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Service Aggregators in Business Networks

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Abstract

This position paper examines the development of a dedicated service aggregator role in business networks. We predict that these intermediaries will soon emerge in service ecosystems and add value through the application of dedicated domain knowledge in the process of creating new, innovative services or service bundles based on the aggregation, composition, integration or orchestration of existing services procured from different service providers in the service ecosystem. We discuss general foundations of service aggregators and present Fourth-Party Logistics Providers as a real-world example of emerging business service aggregators. We also point out a demand for future research, e.g. into governance models, risk management tools, service portfolio management approaches and service bundling techniques, to be able to better understand core determinants of competitiveness and success of service aggregators.

1. Introduction

Recent economic developments have led to increased industry dynamics. The deregulation of markets and the utilisation of new communication channels have enlarged the relevant market scope for organisations massively. Hence, organisations face both the positive and negative consequences of these developments. On the one hand, organisations can conduct business on a global scale and reach markets and consumers that were not in their scope in the past. On the other hand, the number of competitors has increased as a consequence of globalisation as well, and consumers adapt their demands based on global trends and developments. Thus, organisations must promptly adapt to market developments and changes in consumer demand to survive in such a dynamic environment [1].

As a consequence of changing market structures, organisational structures change as well. Recent trends lead towards the specialisation of organisations in order to concentrate on their core strengths and capabilities that distinguish them from their competitors [2]. These capabilities typically represent the foundation of a competitive advantage that ensures the survival of an organisation. To be able to satisfy sophisticated consumer demands, highly specialised organisations however are forced to collaborate with other organisations, which spawns the formation of business networks or ecosystems [3]. Within these networks, each organisation is responsible for a certain part of the overall value creation.

In this paper, we describe different forms of business networks and shed some light on the specific role of a service aggregator. We predict that this entity within business networks will play an increasingly important role in mediating between service consumers and providers.

The remainder of this paper is structured as follows. First, we will describe different forms of business networks, before we present foundational concepts of service-orientation. Subsequently, we merge the notion of

business networks and service concepts to address the emergence of service ecosystems. In particular, we will describe different roles in such an ecosystem prior to discussing the role of a service aggregator in more detail, putting particular emphasis on the logistics domain as an example in order to arrive at open research questions. The paper will end with a conclusion and potential directions for further research.

2. Emerging business networks

Tapscott et al. [4] describe new business models and strategies that are required to compete in the global digital economy. According to them, the industrial organisation is displaced by networks as the new model of the firm, as they allow the participating companies to specialise and focus on core competencies, making the internetworked enterprises more effective than traditional firms in creating value. The authors have coined the term business web or B-web to describe the emerging, distinct networks of suppliers, distributors, commerce services providers and customers that link via the Internet and other electronic media to produce value for end customers and for one another.

Tapscott et al. [4], followed by [5], distinguish between five types of business networks that represent varying forms of cooperation in market spaces:

- *Agora*: Agoras are open, electronic marketplaces with dynamic pricing where sellers and buyers get together and negotiate prices in real-time and on-the-spot, either one-to-one or through multi-party auctions and exchanges. The core value of an Agora is the provision of a trusted platform. Prominent examples are eBay and Priceline.com.
- *Aggregation*: This type of B-web is characterised by a strong company playing the role of an "aggregator", a value-adding intermediary between producers and customers, who leads the network in a hierarchical manner. A prominent example would be Amazon. The role of a service aggregator as we discuss it in section 5, however, can also comprise characteristics of an integrator as described in the following bullet point.
- *Value Chain (or Integration)*: This type of business network involves as primary companies integrators or value-chain innovators that provide through a managed process demand-driven, highly integrated value chains comprising all components from specification, production and delivery to support for the products and services demanded by customers. Value integration is maximised through operational effectiveness. The integrator does not produce services or product components by itself, but acts as a context provider, typically marketing and managing customer relationships. By integrating the value contributions of different providers, the integrator manages and controls the design of the product or service and the steps towards value integration. Prominent examples would be Cisco or Dell.
- *Alliance*: Alliances are dynamic, loosely-coupled, self-organising networks (communities) of equal partners brought together and aligned by a common goal or shared need. The partners remain independent and aim at compensating for lacking competencies by finding complementary network partners. Networks for the development of open source software (e.g. Linux) are a prominent example of this type of business web, or the PalmPilot alliance that is comprised of programmers and hardware manufacturers producing products to add to the PalmPilot's appeal to consumers. These types of alliances can induce continuous and accelerating value cycles.
- *Distributive Network*: A distributor in a distributive business network brings material and immaterial products and services from providers to consumers. This category includes network service providers for sharable products, such as utilities or bandwidth, for forwarded products (e.g. carriers, shippers, airlines) and for consumable products (e.g. capital lent by financial institutions). Prominent examples of distributors include telecom companies and internet service providers such as Telstra or Optus.

