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Open API: An Investigation of its Business Value

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Abstract

Open APIs are receiving attention, promising great benefit to organizations in the form of new revenue streams and unlimited innovation. This paper seeks to provide an alternative approach to understanding the value created by Open APIs. We develop a value taxonomy that contains two axis: tangibility (*tangible*, *intangible*) and proximity (*internal*, *partner*, *third-party*) resulting in a representation of six different value types. With the value taxonomy in place, a comprehensive content analysis of available content on Open APIs is conducted, including published case studies, news articles, whitepapers, book chapters and more, where value of Open API are identified through an open coding process. From these codes, 10 value categories are extracted which are then mapped into the proposed value taxonomy. Our findings reveal that Open APIs provide significant value across all six value types, but the distribution is not equal. More *intangible* than *tangible* value is created, and there is an overweight of value created in the *internal* proximity when compared to either *partner* or *third-party*.

Keywords: Open API, API, business value, innovation

1 Introduction

Since before the term Application Programming Interfaces or API was coined, the underlying idea of separating interfaces between software systems have been a dominant and important aspect in software development (e.g., service-oriented architecture). With advancement in technologies and inter-system communication skyrocketing, API and related technologies grow into an important architectural tool for building modern and scalable systems. Recently, a new movement towards Open APIs (APIs that are open to the general public) have been picking up speed. In 2013 ProgrammableWeb, a news source writing about Web APIs, had documented 9.000 available Open APIs in their database, showing a massive growth from 2.000 APIs in 2010 (programmableweb.com). As of today, more than 17.000 Open APIs are listed in their database.

When studying Open APIs from a practical, non-academic point of view, Open APIs are portrayed as a hot and trendy topic and they promise almost infinite innovation and revenue opportunities (McKinsey, 2014). An unstoppable API "gold rush" seems to be ongoing (Proffitt, 2013), focusing on how APIs are the new source of innovation (Thurai, 2013). Furthermore, all of the big players in the API field are born digital, with openness and the API as a foundation (History of APIs, n.d.). This is clear when looking at the members of what programmableweb.com has coined 'The API Billionaires Club' (companies that receive more than one billion API requests per day) (programmableweb.com). In 2014, Salesforce.com generated 50% of its revenue through its API, and that number for Expedia was 90% (Iyer and Subramaniam, 2015).

However, despite the hype around Open APIs, little or none research can be found in academia on empirically understanding what value Open APIs bring to business and society. Besides innovation opportunities and new revenue models, which has been the emphasis in practice, it is unclear what other types of value can be generated by Open APIs. Further, much of the successful cases related to Open APIs are found in digitally born companies with APIs as the core. As for incumbent companies that are not revolving around APIs and come with their own baggage, can they expect the same type of value being generated if pursuing an Open-API strategy? Such question remains unanswered both in practice and in theory.

This study will take a broad perspective on business value creation of Open APIs, and will aim to give an overview of the entirety of value. We therefore pose the following research question: **What type of business value can Open APIs generate?** As a result of this broad focus, Open APIs will not always be dealt with as a standalone concept, but are understood as an extension of, or building on top of internal or partner APIs. Therefore, it's important to look at the entire API landscape to understand the difference in value created and correctly map value creation.

While business value of IT as a research topic has been studied extensively, with a focus on linking IT to improvement in processes and increases in profit (e.g. Melville, Kraemer, and Gurbaxani, 2004; Piccoli and Ives, 2005), we argue that such literature cannot be directly applied for the case of Open APIs, as such technologies go beyond the scope of internal processes. As DrnevichCroson (2013) point out, IT is not just

contributing to strategy on a functional level, but on a business level, when creating a business strategy. With the research in this study, we draw upon organizational systematics (McKelvey, 1982) and develop a taxonomy of Open API business value that function as a foundation of knowledge on Open API to help future academics and companies understand value creation with Open APIs, and to contribute to the discussion of the underlying understanding of value in IT.

2   APIs and Open APIs

To define the term "Open API", we will look at the two parts that make up the term; "API" and "Open". API is an acronym for Application Programming Interface, and is used to describe operations, inputs and outputs of software components (Orenstein, 2000). They have existed since the two first software components communicated with each other. In its most basic form, API allows programmers to understand how to use a specific piece of software without knowing the internals, and by following the rules put forth in the API, multiple software components can be connected to provide the desired functionality (Orenstein, 2000). Other forms of APIs which are widely used nowadays include web APIs that allow for the same fundamental data exchange as basic APIs, but refer specifically to web services instead of software components. In the remainder of this paper, including the following short history of web APIs, we will use API as a synonym for web API unless we have specifically stated otherwise.

