Chapter 1
The Internet of Services and USDL

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Abstract A prominent research focus, especially in the context of EU public funding, has been the systematic use of the Internet for new ways of value creation in the services sector. This idea of service networks in the Internet, frequently dubbed the *Internet of Services* or Web service ecosystems, wants to make services tradable in digital media. In order to enable communication and trade between providers and consumers of services, the Internet of Services requires a standard that creates a "commercial envelope" around a service. This is where the *Unified Service Description Language (USDL)* comes into play as a normative and balanced unification of service information. The unified description established by USDL is machine-processable, considers technical and business aspects of a service as well as functional and non-functional attributes.

1.1 Services Sector: Key Driver of Developed Economies

The services sector is an economic growth driver in most developed economies. As an example, consider the Federal Republic of Germany, where the largest part of the macroeconomic value of 2009 is generated by the service industry [15, page 637].

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As can be seen in Fig. 1.1, jobs are only created in the services sector in Germany during recent years.

Many manufacturing firms transformed their orientation from products to hybrid value creation through complementary services during the last two decades [5]. Furthermore, a new breed of service businesses entered the stage, growing at a speed that is unprecedented in the history, changing the rules of the existing markets, and creating new ones. Powered by globalization, competition, and the Internet, this process happens globally and at accelerating speed [14]. It breaks existing product supply chains and transforms them into more volatile networks of collaborating businesses which are called *business value networks* or short *business networks* [28]. Business networks increasingly take the form of *service networks* where a business network forms around service value propositions of the participants in order to achieve win-win situations through joint value creation [8]. A service network is a logical collection of services whose exposure and access are subject to constraints characteristic of business service delivery. In these networks, service consumers procure services through different distribution and delivery channels, outsourcing service delivery functions such as payment, authentication, and mediation to specialist intermediaries. Service networks make explicit the notion of service procurement, separating it from that of conventional service supply. [7]

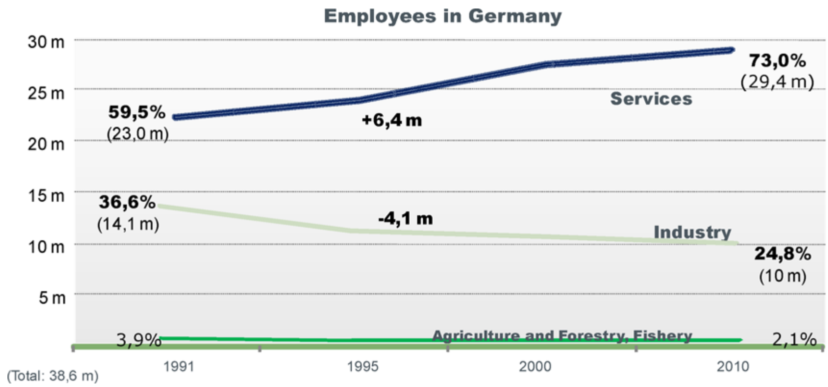

Fig. 1.1: Growth through services: Jobs created in Germany in the services sector [15, page 87].

This trend coincides with the ongoing industrialization of the services sector in developed economies. The industrialization, i.e., the commoditization of a good, can be traced into the steps of innovation, bespoke, product, and service [26]. In general, the three driving forces of every industrialization process have been automation, standardization, and specialization.[1] The following paragraphs will ex-

[1] As an example, consider the automotive industry. In this particular case, automation started by introducing production lines as early as Henry Ford up to the increasing application of robots. In

plain what the three drivers mean with respect to the transition from product to a services-focused sector. First, the Information and Communications Technology (ICT) serves as an *Automation* and transformation factor. Automation is the replacement of human activity by machine activities [21] in order to relieve humans from heavy, dangerous, complex, boring and time-consuming tasks [19]. At the low end, automation in the services sector implies, e.g., the digital brokering of physical services such as car repair. At the high end, service automation considers services that can be electronically consumed in wide settings, e.g., on the Web, which have grown over the last few years. Beyond Web services and services available through the Web, new and disruptive models have emerged that are accelerating the ubiquity of services. Software-as-a-service, business process outsourcing, cloud computing and infrastructure-as-a-service, platform-as-a-service, service marketplaces, and service-centric business networks are a growing list of examples where services are commoditized, exposed and accessed beyond conventional boundaries. In addition to Web consumers, the reach extends to mainstream industries like transportation and logistics, banking and finances, public sector, and manufacturing, when one considers the following sorts of Web services now available: track-and-trace of shipments, tariff look-ups, health insurance comparisons, medical assistance, business formation and ERP hosting.

