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Service in the Platform context: a review of the state of the art

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This is a working paper.

Why this paper might be of interest to Alliance Partners:

Platform based business models, which match the needs between two or more parties, are becoming ever more important in today's economy. Companies such as Uber and AirBnB are disrupting their industries in a dramatic way. These platforms are able to capture the positive network-based benefits generated by their participants and redistribute them back in an efficient manner. This phenomenon is of interest for both industry and academia. This assessment of the literature focuses on the service aspect of platforms. 110 peer reviewed academic articles published between 2006 and 2015 are analysed. This review highlights the prominent research directions, debates and findings in this early emergent field. By reading this paper you will learn the cutting edge research and cases used by organisations as a key reference when approaching service platforms.

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Today's economy is changing; traditional ways of doing business have been turned upside down by a group of new companies. "Uber, the world's largest taxi-company owns no vehicles". Facebook "the world's most popular media owner creates no content" and Airbnb "the world's largest accommodation provider owns no real estate". This relatively new research phenomenon needs a deeper understanding. This systematic literature review is set up to explore and question the existing the literature in this field.

Introduction

New technologies have enabled the proliferation of platform based business models across industries, and they have drastically changed the landscape of today's economy. Uber, Facebook and Airbnb can all be categorized as "multi-sided platforms" (hereafter referred as platforms). These platforms serve the function of matching the needs and resources of two or more groups of customers (Hagiu 2013; Parker and Van Alystine, 2015). One of the most distinctive feature of these platforms is the positive correlation between the number of participants and value of network externalities (Cusumano 2002; Baldwin and Woodard, 2009).

Cusumano popularized the platform's concept in his work "platform leadership" (Cusumano, 2002). A platform encompasses two essential characteristics. First, a platform contains a common "core" or "architecture" with certain essential functions, which can be the basis of development of new products or services (e.g. Gawer, 2007; Tiwana et al., 2010). Second, a platform is capable of a "positive feedback loop" among its users, which is known as the networked effect (Eisenmann et al., 2011; Gawer 2011; Ghazawneh and Henfridsson, 2013).

Despite the extraordinary impact of "platforms' in our service economy, existing literature is mainly focused on product-based platforms (Thomas, Auto and Gann, 2011). Service accounts for over 50% of GDP of the developed world's economy (World Bank, 2014). Three out of the four examples given in the beginning of this research are service providers. Researchers are starting to explore the service aspect of platforms (Suarez and Cusumano, 2009; Gawer 2011). Therefore, the service platforms' agenda is an open research subject for future research. The objectives of this paper is to investigate the state of the art on ."service platforms". The systematic literature review is selected. Because of its objective and transparent approach to search and synthase research (Tranfield et al., 2003).

This paper is structured as follows: first, the methodology used to select the relevant papers is briefly introduced. Then, the research findings and trends and future directions are discussed, and finally, limitations and conclusions are provided.

Methods

The systematic literature review has six key processes: Scope and Keywords Identification, Evaluation of Search Results, Refinement of Search Criteria, Title and Abstract Review, Selection of Articles for Full Review, and Synthesis, as proposed by Tranfield et al. (2003). First, the key words in the study are identified. In order to capture the widest range of literature while remaining relevance, two most representative key words are chosen "Service" and "Platform". Only singular forms of the key words are chosen, because their plural forms are automatically searched by the databases as well.

Three databases are selected to test the search terms. Each database represents a segment of database size. The basic search strings representing the entire knowledge base are tested across the three databases. Science direct returned the lowest number of results, and Google scholar generated the highest number of matches. The below table shows the initial results.

Table 1 – Initial Search Result

Key Word/Databases	Science Direct	Web of Science	Google Scholar
Platform	413,205	792,490	3,630,000
Service	2,096,694	3,320,006	5,350,000

All three databases have generated significant amount literature. However, majority of the findings are not in management related fields and irrelevant to the purpose of this systematic literature review. Therefore, a set of exclusion criteria are setup to filter the research results. Though this process, the comprehensiveness of the databases in the relevant fields are further tested.

