A Developer-Centric API Value Chain

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Abstract. In today's digital economy, the creation of digital services attracts widespread interest due to its new role as the main driver of innovation. Application Programmable Interfaces (APIs) and their emerging ecosystem are at the center of this digital service innovation trend. In this research, we propose a developer-centric API value chain and we link it to the topic of online customer reviews (OCRs). The aim of our work then is to highlight the important role of the developers in the API value chain and the success of a provider's API.

Keywords: APIs · API value chain · Mashup · Service composition · Service innovation · Online reviews

1 Introduction

One crucial component of the new digital services today is the Applications Programmable Interface (API), a machine-readable interface which enables applications to connect to each other's distinctive functionalities and to use them without knowing their inner mechanisms [1]. Right now, the API economy is growing in a fast pace and spans over thousands of API-providing companies which can be clustered in many categories. Service developers (re)use company provided APIs or even combine them with other existing ones to deliver new functionalities on top of them or to create new services. This process is called service composition process through which a mashup (a new application) will be created. Service developers by creating new complementary services and thereby increasing the accessibility to new users, add value to the API-providing platforms or companies [2]. On a more holistic level, such companies also can access distinctive resources and services of others by plugging into their API and using their services.

The API value chain first introduced by Jacobson et al. [1]. From a business perspective, this value chain is a sequential line from the business assets of a company to the end-users. The company transforms assets into an API which then is used by a developer for further use. Due to the growth of the software as a service (SaaS) ecosystem, developers have the option to select variety of APIs and their selections therefore significantly impacts the success of a provider's API. Thus, the business success of the provider company is depending on developers' choice making. To highlight the important role of the developer in this value chain, we propose a developer-centric API value chain which is shown in Fig. 1.
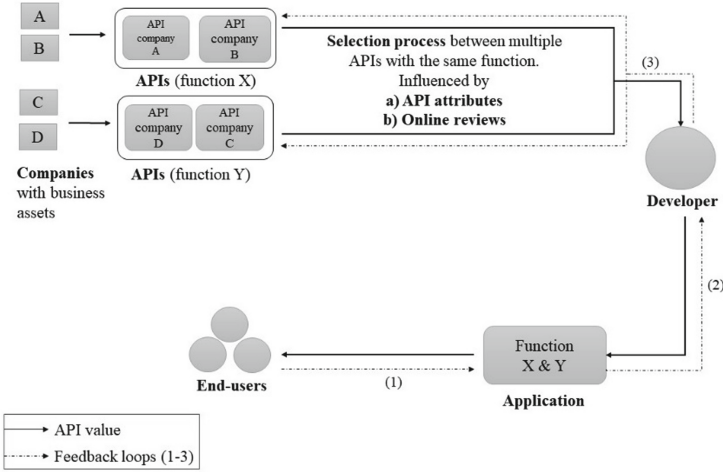
Fig. 1. Developer-centric API value chain.

In contrast to the traditional value chain proposed by Jacobson et al. [1], the proposed developer-centric API value chain shows the important role of the service developers in delivering high-end web services. First, if developers, for example, needs two distinctive functions (i.e., X and Y) for the sake of service composition, they have multiple offerings (i.e., from different companies) for each function. In our example, they have two offers (A and B) for function X and two offers (C and D) for function Y. In this process, we assume that the developers are influenced by (a) API attributes like technical features and the brand and (b) online reviews from the developer community via ratings, reviews, and reports. Second, the proposed value chain consists of feedback loops which can be used to explain how these three actors (i.e., service developer, service providers and end users) are intertwined. The feedback loops (i.e., shown as 1–3 in Fig. 1) are assumed to exist between the end user, the developer and the service providers. As we can see, online reviews are part of the last feedback loop and are visible to the service providers and developers. The importance of this loop is obvious for the service providers since they aim to motivate service developers to favor their APIs over the competitors. Therefore, it is essential for service providers to understand how developers make their choices regarding the process of API adaption [3]. The rest of this paper is organized as follows: In Sect. 2 the relevant literature on APIs and the role of developers in the API adoption process are discussed. In Sect. 3, we formulate our theoretical model which is followed by the conclusion and discussion on the topic.

2   Literature Review

2.1   APIs and Their Role for Service Innovation

APIs are machine-readable interfaces which connect applications and digital services with each other and enable the seamless and easy exchange of data and services. In an API ecosystem, APIs can be used by developers according to the principles of open

innovation. It means that API providers open their digital assets to developers which can innovate on top of them. The potential benefits for both groups are enormous. API providers can reach a broader customer base across markets, platforms, and devices, create new markets, extend their brands and foster innovation. Developers can take a shortcut by using available building blocks for developing their new applications without reinventing the wheel all over [1, 4]. The market for APIs and their composition in mashups is already characterized by Yu and Woodard [3]. They pointed to the long tail of the API market which describes the high number of low frequency occurrences which, when cumulated, can outweigh the most frequent events. The authors observed that about half of all APIs (51%) are not used in any mashups at all. These insights are in line with the work of Koohborfardhaghighi and Altmann [5] who found out that established connections between specific APIs are used in a high frequency even though other APIs would have similar functionalities.