Second, and similar to the area of physical products, *Standardization* [11] is the basis and prerequisite of every further development of an industrial sector. Therefore, standards will play a significant role also in the services industry. Standards are expected to drive the professionalization and industrialization of the service industry, to increase the transparency, and to lead to higher value services, and, thus, to contribute to the overall development of the service economy. [1] The need for standardization becomes apparent when one considers the uptake of service networks as explained above. When participants in a service network specialize to play a specific role in the provisioning and delivery of services, they act as intermediaries between other participants in the network. Such new specialized roles need to disclose and exchange, as well as comprehend business information about services (pricing, general terms and conditions, service-level agreements, etc.) in a standardized way. A standardized and machine readable description of such information will facilitate interoperability between such roles on the business level.

Besides the emergence of specialized intermediaries, there is another aspect of *Specialization* [20]: services once targeted at a specific market, are rebranded and repurposed to fit new consumer needs or other markets in order to extend the reach. Repurposing is facilitated by the automation, since even physical services can be brokered digitally and might be accessed by additional markets and regions.

The ongoing industrialization of the services sector spawned many research activities and even the call for a new discipline, viz., service science, surveyed in Section 1.2. A particular research focus is the systematic use of the Internet for new

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the beginning, each car manufacturer developed its own tires, radios, or electronic components. By standardization of such components and their interfaces, specialization became possible. That means, component suppliers emerged that specialize in the production of tires, radios, or electronic components sold to a multitude of car manufacturers.

ways of value creation in the services sector — frequently called the *Internet of Services*. The basic concepts of the Internet of Services are explained in Section 1.3 where the need for a standardized service description is elaborated. The latter is represented by the *Unified Service Description Language (USDL)* (cf. Section 1.4). Finally, strategic implications are given in Section 1.5.

1.2 Intense Research During the Past Years

Today, the dominating understanding of economic activities is still centered on the product as the main focus of value exchange. A new foundation based on service-driven principles and establishing a service-dominant mindset is required to understand and exploit the innovative value proposition offered by the Service-orientation and the On Demand paradigms to its full potential in the context of software-based complex service systems. In 2006, Henry Chesbrough and Jim Spohrer published *A Research Manifesto for Services Science* [10] that argues for a new multi-disciplinary academic approach in order to integrate academic silos and advance service innovation more rapidly. As we have learned in the previous section, the services sector has grown over the last 50 years to dominate economic activity in most advanced industrial economies. Yet, the scientific understanding of modern services is rudimentary [10]. In 2008, a white paper proposing a framework to progress in service science and innovation has been published as a result of the Cambridge Service Science, Management and Engineering Symposium and a subsequent consultation process with the academic community [2]. According to [23], the notion of a service system serves as the proper basic category for systematic development of theory and practice around service innovation. In addition, [22] identifies the notion of service system as the basic abstraction of service science. [3] and [12] (cf. also Chapter 4) further refined and formalized the notion of service system, respectively.

Following the research manifesto and the seminal scientific groundwork, several initiatives, institutions, and research projects have been established in recent years that revolve around the subject of service science. In the US, an industry consortium led by IBM currently sponsors the *Service Research and Innovation Institute (SRII)*[2] which is a non-profit organization aiming at the improvement of productivity and quality for the technology industry, organizations and society at large. The SRII is accompanied by events such as the SRII Global Conference as a forum for industry, research/professional organizations, and academia to share their research work on all the key areas of services and especially connecting science and engineering to services delivered through major verticals such as health care, financial, telecom, retail, education, government, and energy, to name a few. In the APJ region, a similar endeavor has been initiated called the *Smart Services CRC*.[3] The CRC is a commer-

[2] http://www.thesrii.org/

[3] http://www.smartservicescrc.com.au/

cially focused collaborative research initiative, developing innovation, foresight and productivity improvements for the services sector.