This is the criteria applied at the refinement stage: 1) Only English articles are chosen for the first two databases, where such options are available. 2) Only peer reviewed articles are selected, given the available functionality of the chosen databases. 3) The search period ranges from 2002 to 2015. 3) Only business related subject areas are chosen (e.g. Business Economics, Operations Research, Management Science, or Information Science). For Google Scholar, due to its limited functionalities, is excluded. The following table shows the refined search results. The "filtered" line indicates the number of findings in each database after applying the inclusion and exclusion criteria.

Table 2 – Core Area "Service + Platform" Search Result

Criteria/Databases	Science Direct	Web of Science
Not Applied	166	2,736
Applied	0	776

The abstract reviewing process further eliminated the articles irrelevant to this literature review by focusing on two criteria: First, does the paper have a setting in the service related context? Second, does the paper concern with the two characteristics of platform? After carefully reading the 776 abstracts, 152 articles are selected for full paper review. One additional step of screening were needed to finally clarify the subject area, hence the 110 paper remained. Figure 1 shows the selection process of key articles for this study.
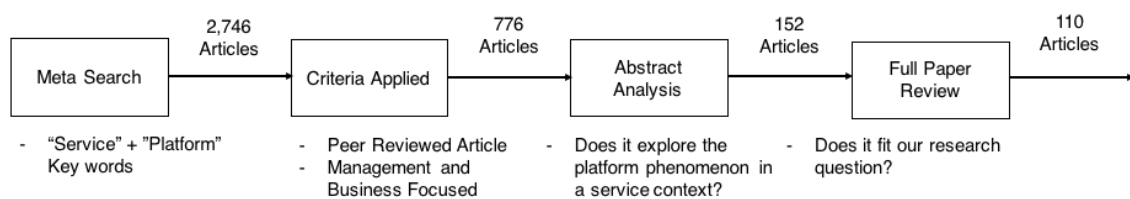

Figure 1 – Screening Process

Analysis

The 110 selected articles from the systematic literature review process are analysed and presented in this section. The discussions and finding of this study are presented in the following section.

Research Distribution

In the early 2000s, the platform literature gained momentum, but it was not until 2008 that is gained significantly attention (See Figure 2). Up on a closer look, two of the most cited papers in 2008 are "How companies become platform leaders" published in the MIT Sloan Management Review and "How to sell service more profitably" in Harvard Business Review. Bridging the two phenomena may have become more relevant ever since.
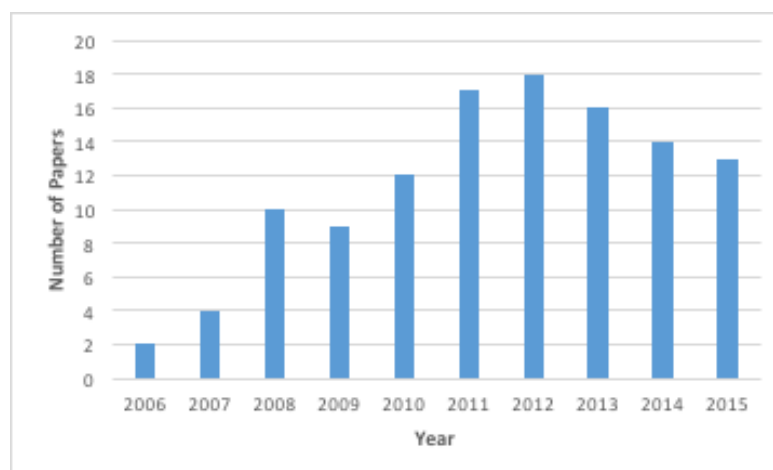

Figure 2 – Distribution of papers published annually

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The "Service Platform" topic attracts wide array of interests from across disciplines. The literature is dispersed over 70 journals. Most of the publications are in the field of technology and information science. This is expected given the root of the platform theory is inspired by earlier engineering and operation management concepts such as "modularity". However, recently management journals such as management science have started to publish in this topic. Table 3 shows the the most popular journals that have articles published.

Table 3 – Journals with more than 2 publications

Journals	No	Journals	No
International Journal of Computer Integrated Manufacturing	4	International Journal of Electronic Commerce	2
Journal of Information Technology	4	Journal of Product Innovation Management	2
Telecommunication Policy	4	Journal of Management Information Systems	2
Expert Systems with Applications	3	Management Science	2
Harvard Business Review	3	Marketing Science	2
Information & Management	3	MIS Quarterly	2
Journal of Service Management	3	SERVICE BUSINESS	2
MIT Sloan Management Review	3	SERVICE INDUSTRIES JOURNAL	2
Telematics and Informatics	3	Technovation	2

Given the infancy stage of "service platform" research. A considerable proportion of the work is conceptual. Approximately 65% (71 papers) of the research are empirical studies with explicit data gathering methodologies. A considerable portion of the research are still conceptual papers.

