Application Programming Interface (API) Research: A Review of the Past to Inform the Future

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ABSTRACT

The purpose of this study is to perform a synthesis of API research. The study took stock of literature from academic journals on APIs with their associated themes, frameworks, methodologies, publication outlets and level of analysis. The authors draw on a total of 104 articles from academic journals and conferences published from 2010 to 2018. A systematic literature review was conducted on the selected articles. The findings suggest that API research is primarily atheoretical and largely focuses on the technological dimensions such as design and usage; thus, neglecting most of the social issues such as the business and managerial applications of APIs, which are equally important. Future research directions are provided concerning the gaps identified.

KEYWORDS

Application Programming Interface, Conceptual Approaches, Future Research Directions, Methodological Approaches, Software, Systematic Literature Review, Technology, Themes

INTRODUCTION

Software has become indispensable in today’s business environment. It has become challenging to envisage business success without software. Given this, there have been advances in the field of software development on how software is developed (Kroll, Richardson, Prikladnicki, & Audy, 2018), and tested (Barr, Harman, McMinn, Shahbaz, & Yoo, 2015). Software development over the years is perceived as a daunting task (Park & Bae, 2011) and demands a lot of activities (Tang, Aleti, Burge, & Vliet, 2010). Hence, developers are continually exploring innovations that will aid the software development process. Application Programming Interfaces (here after referred to as APIs) are one of such innovations in the software development domain. APIs form an integral component of the software ecosystem (Manikas, 2016). These software ecosystems have become an ideal way of constructing large software solutions on top of a common technology platform (Manikas & Hansen, 2013).

Historically, APIs have been there since the advent of personal computers. APIs primarily existed for the exchange between two or more programs (IBM, 2016). The emergence of APIs on the web

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(what is mostly referred to as web APIs) was, however, witnessed around the year 2000. Since then, APIs have received considerable interest from practitioners and researchers to the extent that some pundits argue that we now live in the API economy. This position is supported by the fact that we have become interconnected like never before; and APIs primarily power this interconnection of people, applications and systems. As such, APIs are becoming the fibre of the digital ecosystem that seeks to interconnect businesses and economies to create value and develop more capabilities (Abigee, 2016; Anuff, 2017). The mobile application market, one of the fastest growing areas in information technology, makes use of APIs a lot (Linares-Vásquez et al., 2013; Bavota et al., 2015). Developers of mobile applications primarily rely on APIs to provide reliable and interoperable applications. Despite these developments, researchers are yet to take ascertain the current state of API research in order to provide insights for future research. The current study, therefore, seeks to provide an overview of extant API research to determine the state of the research and steer future research.

Various authors have explained what APIs are, from diverse perspectives. While some authors have given a concrete definition for APIs, others prefer to give clues by providing the attributes or characteristics of APIs. These definitions can be considered either from a technical viewpoint (e.g. Niu et al. 2016; Shatnawi et al. 2016) or from a sociotechnical viewpoint, (e.g Abigee, 2016; Anuff, 2017; Zachariadis & Ozcan, 2017; Ofoeda & Boateng, 2018). Arguably, a better comprehension of APIs goes beyond the technical definition and overlaps into a broader concept where perspectives of users and practitioners are considered. Niu et al. (2016) aver that APIs facilitate pragmatic reuse and improve the productivity of software development. Other authors define APIs as the collection of codes, packaged with interfaces that aid other developers to use it (Stylos & Myers, 2007).

Similarly, Qiu et al. (2016) posit that APIs support software reuse by providing pre-implemented functionalities; thus, reducing the effort and time programmers spend in developing software. The importance of interfaces to the software development process is very crucial. Past research has affirmed how vital interfaces have become in contemporary software development (Shepherd & Pollock, 2005; Robbes & Lugu, 2011; Manikas, 2016). Generally, the explanations mentioned above seem more technical and may be less comprehensible to a lay person. The other definitions of APIs which seem to be less technical argue that APIs provide a common ground for software to talk to each other (Anuff, 2017). This common ground enables different software to exchange information. Through the exchange of information, services between and within organizations, they can create value (Lyer & Subramaniam, 2015).

The motivation for this study is to determine the status-quo of API research since there has not been any extensive work in the area. Several authors in the past provided literature reviews on various software dimensions such as variability in software systems (Galster, Weyns, Tofan, Michalik, & Avgeriou, 2014), technical debt and management as they relate to software systems (Li, Avgeriou, & Liang, 2015; Besker, Martini, & Bosch, 2018), software requirement reuse (Irshad, Petersen, & Poulding, 2018), software development (Kroll et al., 2018), software architecture (Lago, Avgeriou, & Hilliard, 2010/11; Avgeriou, Stal, & Hilliard, 2013; Yang, Liang, & Avgeriou, 2016) among others. There is arguably no review that focuses specifically on APIs even though other authors have provided a review on particular aspects of APIs such as API usability (Mosqueira-Rey, Alonso-Rios, Moret-Bonillo, Fernández-Varela, & Álvarez-Estévez, 2018). This study, therefore, attempts to fill this gap by providing a stepping stone for further research. The main contributions of this paper are:

- The identification of the dominant themes and issues studied in API research;
- The identification of the prevalent methodologies used in API research;
- The determination of the theories which underpin API research;
- The suggestion of future research areas in API research.

The rest of this article is organized as follows: Section 2 reports on the literature review which includes literature search, categorization, inclusion and exclusion criteria, among others. Section 3
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