One of the first concrete mentions of APIs, though in the name RCP, was from 1998 when a news article detailed how Microsoft is working on a protocol that allows you to do what they call *Remote Procedure Calls* (Waldo, 1998). This would later turn into the Simple Object Access Protocol (SOAP) which is still used today. Two years later, Fielding (2000) published a thesis describing the concept of *representational state transfer* (REST). This is **the** standard today for designing APIs: so called RESTful APIs. The first publicly available API is regarded to be the one released by Salesforce.com on February 7th, 2000 which allowed access to the Salesforce.com application through an XML-based API. Later the same year, Ebay released an API to partners and selected developers, and in the following years more companies, including Google, Facebook and Twitter launched their own APIs (History of APIs, n.d.).

APIs (the connectors) can be used to connect modular capabilities both inside (internal APIs) and outside of the company (external APIs). Generally, we can differentiate between three types of APIs: *Internal*, *Partner*, *Open*, which are similar in functionality, but different in intended scope:

- Internal APIs are used *internally* in the organization, and are not exposed outside the organization. Internal APIs became popular in conjunction with Service Oriented Architecture (SOA) and distributed IT in a pursuit to move away from monolithic "all-in-one" systems with the goal of reducing complexity and increasing agility. In such scenario, applications are decomposed into smaller services. Interfaces to these services are defined and many different technologies have been used to facilitate this communication. In the beginning, these technologies are mostly proprietary protocols, but with the rise of Internet and web services, organizations have adopted the web service technologies and standards (such as HTTP, SOAP, REST) to lower complexity and rely on general knowledge instead of proprietary interfaces (Massé, 2011).
- Partner APIs directly facilitate communication and integration across companies. Partner APIs can start out as Internal APIs being opened up for one or two strategic partners to enable tight collaboration. This process entails new requirements, as the API is used outside the organizational boundary and new learnings on handling documentation and support are likely to occur. A well-known example of a partner API is Netflix's streaming API which partners (TV manufactures, console manufactures, mobile devices etc.) can access to build a Netflix streaming app on top of (Mulloy, 2014). This allows Netflix to reach many platforms without huge internal development costs, and while still keeping tight control with access to the API.
- Open APIs, also referred to as "Public APIs", provide opportunities that are not available with internal and partner APIs. The opportunities are mainly rooted in the fact that the API is "open." There is no commonly acknowledged definition of what the "open" part of an Open API is, but several aspects can be considered. First, if the API is free for anyone to use and publicly available to all developers (in contrast with private APIs), the API can be described as "open" in terms of *access*. The second aspect to consider is the ***data***

made available through the API. Do the data have restrictions in its use? Finally, open APIs should also be based on open *standards*, allowing easier adoption because of familiarity. Such standards can include technology standards (e.g., REST/JSON), API description format or specification (e.g., JSON API), and API specification/documentation.

3 Theoretical Background

3.1 Value

In order to sufficiently understand the value created by Open APIs, we first need to reach a shared understanding of what value is. The traditional view on how value is generated is well explained by the **value chain** concept developed by Porter (1985). The basic assumption made by Porter is that a firm is a collection of activities, through which all value is created as a direct result of the price that customers are willing to pay, minus the cost of production. Shortly after Porter, NormannRamirez (1993) termed the concept **value constellation**, and argue that the classical value chain view is no longer a representative approach for analyzing and forming business strategies, as companies have largely moved away from selling products (for example a car) to selling offerings (the car, but also the services, experience and post-purchase relationship). Therefore, it is necessary to see the relationships between provider and customer as ones "in which the provider helps the customer create value - at the extreme, taking responsibility for the customer's bottom line. Customers, in turn, are to be conceived not as passive consumers of offerings but as active contributors to value creation: without *their* contribution, the value of the offering would not exist" (Anderson and Narus, 1998, p. viii). On the other hand, StabellFjeldstad (1998) supported Porter's value chain concept, but expand the term by proposing the concepts of *value shop* and *value network*.