Table 4 – Methodologies applied of the empirical studies

Methodology	No. of Articles	Methodology	No. of Articles
Case Studies (multiple cases)	21	Secondary Data Analysis	11
Case Study (single case)	9	Experiment	4
Survey	18	Model Building	2
Mixed (Survey + Case)	4	Simulations	2
		Total	71

The industries studied are consistent with the journal publications. 55 studies are predominantly conducted with in the IT or Internet related industries. The most cases are set in the context of social network (15 articles). The subjects include social media advertising, content services, or e-word of mouth. E-business (11 articles) researches on B2C and C2C commercial services follows tightly after. The internet is considered as one of the key enabler of platform based businesses.

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Table 5 – Top Industries Researched and Subareas of IT Industry

Industries Researched	No. of Articles	Subareas within IT Industry	No. of Articles
IT Internet	55	Social Network	15
Telecom	14	E-Business	11
Not Specific	11	Crowd Funding	3
Service Industry	10	P2P services	3
Manufacturing	3	Service Oriented Architecture	3
Retail	2	Internet of Things	2

The topics on service platform is also diverse. Figure 3 below shows a sample of the current research areas. Table 6 shows an excerpt of the Systematic literature review findings.

Figure 3 – Examples of the extent of current platform research

Table 6 – Papers that representative of the data set

Paper	Epistemology	Data Collection	Industry	Result
Lusch and Nambisan (2015)	Qualitative	No	Service Industry	Service platforms conceptually can enhance the efficiency and effectiveness of service exchange by liquefying resources and increasing resource density.
Hofman and Meijerink (2015)	Quantitative	Yes	Service Industry	Human resource service value is highest when the service provision is matched with the commonality potential of the services. Hence, the architectural aspect of a service platform can be leveraged. The results indicate that using the wrong delivery channel decreases the service value.
Seamans and Zhu (2014)	Quantitative	Yes	Software/IT/Internet	Relative to newspapers without classified-ad managers, the effect of Craigslist's entry on newspapers with classifiedad managers leads to a decrease of 20.7% in classified-ad rates, an increase of 3.3% in subscription prices, a decrease of 4.4% in circulation, an increase of 16.5% in differentiation, and a decrease of 3.1% in display-ad rates.
Ghargava et al. (2013)	Quantitative	No	Software/IT/Internet	The authors Proposed a model to predict the optiaml expansion strategies for stratups and etsablished firms to benefit from network externalities.
Lu et al. (2012)	Quantitative	Yes	Software/IT/Internet	Through an extensive survey, the authors identified several key factors such as Optimism, Insecurity can influence C2C Platform's Trust and Functionality, which ultimatley influence C2C platform usage Satisfaction.
Kim et al. (2012)	Qualitative	Yes	Software/IT/Internet	Two types of innovation patterns are established as divergence and convergence strategies in approaching The structure of digital content services using three building blocks: product, process, and platform.
Yoo et al. (2012)	Qualitative	No	Software/IT/Internet	This paper summarizes the (1) the importance of digital technology platforms, (2) the emergence of distributed innovations, and (3) the prevalence of combinatorial innovation. Digital Platforms are seen as an essence to promote distributed, recombinational innovations.
Tuunanen and Cassab (2011)	Quantitative	Yes	Service Industry	Contingent to task complexity, modularized services positively influence customer's perceived value of services and their likelihood for trails of service extentions.
Shang et al. (2011)	Qualitative	Yes	Software/IT/Internet	Taxonomy of web 2.0 service models where introduced based on the knowledge-creating perspective.
Evans and Schmalensee (2010)	Quantitative	Yes	Cross Industry	1) platform businesses typically need to attain critical mass when they are launched in order even to survive. 2)direct network effects, the basic problem is that the level of participation on the platform affects the quality of the product it offers to participants, and if quality is too low, participation falls, which reduces quality further, and participation declines toward zero.
Weiss and Gangadharan (2010)	Quantitative	Yes	Software/IT/Internet	1. small number of APIs provides the basis for the majority of mashups, 2, mashup platforms were introduced in response to the increasing complexity of mashups, as mashups evolved from one-feature mashups (widgets). 3.The growth of the mashup ecosystem follows a pattern where keystone data providers or 'powerful hubs' attract niche data providers as complementors, and the positions of keystones in the ecosystem are mutually reinforcing.
Hagiu and Yoffie (2009)	Qualitative	No	Software/IT/Internet	MSP does not gurantee a participant's success, a company should allign their product and service offerings with the type of platform activities they should engage.
Lehdonvirta (2009)	Qualitative	Yes	Software/IT/Internet	Hedonic and Social Attributes act as purchase drivers
Tee and Gawer (2009)	Qualitative	Yes	Telecom	Industry structure can be determinant factor for the success or failure of mobile internet services platforms.
Reisinger et al. (2009)	Quantitative	No	Radio Adverstising	In addition to considering the participation externality, PECUNIARY externality such as revenue stream can also have an influence on the dynamics of a two-sided platform
Lai and Turban (2008)	Qualitative	Yes	Software/IT/Internet	Positive correlation between network value and user content. Services are defined in general terms such as self-serving services, Collaboration Service (google talk).
Gawer and Cusumano (2008)	Qualitative	No	Cross Industry	Through a series of cases from several industries, the authors gave strategic guidance for companies to achieve platform leadership.