In Europe, the European Union is currently spending a significant amount of money for service research. An example is the *Future Internet Public Private Partnership (FI-PPP)* with significant budget aiming to advance Europe's competitiveness in future internet technologies and systems and to support the emergence of future internet-enhanced applications of public and social relevance. It addresses the need to make public service infrastructures and business processes significantly smarter (i.e., more intelligent, more efficient, more sustainable) through tighter integration with Internet networking and computing capabilities.

The term *Internet of Services* has been coined in the context of EU public funding as a technology strategy for explicitly supporting service networks in the Internet.[4] The observation was that the Internet provides the access mechanisms but not the required service supply technology. Service supply comes from companies and communities using dedicated platforms for SOA and service delivery, and the Internet will not magically replace that. However, Internet supportive protocols and technologies will need to be extended so that services can be accessed more seamlessly than is currently the case. For example, when a service is being interacted with, it should be possible through Internet supportive technologies for other potentially relevant services and resources to be sensed through the Internet. Service discovery should not be stove-piped through keyword search on particular resources, but should be as seamless as accessing Web pages. The current barriers to matchmaking of service needs and capabilities — whether it be for finding the cloud services that can support the hosting needs of an application, a transportation service that works best in a geographic locality for a certain line of goods, or a B2B gateway that has capabilities for enabling trading partners to talk should operate on an Internet, not an individual repository, level.

The situation throughout Europe is comparable to national spendings for research projects. As an example, consider Germany's largest publicly funded ICT research programme in recent years called THESEUS [25]. The project addresses the fact that it has become commonplace to sell content such as music and videos on the Internet, yet Web-based services are not as widely used. The goal of the project is develop an infrastructure that will make it easier to combine and utilize Internet services, an important step toward creating an Internet of Services. An accompanying event has been the International Research Forum 2008 [27] inviting top researchers from around the world. Participants from business, academia and government examined the topic of the Internet of Services. The discussion illuminated how the Internet of Services will change enterprise computing. It will help businesses leverage core strengths, find partners in new business networks, collaborate and tap new global markets. Software as a service, cloud computing and other trends are democratizing innovation as never before. The infrastructure barriers to doing business in the Internet of Services are falling away.

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[4] A synonymous term is "Web service ecosystems," i.e., service ecosystems in the Internet introduced in [7].

1.3 The Internet of Services — Basic Concepts

The basic idea of the Internet of Services is to systematically use the Internet for new ways of value creation in the services sector. There are different angles from which one may look at this approach. From an IT perspective, service-oriented architectures [9], software as a service [13], as well as business process outsourcing [24] and business process out-tasking are related trends. In this context, the concept of *service* is referring to a technical understanding of software functions provided as Web services.

But *services* in a broader sense are more than technical capabilities that can be invoked by computer program interfaces. When referring to the importance of the services economy in Section 1.1, we clearly went beyond the purely technical perspective. It is true that the modern service economy is already making an intense use of information technologies, but it is also true that other factors are relevant as well. Therefore, it is important to clarify what we mean by the term *service* Here is our proposal for a definition:[5]

Definition 1.1. A service is a commercial transaction where one party grants temporary access to the resources of another party in order to perform a prescribed function and a related benefit. Resources may be human workforce and skills, technical systems, information, consumables, land and others.

Let us illustrate the definition with some examples. First, think about a traditional service such as a taxi. It is a commercial transaction, as you pay for it. The taxi company grants temporary access to a socio-technical system including the driver, the car, the navigation system (or maps), the billing system and the call centre. The function and the related benefit are the transportation from one point to another.

Another example may be a rating service which defines the creditworthiness of companies. Before selling something to a company, one may want to know how creditworthy it is, so payment conditions can be arranged accordingly. For companies with poor ratings, payment in advance will be asked for while companies with good rating may pay on delivery. The rating service, by nature, is information. As a consequence, the main resources involved are information systems and, most importantly, their content. The temporary access to this information is identical to the service delivery. There is some price scheme to grant the access to this information; examples could be a flat rate or a pay-per-use model. The function is to receive a rating and the benefit to reduce the transaction risk.

Yet other examples include business services such as event management, transportation, insurances, attorney services, public services or medical services. It is also worth noting that not all services are commercial transactions, as some may have a social character such as nursing services that integrate family members.

[5] Other definitions of the term have surfaced in diverse disciplines (a nice discussion is given in [12]). This particular definition serves the needs to explain the basic concepts of the Internet of Services.