While value shop focuses on organizations that provide specialized offerings, **value network** emphasizes organizations that primarily function as mediators in a network, where the primary value creating task is to link two or more parties (Allee, 2008; Normann and Ramirez, 1993). We find the definition of value network especially relevant to our investigation on Open API, as the purpose of APIs is to create networks and facilitate connections/transactions between a backend on one side and consumers on the other side. Further, Allee (2000a) delineates three different types of value, so –called "value currencies" associated with value network: 1) Goods, Services and Revenue: the traditional exchange of value which involves physical goods, services and money; 2) Knowledge: the exchange of "strategic information, planning knowledge, process knowledge, technical know-how, collaborative design, policy development, etc."; 3) Intangible benefits: intangible value, such as sense of community, customer loyalty, brand, etc. Allee (2000a, 2000b, 2001) argues that these three types of value is what is being exchanged in a value network, and that the primary benefit of value networks and value network analysis is that it facilitates exchanges of all three kinds of value, unlike the traditional value chain which was focused on traditional product and service offerings. Another aspect of value networks, is that they exist in parallel at all levels of an organization and economy. You can view individual employees in a department as nodes in a value network, or each department as a node in an organization wide network, or you can map out the entire network of an organization, its suppliers and its customers (Allee, 2008).

3.2 Proposed Taxonomy

In order to find a simple taxonomy that we can rely on in our analysis, we identified two important themes within the value theory: **tangibility** of the value created, and **proximity** of the value creation in relation to the company.

Tangibility seems to be a major theme when describing value and it keeps reappearing in different forms in the literature. Allee (2000a) defines 3 layers; *Goods, Services and Revenue*, *Knowledge* and *Intangible benefits*. We take root in these 3 segregation, but we have renamed them to the below in order to simplify:

- **Tangible:** Value of tangible nature, such as revenue and cost savings.
- **Intangible:** Value that cannot be measured directly.

As shown above, value networks can exist in many different settings. Allee (2008) mentions internal value networks consisting of managers and employees of a company, and external value networks consisting of partners, venture capitalists, etc. In order to sufficiently analyze value in Open APIs, we will combine this concept of value network proximity to the three types of Open APIs: Internal, partner and external:

- **Internal:** Value created within the company or organization.
- **Partner:** Value created at partners through partnerships and agreements.
- **Third-party:** Value created by third-parties. Third-parties should be understood in the sense that extensive partnerships agreements are not a necessity to start creating value - a low barrier to entry and no selection process.

4 Research Methodology

In our process of developing the taxonomy, we draw upon organizational systematics (McKelvey, 1982) and engage in an inductive content analysis, which is especially useful when little previous research on the area is available (Elo and Kyngäs, 2008).

4.1 Data Collection

When selecting which texts to use for the inductive content analysis, we used search engines to find articles related to Open APIs with focus on case studies and industry analysis. The search engines used were Google for public articles, white papers, newspapers and the like, and Google Scholar for academic papers. For Google searches the first two pages of results were included, and for Google Scholar, the first 5 pages. The keywords we used were "open api value", "open api case", "open api whitepaper", plus each search was also conducted with the popular synonym for Open API – "Public API". Links and references to other sources were followed when possible in order to ensure thorough coverage. We limited our selection to articles from reputable sources, including major newspapers, tech sites, white papers, academic papers, etc. and which involved larger, well known private companies implementing Open APIs. The search was done during March and April 2016, which set the time scope for our data sources (up until April, 2016). Table 1 presents a list of all the data sources on which our analysis was based.

Table 1.   *Data Sources*

References to our data sources
3Scale (2011). What is an API? Your guide to the Internet Business (R)evolution.
API Academy (2015). API Strategy 201: Private APIs vs. Open APIs.
Apigee (2016). The State of APIs: 2016 Report on Impact of APIs on Digital Business.
Apigee; VISA (2016). Growing your business with APIs.
Collins, George (Deloitte Consulting) (2015). Companies Assessing Business Value of APIs
Doerrfeld, Bill (NordicAPIs) (2015). Developing the API Mindset.
Iyer, Bala and Mohan Subramaniam (2015). The Strategic Value of APIs.
Jacobsen, Daniel, Greg Brail, and Dan Woods (2012). APIs: A Strategy Guide.
John Gibson et al. (2014). Data Sharing and Open Data for Banks: A report for HM Treasury and Cabinet Office.
Löfgren, Tobias (2013). Before and after - Why did Sveriges Radio think we needed an open API.
Mason, Ross and Joe McKendrick (2015). The Rising Value of APIs.
Mulesoft (2014). Secrets of a Great API Core principles for delivering successful APIs.
Mulesoft (2016). The Value of APIs for Business.
Mulloy, Brian (2014). The Why and How of APIs: The Open API Model.
Oracle (2014). Making Money Through API Exposure.
Petersen, Dennis Bjørn (2014). Building an API platform - One brick at a time.
PricewaterhouseCoopers (2012). The business value of APIs.