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Findings and trends

This section covers the findings from the literature in three areas. First the theoretical foundation of service platform is discussed. Second, the current research trend of the core literature. Finally, a few challenges, which are also potential research directions will be discussed.

Even though service platform is a popular topic as shown in this literature review, The definition of a service platform, or even "platform" is still being debated. Several authors have proposed theoretical foundation of service platform needs more consolidation (eg. Baldwin and Woodard, 2009; Gawer, 2014). A significant portion of the papers included in this review have interpreted the term "platform" loosely. Some research would use the generic meaning of platform indicating any online system as a "platform" (e.g. Cao et al, 2013). In order to qualify as a platform, a platform must fulfil two main features.

First, the architectural aspect of the platform evolves around the common basis of product and service development (e.g. Gawer and Cusumano, 2008). This concept is derived from modularity literature. The second aspect is the network economics of platforms, which concerns mostly with the positive externality of platforms (e.g. Eisenmann, Parker, and Van Alstyne, 2011). In other words, the more people engage in a platform, the more benefits would be received by the participants. Most of the papers address either one or another aspect of the characteristics. Architectural aspect is more predominant, partially due to the overall literature is focused on the information technologies. However, there is a consistent number of publications that acknowledge a unified understanding of platforms (See Figure 3). It is expected that more research will adopt to a similar definition in the future given the continuous popularity of the research topic. On the other hand, the definition of service in the platform context differs quite drastically from discipline to discipline. For the IT literature, the core difference between product and service are their revenue models and ownership. And for platform strategists, platform service mainly deals with activities supporting product aspects of platform. A comprehensive definition of service such as service dominant logic proposed by Vargo and Lusch (2008) may be needed. Current literature has not applied SDL in the context of platform extensively. Nevertheless, product dominant logic still pointed service research to the direction of service platforms.
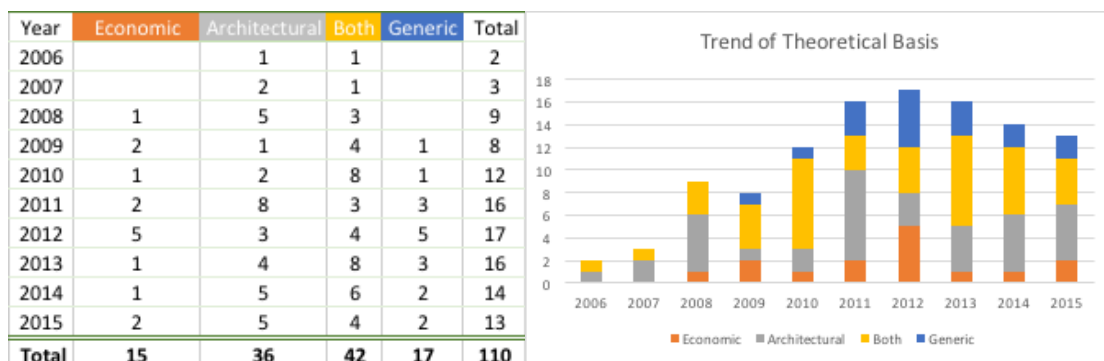
Year	Economic	Architectural	Both	Generic	Total
2006		1	1		2
2007		2	1		3
2008	1	5	3		9
2009	2	1	4	1	8
2010	1	2	8	1	12
2011	2	8	3	3	16
2012	5	3	4	5	17
2013	1	4	8	3	16
2014	1	5	6	2	14
2015	2	5	4	2	13
Total	**15**	**36**	**42**	**17**	**110**

