström et al., 2010	Klievink & Janssen, 2012	Pandav, 2012	Doligalski, 2010
Value Network																								
Customer	x	x	x	x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
Information Flow		x							x		x											x		
Product Flow		x			x				x															
Service Flow		x	x						x															
Supplier	x	x	x	x					x	x			x	x	x		x	x	x	x	x		x	x
Partner Businesses		x			x				x				x	x	x		x	x	x	x	x	x	x	x
Value Proposition																								
Product	x	x		x				x	x	x	x	x	x	x	x		x	x	x		x	x	x	x
Service	x	x			x			x	x	x	x	x	x	x			x	x			x	x		x
Channel	x	x		x	x				x		x		x		x		x	x	x	x	x	x	x	x
Information	x	x	x	x										x					x					x
Price		x	x			x			x	x	x		x		x		x		x		x	x		x
Value Adding Process																								
Operation																								
Activities	x			x	x	x						x				x	x	x					x	
Org. Structure	x																							
Tech/Systems	x		x		x				x	x						x		x						
Revenue Model		x		x	x	x			x	x					x		x	x	x			x	x	
Resources/Assets	x	x	x			x	x						x	x			x	x			x		x	
Financial Model		x							x								x					x		
Strategic Planning																								
Market/ Segment	x	x	x		x				x		x				x		x	x			x		x	
Competencies	x	x	x		x				x		x	x	x		x		x				x		x	
Capabilities	x	x			x				x		x				x		x		x		x		x	
Cost & Pricing		x			x				x						x	x	x	x			x	x	x	
Branding		x															x							
Differentiation		x	x		x								x				x							
Legal issues																	x							
Mission		x	x														x		x					
Knowledge Mngt.																								
Innovation						x	x	x	x						x	x	x		x		x			
Documents													x											
Value in Return																								
Revenue	x								x			x		x		x								
Advertising Space	x																							
Future Contracts	x																							
rent	x																							
Commission	x																							
Value Capturing																								
Profit Formula									x						x		x							
Profit		x			x						x				x	x	x							
Financial Performance									x								x							
Value Mngt. Model																								
Mind-set													x				x							
Organization								x									x				x	x	x	
Governance								x															x	
Stakeholders								x								x	x							

4. MODEL ELABORATION

Here we apply the 6-V framework described in Section 3.1 to characterize the 15 ODBMs highlighted in Section 2.2. We do not include Value Management in the analysis because it executes control over the performance of entire model to ensure the components are set appropriately to meet the objective/s. For each model we describe, the value propositions, core activities of the value adding process, the network of stakeholders required to collaboratively deliver the value, specific value produced and how the produced value will be captured. The resulting information is presented in Table 2 and highlighted below.

Cost Avoidance offers sustainable publishing solution and cost avoidance and provides improved meaning of data and data integration as value in return. *Sponsorship* offers free and useful data to the public and provides availability of data to public as value in return. *Freemium* offers free but limited data and high quality data at some cost and provides limited availability of useful free data to public and perceived value of data as value in return. *Premium* offers specific customer need and provides perceived value of data as value in return. *Dual-Licensing* offers free data for non-commercial use and high quality data for commercial use and it provides limited availability of useful free data to public and perceived data as value in return. *Support and services* offers high value adding data services and provides perceived value of data as value in return. *Charging for changes* offers free but limited data services and high quality data at some cost and provides limited availability of useful free data to public and perceived value of data as value in return. *Increasing quality through participation* offers higher quality of data and provides higher data quality as value in return. *Supporting primary business* offers strategic support to the business objective and provides improved in business results as value in return. *Open source* offers free data for non-corporate use and quality data for corporate use and provides limited availability of useful free data to public and perceived value of data as value in return. *Infrastructural razor and blades* offers incomplete data at discount price while the complementary parts cost higher. It provides perceived value of data as value in return. D*emand-oriented platform* offers high quality and reliable data at some cost and provides commoditization and democratization of data as value in return. *Supply oriented platform* offers efficient and scalable infrastructure and provides perceived value of data as value in return. *Free as branded advertising* offers useful data for public and provides perceived value of data as value in return. *White-label development* offers useful data services and Apps and provides saving in development time and budget as value in return.