Singleton, Micah (2016). Ticketmaster can now be built right into third-party apps.
Sjökvist, Eva (2013). Making a Brand Programmable.
Stafford, Jan (2015). Beat the risks of managing public, private APIs.
Tung, Teresa and Michael J Blitz (2016). APIs can be strategic tools to unlock business value.
Waehner, Kai (2015). Creating Business Value by Example: Open API and API Man- agement at Paypal.
Widell, Micael (2013). The story of Fyndiq.
Willmott, Steven (2016). Create more Value than you Capture!
Woods, Dan (2016). Why APIs Now Mean Business Transformation, Not Just Technology Infrastructure.

4.2 Data Analysis

In order to discover themes and categories from our data, we need to take an inductive approach. Following ChoLee (2014) description of inductive content analysis, we will process through these 5 stages of analysis.

The **unit analysis** is closely related to our research question on value of Open APIs. However, we wanted our codes to represent all kinds of value related to APIs, and not do any preliminary sorting in the coding process on what might be related to *Open APIs*. Therefore, the unit of analysis for the coding process were "value of APIs".

The **open coding** technique provides the researches with an exploratory method to identify themes in content without relying on predefined concepts or theory (Strauss and Corbin, 1990). In this process, there is no focus on categorizing codes and no thinking about relationships between codes. Codes are allowed to be created freely from the digested data. Two of the authors coded data in the open coding process and ended up with 574 codes whereof 124 were unique open codes.

The next step in the inductive content analysis required us to **identify the categories** that emerged from our 124 open codes. In order to form categories, we read through all codes before starting the process, which gave us an overview of all codes which helped us see each code in a bigger perspective. We went through all codes from the top and assigned them to a category. When no matching category existed, we created a category fitting to that open code. During the process, we removed codes that were not relevant to value, but instead focused on good-practices and advice for how to design and implement APIs. After removing irrelevant codes, 98 open codes remained. We also renamed the categories several times as more codes were added to them. When all of our open codes had been assigned to a category, the categories were revised into their final versions.

With our final categories, ready, we started to **code all content** again with these categories as the codes. As we were two researches, we had the opportunity to code all the content twice, once per person. Coding all text again with our final categories yields several benefits, including insights in whether the final categories have been derived in a sensible way, an indication of the importance/weight of each category (by counting how many times each category has been coded), and the ability to ensure the quality of the codes by comparing coding results of two or more coders. We also **revised our categories** through the process. In the end, we have 10 categories, and Table 2 provides an overview.

Table 2.   *Categories, Description and Examples*

Values categories	Description	Example
Agility	How APIs provide agility and lead to boost of speed, which can be development related, time to market, testing of concepts etc.	APIs open the door to agile innovation, improve the ability to adapt quickly to market changes and new competitors.
Branding	How APIs can provide branding value in different ways	Innovation and brand awareness are obvious potential benefits that public APIs can offer.

Business intelligence	How data gathered from APIs create value and intelligence	The demand for data is strong across alternative lenders, accounting software platforms, comparison and advisory services, payment services and others. Many of these organizations already create considerable value from data.
Collaboration	How APIs lead to more collaboration and partnerships	Enterprises are using APIs to extend their business capabilities through partner channels and ecosystem engagement initiatives.
Competiveness	How APIs provide a competitive edge, or how APIs are necessary to keep yourself in the competition.	However, few companies outside the pure web space have become truly digital companies in which information and the ability to act on it creates significant economic and competitive value.
Customer Relationship	How APIs can get you closer to your customers in terms of new channels or innovative, new uses and partnerships	Best Buy gets into the customer's context in other experiences.
Innovation	Mentions of innovation happening or being enabled inside the organization due to use of APIs	A public API program can build and inspire a broad ecosystem of app developers who create new experiences and apps that make big breakthroughs
Internal Optimization	How building APIs lead to significant internal improvements	Private APIs are at the core of a business' digital transformation, and generate efficiencies and productivity improvements across a business' operations.
Revenues	How, through APIs, existing assets can be "unlocked" to generate additional value	By making this previously internal data publicly accessible through an API, the company unleashes the creativity of developers and related businesses to devise new uses for the data.
Untapped Resources	How/when APIs create new or additional revenue.	Not only have they been able to drive significant revenue from new applications and services, but also they have been able to enable the creation of new and innovative services differentiating them from their competition.