Figure 4 – Platform Theoretical Basis Distribution Annually

The platform phenomenon has inspired industry's interests. However, the current research is still at its innate stage. There are very few papers that apply the principles of platform in the service context directly. Most of the reviewed researches only acknowledge the service platforms as given phenomena such as in most of the reviewed articles tagged as "generic". Some researches apply the design and architectural aspect of platform, namely modularity, to services. The results are still limited. Prior to 2008 only one paper was published on service modularity (Bask et al. 2010; Pekkarinen and Ulkuniemi 2008). The studies are based on service industry. Due to the fact that services in the traditional sense tend to adjust its offerings according customers requests, therefore a satisfactory degree of service modularity has not been observed (Bask et al. 2010). Pekkarinene and Ulkuniemi attempted to construct a model for service modularity. However, their research is based on one single case of a logistics service provider. The validity of their proposed model needs further examination. Tuunanen and Cassab (2011) conducted a controlled experiment to determine the service process module reusability against the complexity of service, which shed light on the research direction. However, the causes of low architectural leverage of platform capabilities in the service industry are still unclear. Even though platform and modular design concepts in the service industry have not generated significant momentum.

The most prominent research directions for platform literature evolves around what makes a company platform leader, and how a company can maintain a leadership position (Gawer and Cusumano 2008). The metric of leadership could be interpreted in many ways such as monetary, customer value, market share etc. Several empirical researchers suggested that many of the information such as financial data or customer value are very hard to obtain or objectively determine, therefore the most reasonable metric of current platform research tend to focus on number of users (Evans and Schmalensee, 2010; Lin et al., 2012). This measure is also in accordance with the principles of network effect that the growth of number of users increases the network externality.

To achieve platform leadership, researchers have focused on the two characteristics of platforms. Namely, how to leverage the technology core of the platform, known as coring and how to leverage the platform's network externality, known as tipping strategy. (Lee et al., 2010; etc.). Using strategies from the technology side of the spectrum, a platform leader creates high level of entry barrier for potential challengers. For example, Intel invests heavily on its microchip technology, which makes potential entry into the microprocessor's platform more difficult. To leverage the network effects, platform owners usually create incentives to encourage network participants. It could be benefits for either customers or providers. YouTube subsidizes its content providers by sharing advertising revenue generated by their visitor traffic. Recent research has shown some promising strategies to maintain platform user through governance. Eaton et al. (2015), analysed the iOS platform and apps offerings, through encouraging certain types of offerings and limiting others, Apple achieved higher customer satisfaction, hence retention rate. Below figure shows some of the most popular strategies summarized by Gawer and Cusumano (2008) to maintain platform leadership.

Table 7 - Strategic Options for Platform Leadership

Strategic Option	Technology Actions to Consider	Business Actions to Consider
Coring How to create a new platform where none existed before	• Solve an essential "system" problem • Facilitate external companies' provision of add-ons • Keep intellectual property closed on the innards of your technology • Maintain strong interdependencies between platform and complements	• Solve an essential business problem for many industry players • Create and preserve complementors' incentives to contribute and innovate • Protect your main source of revenue and profit • Maintain high switching costs to competing platforms
Tipping How to win platform wars by building market momentum	• Try to develop unique, compelling features that are hard to imitate and that attract users • Tip across markets: absorb and bundle technical features from an adjacent market	• Provide more incentives for complementors than your competitors do • Rally competitors to form a coalition • Consider pricing or subsidy mechanisms that attract users to the platform

source: Gawer and Cusumano 2008

These strategies have been proven effective for their respective case studies However, with the fast evolving economic and technological landscape propose serious challenges to this binary perception of platform. Increasingly, the more innovative platforms do not fit into the framework developed in the early 2000s. The follow section discusses the challenges briefly.