After having set the context for the remainder of this paper by providing the general classification of emerging business networks presented above, we will narrow the focus in the following towards service-centric business ecosystems and service aggregators as a particularly interesting role in such an environment. First of all, the next section will recapitulate foundational aspects of service concepts.

3. Foundations of service-orientation

3.1 Services

Services are of an increasing importance to our society. Nearly 80% of all employees in western economies now work in the service sector. This increased economic focus on the service industry together with recent technological developments in the area of service-oriented architectures and web services enable and facilitate the formation of the new kinds of business networks and value exchange as described above.

To frame the object of interest, a definition of the term service is mandatory. A review of the use of the service concept in literature reveals various specialised perspectives on services, ranging from business-oriented views of traditional business services to purely technical views of electronic services or web services.

Business services represent standardised endpoints within the network that can be leveraged by organisations as part of the network itself [3]. Thus, a business service represents a capability of an organisation to transform inputs to outputs under the involvement of different participants and their respective resources to solve a distinct problem. Business services within organisations can be executed by (semi-)automatic or purely manual processes.

(Semi-)automatic processes can be realised or supported by software services, which found their most popular incarnation in web services. These services represent autonomous application capabilities that can be invoked using standardised languages [6]. In the context of computer science, a web service is defined by the World Wide Web Consortium (W3C) [7] as a "software system designed to support interoperable machine-to-machine interaction over a network." This technical view is usually not found in business science. When used in business science, web service either refers to the computer science definition or it simply refers to a service delivered over the Web in the meaning of e-service [8].

Rust and Kannan [9], for example, define e-service as "the provision of service over electronic networks." Electronic networks include, but are not limited to the Internet. In business science literature, the term usually refers to an Internet-based version of traditional services [8]. This includes services that only use the Internet as an access channel (e.g., online shopping) as well as services that are entirely delivered electronically (e.g., music download).

3.2 Service-orientation

As organisations struggle to adapt and survive in dynamic markets with rapid technical developments in the digital economy, they increasingly collaborate and form the value networks or business webs outlined before, enabled by the technical developments of Service-Oriented Architectures (SOAs), web services and related technologies and standards.

SOA is seen as an emerging paradigm to foster agility and flexibility of organisations and to enable them to adapt to changing market requirements more quickly [6, 10]. The SOA paradigm provides principles for packaging software components as interoperable services. These services are published to a service registry which allows easy access to a repository through which services can be found and invoked. The SOA approach aims at loose coupling of services to facilitate easy reuse of existing service components. In addition to a focus on reuse, service composability is a guiding principle through which collections of services can be coordinated and assembled to form new composite services.

Although SOA is a purely technical concept and originated in computing, it is closely related to a more general view of service-orientation that has come to influence business relationships. From a classical business or marketing point of view, the general assumption of service-orientation, or the service-dominant logic, is that customers generate value through service experience and relationships [11]. Contrary to the traditional view of value in exchange the focus is put on the customer's collaboration during service delivery (value in use). Thus, customers do not buy services but rather service offerings, which render services, which in turn creates value [12]. As the concept of service-dominant logic changed the thinking in marketing, so do SOAs in computer science.

4. Service ecosystems

The result of merging the concepts of business networks and service-orientation as put forward in the previous sections is the emergence of the concept of service ecosystems. A service ecosystem can be regarded as a multitude of different business and software services providing and relying on various capabilities of organisations within a network [13] [14].

With the increasing adoption of service-oriented concepts, individual service components become more fine-grained. Thus, not only complete large-grained services but also individual service components are being offered. These services can then be reused and recombined by others. This leads to the vision of large service repositories that offer access to a vast selection of services that can be reused and recombined at will to create innovative new services.