4.2.1 Mapping categories to the taxonomy

In order to position the categories into our value taxonomy, as the final step of the analysis, we went through our data sources again and analyzed each instance we coded and their context. When deciding the position of each instance, we followed a simple ruleset in order to ensure consistency. To determine tangibility of a coded instance, we looked for any mention of money, revenue, cost savings, increased sales, or similar indicators of tangible value. When value was mentioned multiple times in one instance, this rule was applied to each of the mentions in order to determine if the coded category can bring both tangible and intangible values. To determine proximity of a coded instance, we looked for mentions of internal, partner or third-party/external/open in the coding and assigned it to the mentioned proximities[1]. Such coding rule would allow one coded instance fit into multiple areas of the taxonomy, i.e., one code could fit both with *Intangible / Internal* and *Intangible / Partner* if the code refers to certain intangible value realized both within the company and also through partners.

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[1] When no mentions were found, we would use a logic deduction approach starting with asking the question "could the value as described in this coding be created using only an internal API?" if the answer were yes, then it was mapped to the internal proximity, if no, then we continued with the question "could the value as described in this coding be created using only a partner API?", if the answer was yes, then it was mapped to the partner proximity, if the answer was no, then it was mapped to the third-party proximity. While this allowed us to place the majority of codings in the taxonomy, we did encounter a few instances where value could only be created by having an Open API, but the value creation process was solely internal, such as branding value. In those cases we placed the coding where we found for multiple mentions of value in a coding.

5   Findings

Our coding has uncovered 10 value categories, as presented in Table 2. Figure 1 shows the distribution of the value categories in the coded content. The percentage attributed to each category is calculated by the amount of times the category has been coded (including all the open codes assigned to it) divided by the total amount of codes (574 in this case). We explain each of the value categories in the sections below. Quotes in this section refers to data sources in table 1.
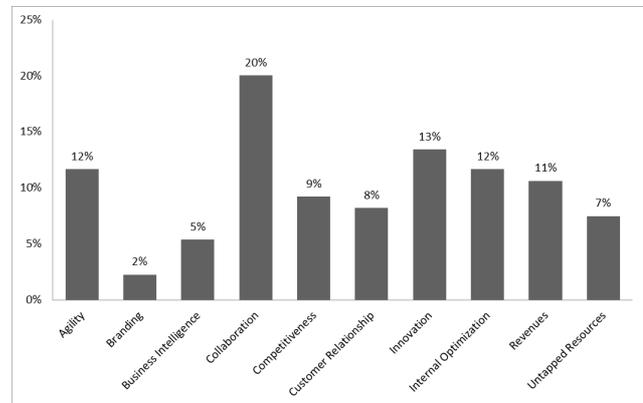

Figure 1.   Distribution of value categories

5.1   Agility

Agility refers to how well businesses are able to transform and adapt to changes in the market, and we found it to be mentioned together with modularity and SOA (service oriented architecture). This type of value can also be manifested in the speed of development, time-to-market, and testing of new concepts, etc. Agility is *intangible* in nature, and often refers to *internal* operations, especially in reducing the time to develop new features. However, such value can also be realized at *partners* and/or *third parties*, by allowing companies to quickly add partnership, or establish ad-hoc partnership, and hence leverage external developing capabilities and reduce time to market.

5.2   Branding

APIs provide branding, publicity, press or otherwise can influence the public image of a company. Such benefits are especially relevant when APIs are open to the public. Most of the coding that refer to branding were mentions of branding or brand awareness that arose directly from creating an Open API. In some cases, APIs represent the leading edge of new business models, providing innovative ways for companies to expand brand value and routes to market, and create new value chains for intellectual property". In this regard, branding value is often generated through a *public* API (open to third parties), and is *intangible* in nature.

5.3   Business Intelligence

In general, two kinds of business intelligence value have been mentioned in our sources: 1) enabling access to existing data across the enterprise, and 2) gaining insight into market demand through API data usage coming from apps, partners and customers. Since APIs act as gateways between platforms/systems/applications, they give companies visibility all the way from the backend to end users (Mason et al., 2015). Therefore, it is regarded as a way to unlock data *internally* and *externally*, and enabling companies to gain insights on the usage patterns related to their employees, their partners, and their customers, thereby extracting value. In this sense, the value of business intelligence is *intangible* in nature, and can be generated *internally*, at the *partner*, and *externally*.