The first challenge directly points to the technological side of platform. Compared with previous studies of platforms with distinct psychical technologies such as video cassette players and game consoles, in the setting of digital service platforms such as Uber, AirBnB, very little sunk cost such as equipment purchase prices are imposed on customers. From a transactional cost perspective, many information goods and services have virtually zero marginal cost (Gawer, 2014). On the other hand, the "core" technologies provided by these newly emerged platforms are not very hard to create given the easiness of programming of modern web and mobile technologies (Kim et al. 2012).

Second challenge is the adoption issue characterized as a chicken-and-egg problem. One commonly agreed notion of platform network externality is that the increase of product and service offering variety and quality tends to attract customers (Boudreau, 2012; Hsieh and Hsieh, 2013). The network externalities are dependent on both side of the market, without enough customer base, the providers are unlikely to join and innovate, and without enough offerings available, customers will not come (Eisenmann and Hagiu 2008). Current literature suggested the solution to the issue through capabilities (e.g. Wales et al., 2012), pricing (e.g. Bolt and Tieman, 2008; Hagiu, 2009), strategic alliances (e.g. Caesy and Toyli, 2012), or ecosystem value co-creation (e.g. Ceccagnoli et al., 2012). Little research is focused on appealing to the provider side of the market (Hsieh and Hsieh, 2013).

The strategy literature on platform noted subsidizing supply side as a method to sustain platform leadership. For example, Intel could convince motherboard makers to adopt their PCI standard by committing its own micro-processor production volume (Gawer and Cusumano, 2007). However, a substantial study on the factors that influence providers' adoption and innovation decisions is currently unavailable.

As mentioned in the earlier, platform customers have very low sunk cost, which also reduces the switch cost undermines the lock-in effect. The same applies to the provider side of the platform. Providers have also shown strong incentives to switches between platforms given the right circumstances (Lin et al. 2012).

Finally, the current research agenda of platform in respect to adoption is quite limited to economic and technological rationale of platform strategy (Thames et al, 2011). Recent research has pointed to areas of cognitive biases such as the "Bandwagon Effect" have been put into the research agenda (Xu et al. 2012). However, the results of these researches are not tested in a wider scale. Some researchers have taken into consideration of the intangible aspects of platform strategies. However, this type of research is still at an innate stage, a systematic understanding the platform adoption process is missing. Marketing researchers have studied customer behaviors from the non-economic aspect. Phenomena such as word of mouth (Shin et al., 2014) and viral marketing (Palka and Pousttchi, 2009), even B2C communication via sponsored message (Magnini, 2011) can have significant impact on platform users' behavior. However, not enough research focusing on the complimentors, or service innovation contributors has been conducted.

Many platform providers understand the importance of platform success heavily rely on the sheer number of participants in order to construct a meaningful business model. Therefore, in many cases of Internet based platforms, the contents are offered free of charge. Some scholars considers pricing and access limitations to be potentially useful tools in term of quality control (Economides and Hermalin, 2015). And platform leaders like Apple tend to be able to manage the quality of the contents of their platforms through governance of boundary resources (Eaton et al., 2015). However, further studies on the quality aspects of platform are not widely covered. Therefore, it is particularly meaningful to understand what drives providers in a platform to innovate quality services.

Limitations
There are several limitations of this research. First, as previously discussed, researchers tend to use different words to describe a given event. This research does not claim to be exhaustive of this subject area. Second, the database used may not contain all the relevant journals covering the area. Hard copies such as library books, journals and articles without peer reviews such as online working papers are missed. Third, papers without full text in the Cambridge library system are not included.

Conclusions
This systematic literature review was carried out on service platform. This paper provides a holistic overview of the current state of affair of the subject. The review shows that research on service platform increased rapidly after 2008. A wide spectrum of research from different industries, methodologies and scientific disciplines have been covered. This paper identified the need for a better and more compressive theoretical foundation for the service platform literature. The trends of core literature research, is discussed. Finally, a few key areas of future research have been identified. This paper is also valuable for industry readers. Increasing number of

firms are seeking to engage in service platforms. This compressive review to the cutting edge research and case studies can be used by organizations as a key reference when approaching service platforms.

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