Table 2. ODBMs elaboration based on the 6-V model

Models	Value proposition	Value adding process	Value network	Value in return	Value capture
Cost Avoidance	• Sustainable publishing solution • cost avoidance	• Publishing data as Linked Data • data retrieval	• EU, parliaments • government department • people	• Improve the meaning of data and data integration	• Sustainable publishing practice • proactive data release
Sponsorship	• Free data and useful for public	• Publishing process	• Sponsors • clients	• Availability of data to public	• Revenue from sponsors
Freemium	• Free, but limited data services • High quality data at some cost	• Availability of different machine-readable formats • unconstrained numbers of API calls • more sophisticated querying, • access to data dumps rather than through an API (or vice versa) • provision of feeds of changes to the data • enhancement of the data with additional information • early access to data • provision of data on DVDs or hard disks rather than over the net	• Clients (mostly consumers B2C)	• Limited availability of useful free data to public • Perceived value of data	• Revenue from the small % of the free users • Charges for additional data or advanced features
Premium	• Meeting specific customer data need	• Publishing • data maintenance	• Mostly business clients	• Perceived value of data	• Lump sums Revenue
Dual Licensing	• Free data for non-commercial use • high quality data for commercial use	• Publishing data • data maintenance	• Developers • clients	• Limited availability of useful free data to public • Perceived value of data	• Revenue from added value services
Support and Services	• High value adding data service	• guarantees on data availability • prioritization on bug fixes (both in data and its provision) for paying customers • timely help for customers using the data • services around data visualization • analysis and mashing with other data	• Mostly business clients	• Perceived value of data	• Revenue • presence in the service market

Charging for Changes	• Free, but limited data services • High quality data at some cost	• Update data • Availability of different machine-readable formats • unconstrained numbers of API calls • more sophisticated querying • access to data dumps rather than through an API (or vice versa) • provision of feeds of changes to the data • enhancement of the data with additional information • early access to data	• Mostly business clients	• Limited availability of useful free data to public • Perceived value of data	• Revenue from added value services
Increasing Quality through Participation	• Availability of higher quality data	• Update data • Cleansed data • Feedback	• Developers • Lawyers • Academics and government • clients as an active player	• Higher quality data	• Revenue • client satisfaction
Supporting Primary Business	• Open data supporting strategic business objective	• Publishing data • providing APIs	• Developers • Clients	• Improved business results	• Revenue • customer satisfaction
Open Source	• Free data for non-corporate use • high quality data for corporate use	• Publishing data • Data maintenance	• Mixed clients (B2B,B2G, B2C)	• Limited availability of useful free data to public • Perceived value of data	• Revenue from added value services
Infrastructu-ral Razor & Blades	• Incomplete data at low cost • Complete data at higher cost	• Update data • maintenance	• Developers • clients	• Perceived value of data	• Revenue from data
Demand-Oriented Platform	• High quality and reliable data at some cost	• Refining Datasets • Collecting and cataloguing data • harmonizing data in terms of formats and exposed through APIs	• Developers	• Commoditization and democratization of data	• Revenues in exchange for advanced services and refined datasets or data flows
Supply-Oriented Platform	• Efficiency • scalable infrastructure	• Data retrieval • standardization of formats • automated external exposure of data via APIs and GUI	• Technology companies • publisher (who is selling)	• Perceived value of data	• Revenue from potential advertisers
Free, as Branded Advertising	• Useful data for the public	• Data visualization	• Software development • Companies • developers	• Perceived value of data	• Revenue from Adverts
White-Label Development	• Useful data services and Apps	• App making • App upgrading	• Mostly Business Clients • developers	• Save development time and budget	• Lump sum Revenue

5. ANALYSIS

The ultimate goal of understanding the business model variations in the digital world is to be able to analyze them to address real-world problems that the business faces. It's one thing to understand what business model mean for different businesses, but it's quite another for a business to be able to distinguish different business models and understanding what business model suits the business.

We will address these issues by seeking commonalities in the 15 ODBMs based on the 6-V framework. This gives us insight into what are the core ODBM patterns or categories available and the value disciplines for these models. Business model categorization and value disciplines aid businesses especially innovative start ups to define the right business model for their business. Business model categories and value disciplines are described below.

5.1 Business Model Categories

According to the conceptual model in section 3.1 – showing the central position of value proposition – the starting point when designing a new business model is articulating a value proposition.

Value proposition provides the scope for the business and identifies how the business proposes to realize its revenue and profit. Therefore, we based our analysis approach to determining business model categories on each model value proposition. We looked for similarities in terms of value proposition and we carefully compared what each model is trying to achieve and how.

Our analysis resulted in five major categories in which each category consists of one or more business model/s. Categories are Freemium, Premium, Cost Saving, Indirect Benefits and Razor-Blade categories. These categories are shown in table 3 and briefly described below.