5.4   Collaboration

This category includes all mentions of and references to if, how, and why APIs enable collaboration. This value type is among most frequently discussed ones in our sources. In the content, we see different perspectives on how APIs can enable collaboration. To start with, APIs can lower costs of interaction, through standardized

technological interfaces provided by APIs and supporting documentation and guidelines. Therefore, interaction is in a way automated, and external collaborators, such as partners and third party developers, can easily tap into API providers' internal resources to create new services and products. Relatedly, such interaction through APIs has also streamlined the process, and hence made the collaborations easily and more ad-hoc. In terms of the nature of the collaboration value, it can be both *intangible* (easy process) and *tangible* (lower cost), and on the other hand, it can be generated *internally* for the company, and *externally* for the partners and other third party developers.

5.5 Competitiveness

Competitiveness as a value category covers two different aspects. First, extended deployment of APIs can give companies a competitive advantage over competitors that have not yet deployed APIs. Second, in certain industries, it has become increasingly evident that APIs are being transformed into a standard or norm for collaborations, and hence a necessity to stay relevant in the market. Such value is *intangible* in nature, and mostly realized *internally*.

5.6 Customer Relationship

The value category of customers describe how APIs can facilitate companies in getting closer to customers. Such value could refer to reaching the same customers on more platforms or providing more engaging, personal experiences to retain customers, through higher integrations in B2B relationships enabled by APIs. On the other hand, in the B2C context, when a company releases public APIs that power consumer facing applications, it enables new ways to engage and connect with its customers through different channels. In essence, through APIs, companies are able to provide customer experiences, which can lead to higher customer loyalty. Such value is *intangible*, and can be realized *internally*, or *externally* through partners and third party developers.

5.7 Innovation

The smartest businesses have worked out that APIs – which used to be technical artefacts – possess potential strategic value. Not only do they enable a company to make its underlying data and functions available for general use, hence driving efficiency and agility across the company and its partner ecosystem, but they can also be open to developers, both internal and external, who can utilize this web-based technology to engage in service innovations. A partner API program can open up secure collaboration and innovation with partners, helping a business deliver on new business-development opportunities with consumers and partners. More emphasis has been put on third party developers, who can create innovative use of the APIs internal developers never envisioned. Such value related to innovation potential is *intangible*. However, it is like opening up "Pandora's box" that can lead to various innovative efforts *internally*, but more importantly, *externally* through third party developers.

5.8 Internal Optimization

This value category concerns with inherently *internal* benefits or improvements that are realized within the company who provides open APIs. This is mostly related to the changes a company needs to go through to create an open API. Establishing internal APIs is often the first step before making the APIs public for external entities. To do so, companies, especially the companies with burdens of legacy systems, often have to go through a lengthy process of standardize and modularize the internal infrastructure and platform. According to our sources, such practices can relieve some of the pain working with the legacy systems, for instance, by making adding new functionality much easier and less costly, as it can be now done through API tier.

Secondly, we see that APIs can change not only the way that the IT department works, but can also lead to empowerment of other departments, as described below:

> "*Our interactive graphics desk can build really creative stuff with the new APIs. Some of the creative campaign profile or finance graphics would have been impossible or just a ton of manual work without the APIs. The reporters can do lookups that they couldn't have done before. This means they can ask more questions, do new kinds of analysis, and create comparisons. The API enables them to get answers where it*

might not have been possible before or have been too much work. This allows them to produce their core business product better—which is journalism." (APIs - A Strategy Guide)

5.9 Revenues

Increased revenue is often mentioned as a direct outcome of creating APIs and sharing them with partners and third parties. This is also the most *tangible* value realized through open APIs. For instance, API enabled presence in more channels could increase reach in existing markets, such as providing applications across a range of platforms and devices. This is one common way of creating new revenue streams and driving more revenue to the business. We have seen the focus of this type of value in our sources, describing in length the possibilities of creating revenue with APIs, through many different ways, directly and indirectly, in many different settings through various business models. We have also found that such new revenue streams can be realized through the company itself, but most importantly through *partners*.