The value of APIs and their adoption by developers is rooted in their importance for service creation and service innovation. Den Hertog in [6], argues that service innovation can be structured using four dimensions which are mainly the service concept, the service client interface, service delivery systems and the technological options. These dimensions are interrelated and each of them can be innovated by itself. A new service concept describes how a problem can be solved in a new, often intangible way. The client interface describes how client and service-provider interact with each other. The service delivery system focuses on the internal capabilities and processes of a company which enable the workforce to innovate and to deliver services to the clients in an efficient manner. Even though service innovation can happen without technology, new technological option as a dimension, is the main driver and the enabler of service innovation.

2.2 The Role of the Developer

Developers have an important position within the API ecosystem and their role is clear in the API value chain. Due to their position between the API and the end-users, they can be seen as an important bottleneck within the API value chain [1]. By looking at the developer-centric value chain depicted in Fig. 1, it becomes even more obvious that two things are crucial for the service composition process. Firstly, the professional capabilities of the developers to create a new application, and secondly, their choice making process when picking one amongst several APIs. They have an innovative role in a coevolving ecosystem which depends on both, the APIs, which is offered by providers, and the developer's choice [1, 7]. Developers are also providers themselves. They provide new applications to their own clients or companies [1]. The quality and reliability of an API are assumed to have a crucial role due to the high reputational risk for both the developers and the client company if new mashups or applications fail in delivering the right service. Therefore, the need for quality assurance is an important explanation for why developers decide to pick APIs which are often used by other developers and neglect the long tail of the API market. In this research we believe that similar to the online retail market, user-created feedback can be used to assure a certain quality standard in API market [8]. Thus, in the extension of this research we aim to cover the latest research about the influence of online reviews in the decision making process from a product-centric point of view.

3   Conceptual Framework

Developers can find different information about APIs and mashups on multiple API dictionaries and websites (e.g. programmableweb.com). They have access to the API attributes which are provided by the API provider and the reviews which are represented in the form of the average user rating on each API. These online reviews are not yet used systematically on API directories but can be considered as a tool to overcome information asymmetry and create a quality assurance for existing services. In this study, these two sources of information (i.e., API attributes and online reviews) are assumed to influence the choice probability of the developer in the selection of APIs. The proposed conceptual framework is presented in Fig. 2.
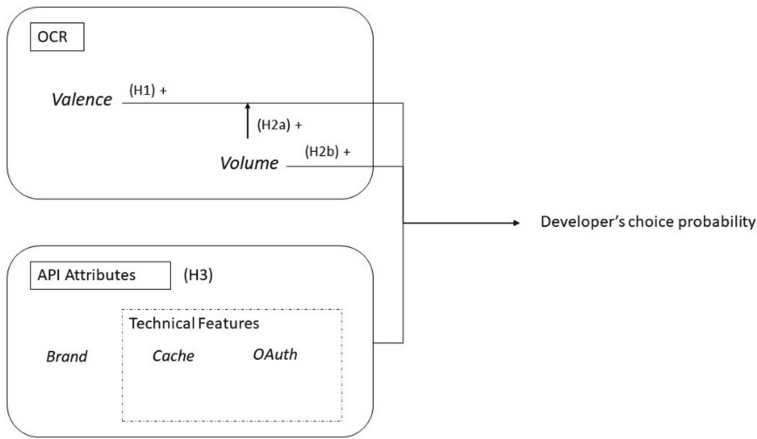

Fig. 2. Proposed conceptual framework.

The proposed conceptual framework consists of two blocks which are assumed to influence the choice probability of the developer when selecting a specific API. The first one is the OCR block, which includes the two OCR dimensions valence and volume. Valence describes the overall satisfaction of users (i.e., service developers) with the API and can be used to make a quality assessment. Volume is particularly interesting because it can not only be used to identify the general opinion of the community about an API, but also to have an estimation of the number of service developers who have had experience of using it. Number of service developers can be an indication of a community support for an API. The second block includes API related attributes which are assumed to influence the developers' choice making. As we discussed in Sect. 2.1 due to the identified power-law distribution of the use of mashups, we can test whether the brand attribute is a major influential factor which impacts the adoption process of APIs. There are also many technical attributes which are associated with APIs. Security schemes such as personal identification for example are often used in the online sector due to the growing security concerns [1]. In this study, OAuth 2.0 is picked as a security attribute for an API. OAuth 2.0 is an open protocol for secure authorization and is a safe way to handle protective data. It helps service providers to prevent data from being

used by unauthorized parties. However, this authorization process via OAuth 2.0 can also prevent developers from trying an API due to the time-consuming procedure [1]. Another important technical at-tribute which can be used to make APIs and their response rates fast and reliable is a cache function. If an API works slowly, the application or mashup the developer develops will also work slowly. That is why we include caching as an important factor for developers in the selection of APIs. As depicted in Fig. 2, based on the proposed conceptual framework, now we are able to generate several hypotheses which will be considered and tested as the future extension of this research.

4   Conclusion and Discussion

API positioning and thereby its adoption is increasingly important for the survival of every modern business. The insights derived from this research will contribute to theory as well as to practice. In this study, by introducing a developer-centric view for the API value chain, we position the developers and their decision making at the center of API driven service innovation. Thus, the developers' role as a crucial factor within digital service innovation process is highlighted. This perspective, has not been sufficiently explored in recent research.

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