The first category – *Freemium,* includes "Freemium", "Dual-Licensing", "Charging for Changes", "Open Source", and "Free as Branded Advertising" models. All the models in this category offer limited data free of charge and apply fees for additional request for complete and higher quality datasets. The second category – *Premium,* includes "Sponsorship", "Support and Services", "Demand-Oriented Platform", "Supply-Oriented Platform", "White-Label Development" and "Premium" models. Data in all these models is not offered free of charge. However, data are offered in high quality and complete form at some cost. The third category labeled – *Cost Saving category,* includes "Increase Quality through Participation" and "Cost Avoidance" models. Models in this category do not entirely cover the cost, but reduce cost of opening and releasing data by engaging participants and publishing data as Linked Data. Data user or re-user participants play a vital role in this category as by active participation publishing data can happen at lower cost. The fourth category – *Indirect Benefit,* includes "Supply Primary Business" model. Opening up data in this category is strategic and releasing open data naturally supports the primary goal of the business. Model in this category allows the business to develop its own data and data infrastructure by using the third-party infrastructures that are created because the data is open and available. The fifth category – *The Razor-Blade category,* includes "Infrastructural Razor and Blades" model. The business strategy in this category is to offer first set of data at a discount, while offering complementary or dependent data at a considerable higher price. Table 3 clearly shows that many types of ODBMs fit themselves into Freemium and Premium model categories therefore, in business community, more emphasize are given to Freemium and Premium model than the other three.

5.2 Value Disciplines

A business model – and value proposition in particular – is shaped by the business's underlying value discipline which describes different ways a business can differentiate itself from competitors. It is a strategic focus that enables a business to set its vision and objectives. Value discipline helps a business to tailor value disciplines to exactly match the need. Therefore, before identifying business model, defining business value discipline is necessary.

In our analysis, identifying value disciplines is mainly based on the models comparison of value proposition and value in return and clear understanding of their similarities. Determination of the value disciplines enables analysis of the required capabilities to enable attainment overall business objectives. Our analysis of table 2 produced four types of value disciplines for open data

businesses. These include Usefulness, Process Improvement, Performance and Customer Loyalty.

The first type – *Usefulness*, tailors value proposition of the business to meet usefulness of the business offer. Business strategic focus, corporate vision and business objectives should be defined to meet usefulness of the offer. Usefulness is associated with the Freemium, Dual- Licensing, Charging for Changes, Open Source and Free as Branded Advertising. These models focuses on the usefulness of the data offered to the clients as the business value disciplines. The second type - *Process Improvement*, tailors value proposition to match to the needs of the customer for improving processes. Process improvement is associated with Cost Avoidance model. A business oriented on Process Improvement, aim at greater efficiency to reduce cost by optimizing its processes. Open data published based on this discipline targets improving of business processes. The third value discipline type - *Performance,* tailors value proposition for a better performance. Performance is associated with Supply Primary Business model. Businesses with this orientation aim to release data which support their primary business objectives. The fourth type - *Customer Loyalty,* tailors value proposition to target customer loyalty. This is associated with Premium and Infrastructural Razor and Blades. A business with Customer Loyalty value discipline should apply Premium or Infrastructural Razor and Blades model to adjust their processes to meet the clients' satisfaction and build customer loyalty.

Table 3 shows that Usefulness value discipline is the most popular value discipline in the open data industry followed by the Customer Loyalty.

5.3 Summary

We categorized the existing ODBMs and constructed the value disciplines for each models to be able to position the existing ODBMs in regard to the categorizations. Different model positioned differently based on the categorization.

An open data business which aims to focus on customer loyalty can have two choices for their business model which are Infrastructural Razor and Blades and Premium. Business can choose one depending on business model category they aim to target.

For open data businesses aiming at increasing performance as their value discipline can have one choice for business model which is Support Primary Business.

Similarly, for open data businesses aiming at improving processes as their value discipline can have one choice for business model which is Cost Avoidance.

Most of the business models are targeting Usefulness value discipline. Increasing Quality through Participation, Sponsorship, Support and Services, Demand-Oriented Platform, Supply-Oriented Platform, White-Label Development, Freemium, Dual-Licensing, Charging for Changes, Open Source and Free as Branded-Advertising fit themselves to this value discipline. Depending on the business model category, a business can come up with proper business model for the business.

Table 3 shows this positioning.

Table 3. ODBMs and value proposition categories

		VALUE DISCIPLINES			
		Usefulness	Process Improvement	Performance	Customer Loyalty
CATEGORIES	Razor-Blade				Infrastructural Razor and Blades
	Indirect Benefit			Support Primary Business	
	Cost Saving	Increasing Quality through Participation	Cost Avoidance		
	Premium	Sponsorship, Support and Services, Demand-Oriented Platform, Supply-Oriented Platform, White-Label Development			Premium
	Freemium	Freemium, Dual-Licensing, Charging for Changes, Open Source, Free as Branded-Advertising			

6. DISCUSSION

Several authors have attempted to represent business models in different ways. Some of them have similarities in terms of the components of the business model while others have new components in their model. For example, the existing models such as Hamel [25] and Shafer, Smith and Linder [24] models captured some (essential) components but not all. Consequently, the conceptual model (6-V) we have developed which is the consolidation of existing business models captures all the components of business models in one place. It enables businesses to have a complete understanding of business model components and their relations. The 6-V and Osterwalder and Pigneur canvas [23] are very similar but 6-V shows the dependencies between components.