5.10 Untapped Resources

We found a strong focus on unlocking value from resources that were untapped before. For some companies, open APIs provide connectivity that allows them to unlock their systems and data for both internal and external use. Other companies found out that they can monetize their APIs as a new commercial product or service, with developers/customers willing to pay for access to the stream of data or functionality opened up via APIs (Developing the API mindset). However, capitalizing on existing resources is not just about opening up access to date. It's also about making it easier to integrate with existing systems and leveraging the capabilities within and outside the organization to create more value:

"*In other words, an API offers a way to unlock the value of a business's digital assets and to extend its reach through leveraging the integrations and development across the enterprise, from partners to independent developers. The business can then leverage these relationships to create more and more value from augmenting its key assets.*"

6 Discussion

Open API is a technology that is a central part of the born open's technology strategy, including Google, Netflix and Facebook, and is increasingly adopted by incumbents. It might be the ignitor of the exponential growth of digital networks regardless of industry or context. The impact and use of this boundary resource goes well beyond the firm and influences all parts of the extended value network and given birth to the "API economy". In the reminder of this section, we first discuss the individual value categories followed by a discussion of the Open API value taxonomy.

6.1 Value categories

The value categories generated by the content analysis serve as one of the initial efforts in understanding value of Open API in a business context. Our findings show that the value provided generated by such technology is multi-dimensional in nature (Hoebeke, 1990; Ramirez, 1999; Venkatraman and Ramanujam, 1986) and can exert throughout the extended value network (Allee, 2001; Normann and Ramirez, 1993). As such this technology has a potential impact that goes beyond most other individual technologies.

To our surprise, the most discussed value category of Open API is *Collaboration*. Such finding is consistent with the digital platform literature where API is regarded as a boundary resource that enables (and controls) interactions between a company (API owner in this case) and external entities (Eaton, Elaluf-Calderwood, Sorensen, and Yoo, 2015; Ghazawneh and Henfridsson, 2013). Relatedly, *Innovation* as a value category is also prominent, based on our content analysis. We could argue that collaboration enabled by API with partners and third party developers enable companies to leverage external intelligence for innovative initiatives, a scene much aligned with the inside-out and outside-in open innovation concepts (Chesbrough, 2003; Chesbrough, Vanhaverbeke, and West, 2006) and also new emerging concepts surrounding digital innovation (Yoo, Henfridsson, and Lyytinen, 2010). *Agility* and *Internal Optimization* came in third and fourth place, where the emphasis is on how the process of deploying Open API requires standardization of internal process and

architecture, which would then lead to more cost efficient and effective way of both internal development and external reaction to changes (Overby, Bharadwaj, and Sambamurthy, 2006). We argue that such value is especially relevant for incumbent companies (often burdened with legacy systems) who often had to first establish internal API before opening it up for the partners and/or the third party developers (Kohli and Grover, 2008). Increased *Revenues* streams is the fifth mostly mentioned value category in our content analysis, which is contrary to the often buzzed "API economy". Such finding highlighted that Open API as a strategic tool for business has far more extensive implications for a company's business model and value network, than simply another revenue channel (though admittedly many of the value categories might lead to increased revenue in the end) (Benzell, LaGarda, and Van Alstyne, 2016). On sixth place, we find *Competiveness*, which on hand refers to a firm's ability to diffuse Open API before its competitors or to comply to industry standards. Thus, Competiveness illustrate both first mover advantages (Lieberman and Montgomery, 1988) and institutional pressure (Shapiro and Varian, 1999) in technology adoption. *Customer Relationship* is the seventh category, and demonstrates the role of Open API to reach customers in new ways and thereby create customer loyalty and look-in (Amit and Zott, 2001). The eighth category address the resource base of the firm (Barney, 1991) and in particular the unused resources or *Untapped Resources* as we call it. This can be seen as an extension of the resource based view of the firm, where technology provide access to old but unreachable resources. The two final categories are *Business intelligence* and *Branding*. The first one is built in part on Untapped Resources by focusing on the use of data and how this can enhance business performance, whereas Branding deals with overall perception of the firm. The concepts of Business Intelligence and Branding are not new, but in the context of Open API or boundary resources the concepts show the potential of the technology.

6.2 The value taxonomy

Inspired by McKelvey (1982) on organizational systematics, we develop the Open API value taxonomy, which is to our knowledge the first taxonomy on value and Open API. The taxonomy shows that Open API value is a multi-faceted concept that can be understood along two dimensions: Tangibility dimension and Proximity dimension. Figure 2 shows the distribution of all the coding's by these two dimensions. The taxonomy, complements and extends previous research on IT and value (Drnevich and Croson, 2013; Melville et al., 2004; Piccoli and Ives, 2005) in business networks (Allee, 2008; Normann and Ramirez, 1993), by showing how a "new type of IT artifact" contribute to business value that previous literature showed limitations.