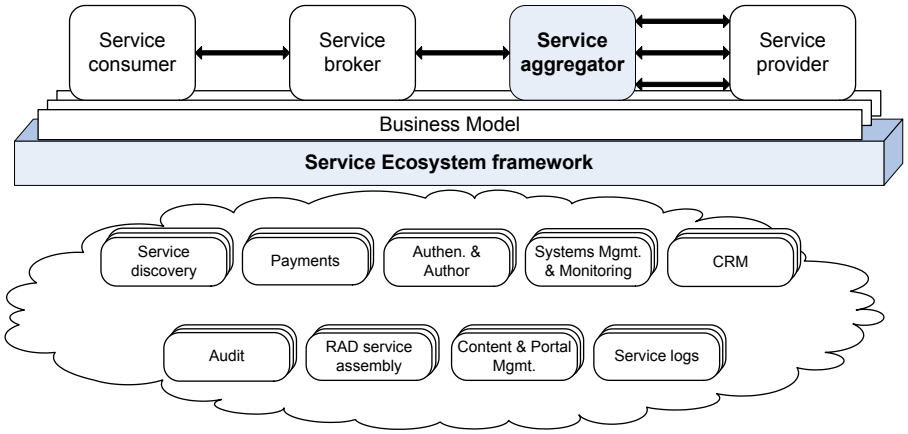

Figure 1: Roles along the service delivery chain

Especially when the Internet is utilised for the delivery and as a means of offering services, the term "Internet of Services" has evolved to denote this particular type of service ecosystem. Current servitisation trends such as Infrastructure-as-a-Service, Platform-as-a-Service, Business-Process-Integration-as-a-Service and Software-as-a-Service underpin the growing importance of the technical service concept in the business context. There is a global trend towards platformisation to be recognised on the Internet (e.g., [15]), and scholarly interest in the Internet as a service platform is increasing (e.g., [16]; [17]). Despite the phenomenological character, accepted theories on the formation of networked organisational structures can be used to explain these manifestations (e.g., [18]; [19]).

Service ecosystems expand the idea of an interconnected service repository. Here, services are governed by constraints on the service delivery at a business level. Service providers of basic, or core, services can augment their services by distribution and delivery functions provided by the ecosystem (Figure 1). For example, the ecosystem could provide basic payment, metering, and distribution services that can be used by service providers to create marketable services out of their core components. Based on their tasks and responsibilities within an ecosystem, different roles can be distinguished.

4.2 Roles within a service ecosystem

We envision the roles described in this section to be characteristic of a service ecosystem (some of which are represented in Figure 1). It should be noted at this stage that an entity in a service ecosystem (i.e., an organisation) can take over multiple roles. Thus, there is a many to one relationship between roles and participants in an ecosystem.

In general, there are two essential roles in an ecosystem that can be distinguished:

Service Provider: Services are offered by service providers. They provide the access point to a concrete service implementation and offer the service by publishing a service description in the service repository of the ecosystem. Service providers may be distinguished based on the type of services they offer. Services can be targeted at end-consumers or at other entities along the service delivery chain (e.g., service aggregator, service broker, etc.). It is also possible to differentiate further, on a finer level of granularity, between service providers as the role that provides the access point to a service, service creators as the role responsible for the implementation of the service and service hosts as the role that manages the hard- and software environment where the service implementation is deployed. Some service providers offer specific service delivery components that are used by other providers to create marketable services and thus play the role of "Specialist Intermediaries" (examples see below; e.g. a service broker typically fulfils this kind of role). Common examples for the kinds of services offered by these intermediaries are payment, authentication, or monitoring services.

Service Consumer: Service consumers request and invoke the services offered by service providers. Service consumers can either be the actual end-users of a service or other service providers, e.g. service aggregators.

In addition to these two basic roles, there are typically roles that function as intermediaries between service providers and service consumers.

Platform Provider: The platform provider makes the overall service ecosystem platform available, on which the other actors operate. The platform provider will also offer some of the core services necessary to create marketable service.

Service Aggregator: Scalable third party service aggregators with decent domain knowledge will play an important role in service ecosystems by adding value to the services, e.g. through semantic aggregation or composition, respectively. They create service bundles and new service offerings by combining and integrating existing services and offering them under new business models.