1.3.1 The Digital Footprint of Services

The service definition above covers a broad range of services. It is therefore useful to find criteria to differentiate the various kinds of services. One obvious criterion relates to the digital footprint of a service: how and to what degree are information technologies used to instantiate a service.

As an example, think about logistic services. The traditional service is about granting access to some socio-technical resources to ship something from one point to another. With digital media, the information flow associated to the material flow became more and more important. As an example, information about delays in *just-in-time* delivery is almost as important as the material flow itself. Even without introducing a strict metric, it is intuitive to say that the digital footprint of *just-in-time* logistics is higher than in traditional transportation.

In the example above, information technologies contribute to the coordination of the core process. But digital media can also add to customer experience. Take the example of a haircut. It is in itself a manual service. But the service may be *enriched* by digital media: the appointment may be done over the web, the hair cut may be chosen in advance at home out of a photo gallery or the hair colour may be presented as an overlay on the portrait photo of the customer.

Another dimension of digital footprint comes from new ways of customer *co-creation*. E-banking is a good example for an efficient co-creation. Here, the customer has web access to the bank's information systems directly over digital media. This *digital self service* makes the overall process more efficient and provides more transparency to the customer. Part of the service delivery is shifted to the service consumer, but creates value for both the service consumer and the service provider.

In general, a simple thought experiment can help to illustrate the digital footprint of a service. Just imagine all computer system would shut down for a given time. To what degree would it be possible to deliver the service? If you apply this thought experiment to the services of our daily life, it becomes quite clear that the *digital footprint* in services is already significant.

Yet, as of today, there is no normative way of describing the services in a unified and machine-readable way. Such a description would *wrap* a service and would expose it in a novel way. This kind of digital footprint is what we aiming for with the Unified Service Description Language.

1.3.2 Complementing the Service-Oriented Architecture paradigm

For Web services, the SOA paradigm including the Web Service Description Language (WSDL) did provide standards for technical service ecosystems. Based on these standards, the promise of SOA was to lower effort of integration of services coming from different information systems. Even if in many practical situations there are still organizational and technical obstacles to fully leverage the potential of SOA, it is clear that the paradigm does indeed offer possibilities to combine and integrate technical services in a faster, more flexible and more consistent way.

The Internet of Services and the Unified Service Description Language take this approach to the next level. They complement the SOA approach by adding the operational and business aspects to it. To illustrate this, consider the following. In definition 1.1 above, we made clear that a service should not only be considered as the invocation of a technical interface, but rather as an economic or social transaction with a broader context. A rating service may indeed be implemented as the invocation of a technical Web service of a given information system. For the context of this service, it is not only important to define how to technically invoke it (give an address and the interfaces), but it is essential to define the price scheme, the service level agreement, and the terms and conditions when consuming the service and paying for it.

There is another extension of the SOA paradigm. It relates to the roles that come into play in service networks. In SOA, three basic roles have been defined: the service provider, the service consumer and the service mediator or broker. In addition to these roles, we follow the proposal of [6] to also consider the service hoster, gateway, aggregator, and channel maker (cf. Fig. 1.2). The *service hoster* is an example for an intermediary that catalogues special types of services, namely infrastructure-as-a-service and platform-as-a-service offerings (commonly termed cloud-computing services). It also provides means to interface uniformly with the providers of these services, i.e., re-hosts services through cloud computing environments. Likewise, the *service gateway* is a specific intermediary that provides interoperability through cataloguing and interfacing with a choice of a 3rd Party B2B gateway, which provides services such as message translation and store-forward processing. The *service aggregator* provides additional value by packaging and combining services. Finally, the *service channel maker* is positioned at the consumer end of the service provisioning chain where services are channeled into user environments and consumed. Other roles may emerge when service networks establish, e.g., a clearinghouse role.

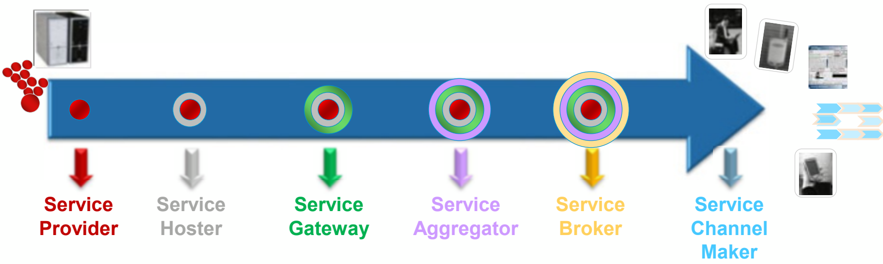

Fig. 1.2: Original SOA roles and additional roles identified by [6].