Figure 2.   *Our findings mapped into the value taxonomy*

	Internal	Partner	Third-party
Tangible	90 16%	49 9%	26 5%
Intangible	190 34%	83 15%	120 22%

For the tangibility dimension, it is revealed that the intangible values overweigh the tangible values (393 vs 175), suggesting that the existing discussion of the value generated from Open API focus largely on the intangible categories, such as branding, innovation, collaboration, etc. We speculate that this could be due to two reasons. First, value that is mostly understood as intangible is usually of a more complex nature, such as *Innovation* or *Collaboration*, and therefore both encourages and requires more discussion. Intangible in that

sense that it is hard to measure the causality between technology and business value. This echoes debates on organizational measurements (Hoebeke, 1990) and value of network business (Allee, 2000a, 2008; Ramirez, 1999). Tangible value, such as *Revenue* is often easier to describe, precisely because of their tangibility. Second, Open API as a concept is still new, and few incumbent organizations have much, if any, experience with them. This affects mentions of tangible value in particular, since you often need to be in a very mature phase of the Open API process to start realizing and measuring tangible value.

Along the proximity axis we have observed a large majority of mappings in the internal value. The domination by internal value was unexpected for us, even though we suspected from the very beginning that the value of an Open API would not exclusively be created by third-party users of this API. This confirms the general conceptualizations of IT and value (Drnevich and Croson, 2013; Melville et al., 2004). Looking back, the result is a reasonable outcome of how Open APIs are usually structured and implemented – often a process evolving from an internal APIs towards an Open API. One could view the development of an internal API and a learning process before reaching out. For many, the most obvious path to an Open API is building an internal API, testing it with partners and only then discuss the option of opening up to third parties (Yoo et al., 2010). Likewise, in order to create a partner API, the most obvious way is to expose an already existing internal API, or create an internal API and expose this. Because this is the natural path to follow, internal benefits are the first benefits that a company will realize on its way to openness. Throughout the analysis, we indeed observed such ripple effect. Therefore, it was almost inevitable that internal benefits are dominant in the context of Open APIs.

6.3 Implications

The taxonomy provides a high-level overview of value types within our two dimensions. This can be used to analyze not just Open API value, but any type of value that is created within one or more value networks. Our horizontal axis describes three proximities, *Internal*, *Partner* and *Third-party*, from the center of the analyzed value networks. It is important to note here that the value networks included on the horizontal axis need to be related in order to fit into our taxonomy, in the same way that the API value creation proximities we have worked with throughout this thesis are "stacked" on top of each other, i.e. the internal value network represents a subset of the partner value network, and the third-party value network includes both the internal and the partner value network; as discussed previously.

Practical implications of our findings are several folds. The value taxonomy can be applied to specific instances of Open API implementations. The findings will yield insights on how the understanding of Open API value in the specific implementation correlated to the general understanding presented in the content mapping. These insights will describe the maturity of the specific Open API project, and whether the implementers are focusing on the right value types.

6.4 Limitations and Future Research

One of the major limitations of this research is that we try to explain value in Open APIs through mentions in texts, rather than actual value being realized. Though our study presents a reasonable proposition of Open API value, but we have no evidence that our derived value categories maps exactly to actual value created. However, we believe that our efforts serve as an important initial step to understand value of a modern technology, and provide a taxonomy for future research to tap into. We argue that one fruitful area for future research is to test and further improve the taxonomy in empirical settings. A multiple case study approach could be used to compare and contrast whether and how each value category is realized in different case settings. Alternatively, future research can strive to develop measurements of these value categories which could then be validated through quantitative methods such as survey. The multi-dimensionality of value can be addressed by multi-dimensional scaling technique, which could be used to verify the taxonomy

7 Conclusion

The aim of this study was to understand the values of Open API. To this end we have developed a taxonomy with two primary axes of tangibility and proximity. Tangibility is divided into intangible and tangible whereas

proximity is divided into internal, and partner and external. The taxonomy provides a starting point in how we can understand Open API and the values they create. Our study revealed that Open APIs create value in many different aspects, and companies and researchers now have a foundation to rely on in their future research into understanding and creating Open APIs.

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