Service Broker: Service brokers bring service providers and service consumers closer together. Typically, they integrate a service or service bundle with certain delivery functions such as payment and authentication. While service aggregators have decent domain knowledge, a service broker has decent knowledge about the specific market and thus can integrate additional services based on customer demand and may introduce competitive repricing (e.g., adding advertisements, etc.).

Service Mediator: Service mediators offer translations between different service formats and other routine functions. This allows service brokers to concentrate on their core competencies by eliminating the need for additional technical transformations. This role is of particular importance for the usability of software services within an ecosystem. Translating between different messages of different services is especially relevant in ecosystems that are not characterised by the use of commonly agreed upon policies and languages for the description of services and the explication of communication patterns between services.

The following section will elaborate in more detail on the role of a service aggregator and provide real-world examples of this role in the logistics domain.

5. Service aggregator

5.1 Terminological and conceptual clarifications

In order to be able to elaborate further on what types of service aggregators are conceivable in service ecosystems, it is imperative to clarify our view of certain terms that are used in different research communities, such as service marketing and SOA, to avoid confusion. These include aggregation, composition, bundling, integration and orchestration. Moreover, we have to keep in mind the distinction between business services and software services. Business services are realised by processes, which may comprise manual as well as (semi-) automatic activities. The latter type of activities can be realised and supported via software services, such as web services, which are fully automated and are the focal object in the SOA domain.

Aggregation and composition are used to describe services that contain other services as sub-services [20]. These terms are frequently used in the domain of software engineering. For example, in object-oriented modelling and programming they are used to express specific relationships and ownership considerations between multiple objects. The typical understanding in that domain is that an aggregation will still exist, even if component services are removed from the aggregate, whereas a service composition will cease to exist in case a constituent component service is removed, based upon structural dependencies between these elements. In a more general sense, that also relates to the business domain, an aggregation would comprise multiple services and provide access to them in a single location [20]. As an example, one could think of a telecommunications company that offers services such as call forwarding, voicemail and others via the telephone. These services are all accessible separately and they may be priced separately as well. Nonetheless, they have been aggregated to be accessible in one location. Moreover, aggregation is a core characteristic of the aggregation B-web mentioned earlier. Tapscott et al. [4] state that such aggregations are quite ubiquitous and can be found in business-to-business as well as business-to-consumer markets for products, services and information.

A composition, on the other hand, refers to a tightly-coupled integration of sub-services, thus adding value not present in the individual constituent services [20]. O'Sullivan et al. [20] state that the additional value may be represented by a specific service property, such as reduced price. Additionally, the authors state that service composition encompasses functional as well as non-functional composition. Therefore, combining air and land travel services into a transportation service (functional composition) is a composition as well as combining a freely available service with a payment service (non-functional composition). As implicitly indicated, services in a composition are always integrated to a certain extend. This integration, for example, is a core characteristic of the value chain B-web described before.

In the SOA context, the term orchestration is frequently used in this connection to describe a service composition that is somehow autocratic and refers to a workflow orchestrated by a central controller, e.g.

specified by an execution language such as the Business Process Execution Language (BPEL) and executed by a runtime workflow engine [21]. The composite service, however, is a new service whose internal realisation through other services is transparent to the composite service's consumer.

A notion that is less used in the computer science domain but has been coined in business science, particularly marketing, is bundling (or tying). Bundling refers to putting two or more products or services together to offer them as one package to a customer, typically with a price reduction compared to the sum of the individual prices of the bundled services [22]. The focus lies on business aspects, such as strategic alignment, pricing and external conformance of the service bundle. Support for the initial decision about which services can be bundled is discussed in [23]. Regarding the structure of a bundle, at least pure bundling and mixed bundling can be differentiated [24]. Pure bundling describes a service bundle consisting of elements that are only priced and offered as a bundle and not as individual items. Using mixed bundling, the elements can also be obtained separately next to obtaining the elements as part of the complete bundle. All these types of activities, from aggregation through composition, integration, orchestration to bundling could be at the core of a service aggregator's business operation, depending on the particular specialisation the aggregator chooses. This leads us to a more detailed discussion of the role of a service aggregator and the presentation of a real-world example from the logistics domain.