What is important in our context is the fact that with the many roles involved in the Internet of Services, the need for a common standard in the description of operational and commercial metadata becomes important. Just think about the role of a service aggregator. This role will aggregate atomic services to service bundles or aggregates. As an example for aggregates, you may think about packaged tours where airport transfers, flights, hotel booking and other services are bundled in one package. In a similar way you could think about an export service as a bundle of logistic services, insurances, services of the customs authority, technical certifications for the target country, export credit guarantees and the like.

The economics of bundling is defined by the cost of aggregation in relation to the perceived benefit. Obviously, the cost is dominated by the integration cost. It is exactly this integration cost that can be lowered by a common standard such as USDL. Ideally, a composition of USDL-described services can be based on a standardized tool chain and therefore be performed efficiently and at low cost.

Summarizing, the Internet of Services wants to make services tradable in digital media. In particular, with USDL, we want to offer a standard that creates a *commercial envelope* around the services. Technical services may be lifted to business services, but the same standard should also be able to describe more manual or physical services. As many services have a hybrid character with both, a digital and physical or manual footprint, a unified service description language can facilitate the combination and aggregation of such services.

1.3.3 Software Applications and Services

One question both for SOA and for the Internet of Services is the relationship between services and traditional applications such as Enterprise Resource Planning Systems. Here, we suggest the following two-dimensional approach.

In one dimension, we distinguish according to the *frequency of use* of a certain function. Consider an entry in an accounting system. This is something that happens daily in a business. The frequency of use for such a function is therefore very high. On the other side, you may have a rare business situation such as an export of your product in some unusual country. In order to deliver to this country, you are looking for special export services. This happens rarely, maybe only once in the history of your company. Between these two extremes, you may have situations where your ratings for the creditworthiness of new customers are required, which you need, e.g., 10 times a year.

As a second dimension, we suggest the *degree of integration* into the existing core processes of a business. The degree of integration concerns the amount of data that must be exchanged and the number of interaction points within a process. As an example, the creditworthiness check is needed at exactly one interaction point (when defining the payment conditions); the input to the service is the customer name and registration, while the output is a rating on some scale. This could be considered a shallow integration, while the export example needs much more interaction points and more data. On the scale, it can be considered to be a service with a high degree of integration.

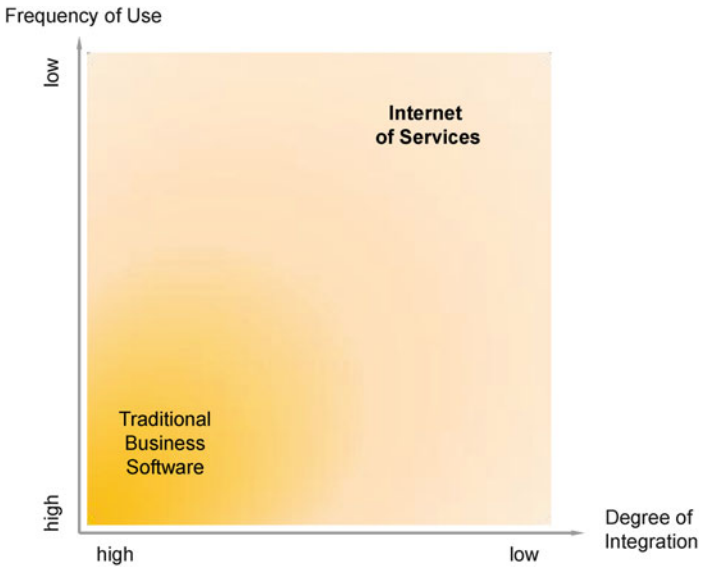

Fig. 1.3: Classification of services according to frequency of use and degree of integration.

The two dimensions span a function matrix as depicted in Fig. 1.3. Traditional application suites, such as SAP's Business Suite, with a high degree of integration are in the lower left corner, while we anticipate a whole range of services in the other sectors of the matrix. All these functions are provided by some sort of socio-technical system: for traditional software, the application is complemented by consulting, maintenance, call centres and training services, while other parts of the matrix may have an even stronger emphasis on the involvement of human resources.