Furthermore, in data industry research, we only found limited scientific sources related to ODBMs. This is an essential research gap which we studied in this paper. Existing models were not discussed in terms of the model components. According to the models naming convention and available literatures- that claimed ODBMs are used interchangeably with revenue, distribution, and architectural models, as well as pricing strategy and marketing techniques [16], [18]- authors have concluded that these models are not ODBMs. In order to justify our conclusion, we implemented all of the existing ODBMs into our 6-V model.

We deliver unexpected finding by being able to successfully come up with characteristics of each model in terms of the 6-V model. Therefore, our study declares that the mentioned models are ODBMs. In addition, our findings also include five categories of ODBMs. This finding is particularly based on the analysis of the characteristics of each ODBMs. Our categorization shows that more of the ODBMs belong to Freemium and Premium categories. This is mainly because the strategic focus in these two categories is less complicated and more successful cases and experiences have been achieved. Besides, the revenue model of these two categories are similar when the product is offered free of charge and extended when product is offered under Premium.

Categories assist open data businesses to know what choices they have for business model. For example, business X is willing to offer Premium data to clients. Our categorization offers six choices (5 from Usefulness and 1 from Customer Loyalty) to select from (refer to table 3).

Moreover, we know from the literature that value disciplines; a central act that tailors value proposition and shapes every subsequent plan and decision of the business; should be identified before the accurate model to be identified because, value discipline shapes segmenting the right customer, tailoring value proposition, defining value adding processes and setting corporate vision. We identified four value disciplines for open data business: *Usefulness*, *Process Improvement*, *Performance* and *Customer Loyalty* which can assist them to achieve these objectives. Nevertheless, there are various researches about the three general value disciplines: Operational excellence, Product leadership and Customer intimacy. While there are very few similarities in terms of vocabulary between the value disciplines in general business and open data business, the differences are visible and on the concept. For example, Customer Loyalty and Customer Intimacy appear to be similar, but very different in terms of the implication and concept more specifically in open data context. ODBMs categories in conjunction with the value discipline categories assist businesses to come up with the right model for their business. Now business X has decided to focus on customer loyalty, our finding recommends only one model- Premium business model - instead of six (refer to table 3).

Despite the fact that there are more than enough literature (in open data and generic business model) and our attempt to rigorously present and objectively organize them, this review work comes with several limitations. First, very limited articles exist covering the ODBMs. Second, contributions in ODBM are yet to appear in major conferences and journals. Third, researchers claimed that the existing ODBMs are revenue models, pricing strategy, distribution model, marketing techniques and architectural model [16], [17], [18]. Fourth, most business models discussed in literature are the outcome of the researchers' perception. Fifth, application of ODBM varies from country to country due to the differences in business environment, for instance with respect to available resources. Therefore, future research should seek to overcome these limitations.

We recommend researchers to extend studies on ODBMs and their contributions and impacts on emerging new open data businesses. Moreover, there is a need to study and develop the theoretical foundations of ODBMs and open data capabilities as well.

7. CONCLUSION

All businesses, either explicitly or implicitly should employ a particular business model. Similarly, open data businesses must utilize ODBMs. The first and foremost activity of emerging businesses is to identify the value discipline before identifying a

particular business model. This particular research field; open data business value disciplines; is missing and literature on ODBMs is also very limited to some number of websites and presentation files. Besides, in regard to business models, various scholars present generic business model differently.

Our research findings clearly answered to the aforementioned problems both at the research and business levels. We also confess that the conceptual business model (6-V), core ODBMs patterns-*Freemium, Premium, Cost Saving, Indirect Benefit* and *Razor-Blade-* and new open data business value disciplines - *Usefulness, Process Improvement, Performance* and *Customer Loyalty-* contribute significantly to business model and ODBMs literatures and assist not only start-ups and SMEs but also big businesses to deliver full value to their stakeholders.

This study provides insight to governments and government authorities by providing knowledge of importance of availability and accessibility of open data for innovation and transparency. This allows more businesses and development of open data products like APIs. For example, with a focus on realistic local solutions, initiatives like CitySDK are working with pilot cities to create uniform APIs that have standard approaches to how APIs expose local government data. Therefore, governments have a new way of saving and making money by becoming a provider for the city. By opening the data, governments let city (businesses and developers) to create products. Governments can also establish partnership with private sectors to benefit. Therefore, governments should seek to identify how publishing open data can be done in a way provides value to general public and facilitates the development of both free and commercial products.

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