5.2 Detailing the service aggregator role

Different definitions can be found in literature that elaborate on the role of an aggregator. Madnick and Siegel [25] define "*web aggregators*" as entities that "can *transparently* collect and *analyse* information from multiple web data sources." This process requires resolving the semantic or contextual differences in the information. Access to the data sources is transparent insofar as the aggregator appears like a normal user. Contextual differences are transparent insofar as the web aggregator undertakes to resolve them. Based on post-aggregation analysis, the web aggregator then synthesizes value-added information, e.g. regarding effective comparison of the data sources. Madnick and Siegel [25] distinguish two main types of aggregators, namely *Comparison* type aggregators and *Relationship* type aggregators, and orthogonally two different scopes of information sources from which the new integrated information collections can be built, namely inter-organisational and intra-organisational. While comparison type aggregators, such as shopbots and price comparison agents, collect and evaluate information about specific goods and services, relationship type aggregators manage the relationships with various aggregates to form new information collections. An example would be financial account aggregators like CashEdge that offer customers a single point of access to manage all financial relationships. Of course, hybrid types of aggregators are also conceivable, and "mega-aggregators" will even include information offered by other aggregators in their aggregation services.

A *service aggregator* acts as an intermediary between service consumers and providers. This role combines certain services based on its detailed domain knowledge to add additional value to the services and provide a solution to a customer-specific need. Thus, they rebrand, repurpose and refactor certain services for a specific or anticipated customer demand. The value proposition includes selection, organisation, matching, price, convenience and fulfilment [4].

Papazoglou and van den Heuvel [26] define service aggregators as entities that "group services provided by other providers into a distinct value-added service and can themselves act as providers." Thus, service aggregators have a dual role. On the one hand, they offer the aggregated services and thus act as a service provider, who can enforce its own policies for the aggregated service. On the other hand, they rely on external services offered by other parties within the ecosystem. Hereby, they act as service consumer.

The role of an aggregator has been described as being similar to a digital retailer: the aggregator chooses suitable services offered by various service providers, makes decisions about different market segments, determines prices and controls the transaction. Due to market volume and market power, aggregators can decrease their transaction costs, particularly for Internet-based services and corresponding electronic agents.

According to Meier and Ullrich [5], the advantages that a service aggregator has in an ecosystem include the following:

- Strong negotiating power: The aggregator selects the services and determines pricing conditions.
- Use of digital recommenders: software agents support search and comparison tasks and assist potential service consumers.
- Independent service assessment: advantages and disadvantages of services are assessed by consumers and published by the aggregator as a means of decision-support to potential service consumers.

- Sale stimulation: in a digital supermarket, services can be bundled and cross-selling measures can be realised.

Service aggregators need to have superior governance frameworks in place to manage the multitude of different services within an ecosystem. In a typical multi-organisational service delivery and exchange model, where each organisation relies on services of partners within an ecosystem, governance issues become important due to the disappearing (economic, legal, technical, etc) boundaries [26]. Research into new governance models, risk management tools, service portfolio management approaches and service bundling techniques will be essential to understand core determinants of competitiveness and success of service aggregators in the future.

5.3 Real-world example from the logistics domain

Applied to the logistics domain, a service aggregator could manage multiple relationships with contractors covering a multitude of outsourced logistics services. Based on specific customer demand, the service aggregator would combine the services from its contractors to develop a customer-specific service bundle. From the point of view of B-webs as introduced earlier, such a logistics service aggregator would be part of and lead a value chain or integration business web. Service aggregators in the logistic domain are most commonly referred to 4PL (Fourth-Party Logistics Provider).

Several publications confirm the trend towards outsourcing entire processes and the emergence of service aggregators. A recent international study about 3PLs/4PLs with over 1600 participating logistic executives pointed out, that especially the capability of integrating different logistic functions as offered by 4PLs has great practical importance [27]. Almost 75% of the respondents acknowledged the greater ease of managing outsourced logistics services (e.g. only one point of contact, end-to-end accountability, etc.) Other popular reasons include reduced management time (69%) and the ability for the company to focus on core business (67%). More than 50% of the respondents stated that outsourcing to integrated logistics providers results in a reduction of the overall number of logistics service providers. This is consistent with the result that 47% of 3PL users want to reduce the number of their 3PLs in the near future. These empirical findings indicate that services offered by a 4PL will become even more important in the future.