Let us discuss two simple implications for this landscape. First, look at pricing. The traditional model for software is that of a flat rate, either licensing and maintenance fees, or Software-as-a-Service monthly flat rates. In any case, you can use the system as much as you like, while if you do not use it, you still pay the costs. For services, that you rarely use, you would expect a completely different pricing scheme. You may accept a moderate fixed rate to have access to a service ecosystem, but you will be willing to pay a higher price for a special service that fulfils your needs.

A second consequence is related to the degree of automation for exception handling of a service. In highly integrated functions with frequent use, automated exception handling usually covers more than 99% of all conceivable states of a service. This is different for services that are in other parts of the service matrix. Here, it may be a better choice to always keep some significant social interaction (by phone, mail or in person) deliver value. This allows for a higher flexibility and makes it possible to also respond to less standardized requests.

According to the functional matrix, we anticipate that standard software in the future will be complemented by some form of service delivery framework, e.g., [6], which enables a broad ecosystem, i.e., the Internet of Services, to deliver services on a common technological basis. We consider USDL to be one of the foundational technologies to set up such an Internet of Services around core enterprise systems as we know them today.

1.3.4 Applying the Internet Economy to the Services Sector

From an economic perspective, one of the basic features of the Internet is that it connects communities at marginal communication costs. Markets that were fragmented without the Internet suddenly are connected. Sometimes, this phenomenon is referred to as the long-tail opportunity [4].

A well-known example is books with a limited audience. There may be some hundreds amateurs around the globe that appreciate a book such as "Butterflies of the Caribbean" or similar titles. Without the Internet, it would be very hard for an editor or a bookshop to find the people that show an interest and a willingness to pay for such a book. The barrier to produce the book would be very high and it would be most likely that the book never appears on the market. With the Internet, the limited community can be reached and the long-tail books suddenly can be marketed profitably. Products for smaller groups with special interests or needs suddenly can be marketed profitably over Internet media.

The same situation also holds for service ecosystems. Apart from providing highly standardized and low-priced services with economies of scale, or highly individualized premium services, we anticipate mass-customized services to play a prominent role in future service ecosystems. As an intermediate between an economy of scale [16] and an economy of scope [18], we speak about an economy of micro-scale. We expect new business opportunities for such services to materialize systematically in the future service ecosystems. The economic set-up and an efficient channel for such services depend on service delivery platforms and a corresponding service ecosystem design including the right rules and business models for such ecosystems.

1.4 The Unified Service Description Language

The previous section made clear that an Internet of Services requires a way of describing services to wrap a service and expose it in a novel way. We have learned that a service is not only considered as the invocation of a technical interface, but rather as an economic or social transaction with a broader context. Therefore, it is essential to describe the price scheme, the service level agreement, or the terms and conditions when consuming the service and paying for it. With the many roles involved in service networks, the need for a common standard in the description of operational and commercial metadata becomes important.

None of the existing approaches responds to the needs of having a comprehensive service description in an Internet of Services setting. In particular, SOA description efforts provided means for formally describing IT services but do not allow describing the commercial conditions under which the service is consumed or under what operational conditions a service can be invoked. Further, SOA description approaches do not consider physical or hybrid services.

Therefore, we contribute *USDL, the Unified Service Description Language*, as a standard that creates a commercial envelope around a service. Technical services may be lifted to business services, but the same standard should also be able to describe more manual or physical services. As many services have a hybrid character with both, a digital and physical or manual footprint, a unified service description language can facilitate the combination and aggregation of such services. We consider USDL to be one of the foundational technologies to set up such an Internet of Services around today's core enterprise systems.