Another recent survey about the future prospects of the third-party logistics industry in the Asia-Pacific region answered by chief executive officers (CEOs) of ten major logistics service market participants, including DHL Exel Logistics, Menlo Logistics and Modus Link, underlined the trend towards 4PL arrangements [28]. Half of the participants (45% in 2006) believe there is a growing interest in service providers managing multi-company relationships on behalf of their respective clients. Their answer was based on such issues as growing scope of 3PL contracts, the lack of client expertise and experience in managing complex 3PL relationships and the desirability of dealing with only one organisation accountable instead of several. These findings are consistent with the survey made by [27].

Apart from empirical evidence regarding the relevance and importance of service aggregators in the logistics domain, multiple academic publications state that research in the area of service aggregation, value networks and service governance is needed:

The most prominent statement has been made by [29]. The authors conducted a comprehensive literature review of peer-reviewed journal articles published between 1990 and 2005 (114 sources) about 3PLs. They concluded that further research is needed in the area of network research. Particularly, they stressed that research should be directed towards:

- rationale and main drivers for 4PL solution development;
- scope of service offerings;
- enablers and inhibitors regarding the design and implementation of 4PL;
- structure and management of 4PL networks;
- empirical examination of the role of 4PL providers as supply chain integrators; and
- profit and risk sharing in 4PL.

The authors suggested that the 3PL/4PL phenomena "could offer considerable insights of existing network research" [29]. Especially, research in contract design of 4PL relationships could potentially contribute to a better understanding of the emergence of interorganisational networks [30]. Next to the investigation in the area of network design and contractual arrangements, risk mitigation and trust within supply chains are other items on published research agendas [31, 32].

Especially for governance issues, this research could build upon the work by Gereffi et al. [33], Sacchetti and Sugden [34], Fawcett et al. [35] and Vandaele et al. [36]. Gereffi et al. [33] developed a theoretical framework to help explain governance patterns in global value chains. They concluded that three variables are mainly responsible for the type of governance, namely the complexity of transactions, the ability to codify transactions and the general capabilities

within the supply base. Based on the characteristics of these variables five types of global value chain governance can be identified: hierarchy, captive, relational, modular and market. Based on these findings, research could focus especially on characteristics of network structures to build the foundation for a governance framework. Sacchetti and Sugden [34] studied governance issues in networks and how economic power affects the relationships within the network, especially in regard to subcontracting relationships. Fawcett et al. [35] analysed the commitment levels and governance structures amongst the involved parties along the supply chain and their contribution to the overall success. The article published by Vandaele et al. [36] represents one of the most recent publications, investigating exchange governance in a business services setting. Contractual as well as relational governance issues and their respective impact on performance outcomes are considered as well. However, since this is one of the few publications that emphasises the focus on services and governance, the authors also suggest that future research is needed regarding the interrelationship between contractual governance, relational governance and performance outcomes in a business services setting as well as asset specificity in general.

6. Conclusion

In this position paper, we have explored the emergence of different types of business networks and argued that particularly service ecosystems, facilitated by the growing adoption of the service-oriented paradigm on both the business and the software level, will gain increasing importance. We conjecture that such an environment will provide new business opportunities for evolving intermediary roles such as service aggregators, who specialise in bundling, integrating, aggregating, orchestrating or composing existing services in the market to provide new value-added offerings to end-customers or service brokers. We see potential for service aggregators not only in purely technical environments, e.g. in the context of aggregating, composing or orchestrating web services or other software services, but also in the domain of (IT-supported) business services, as we illustrate with a real world example from the logistics domain. Several challenges will arise for these kinds of roles, e.g. related to risk management, questions of ownership and liability, suitable governance approaches etc., which we aim to explore in future research. The findings of this research are expected to have several important academic as well as practical implications. Mainly, we aim at improving our understanding of the emergence of different forms of business networks in general, service ecosystems in particular and, in addition, evolving roles such as service aggregators. This will help companies to study their conditions against a set of identified characteristics and criteria, which could help them make better informed decisions about choosing a suitable business strategy in the changing environment and could thus improve their chances of future economic success in the globalised, IT-enabled services economy.

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