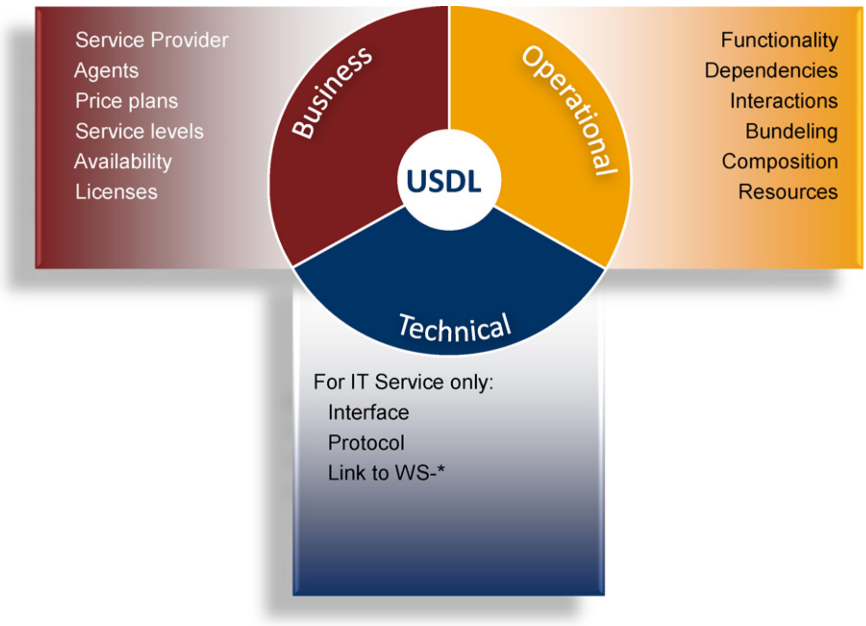

Fig. 1.4: USDL unifies business, operational, and technical master data of a service.

USDL comes into play for the aspect of standardization (cf. Section 1.1) as a normative and balanced unification of service information, which is required to further capitalize on the growth potential of the services industry. The unified description established by USDL is machine-processable, considers technical and business aspects of a service as well as functional and non-functional attributes, and provides both a blueprint and means for extensibility.

The Unified Service Description Language (USDL) is proposed as a normative and comprehensive master data model for the commercial meta data of IT, physical, or hybrid services. More specifically, USDL allows a unified description of business, operational and technical aspects of services as depicted in Fig. 1.4. USDL aims at a holistic service description putting a special focus on business aspects such as ownership and provisioning, release stages in a service network, composition and bundling, pricing and legal aspects among others, in addition to technical aspects. It proposes a consolidated foundation for service-based systems enabling different roles to participate in diverse aspects of provisioning in service networks.

1.5 Strategic Implications

In the previous sections, we have presented the approach of the Internet of Services, its relevance, the state of the discussion, the basic concepts, and the Unified Service Description Language as a standard to facilitate interoperability and fluidity of novel service networks. What are the strategic implications of the approach?

First let us talk about the role of platforms as *trust gates*. Service networks will imply many smaller players, often specialized in a small range of specific services (e.g., export services). In most cases, a potential service consumer will not know the party that is offering such a service. From a buying psychology point of view, one main consideration of the service consumer will be: *Can I trust this service provider?*

Bigger platforms can be trust gates in this situation. Combined with community ranking, well known from places such as eBay or Amazon, the platform can act as a business mediator in a double sense: it can match request and offering, but it can also act as a trust gate for the integrity of the offerings. This can happen by some form of checking the offerings before they are published on the platform (such as certifications in app stores), it can make use of community based reputation and rating systems, but it can also be done by sanctions against business partners that do not comply with certain standards.

These measures can lead to a reasonable level of trust on the consumer's side to also acquire new or unknown offerings. Of course, this trust federation — from a known platform brand to an unknown service provider — requires a strong brand of the platform operator. This brand may build on companies, cooperatives, a regional organization (such as a chamber of commerce) or even the public sector. In any case, strong related brands — software companies, internet companies, telecom operators or strong local brands — have a significant opportunity to extend their business in their installed base.

What we have seen in the Internet Economy, is an immense concentration of the market power of the big platforms. Some have been talking about *Internet Islands*

[17], where non-interoperable segments in the web are dominated by some platform operator. We think that a similar approach in the service sector would not be sustainable and are looking for a more pluralistic approach. A right balance between the service providers and the bigger platforms can lead to a powerful and sustainable growth in the service sector, leveraging the possibilities of Internet technologies for new forms of value creation.

In this light, the Unified Service Description Language can be seen as a conscious choice to shift market power to the service provider. Once a provider has described his or her service in USDL, he or she can publish it multiple times and on different platforms. This is in contrast to proprietary platform services descriptions that would create barriers between the platform islands imposing additional effort on the providers if they wanted to use more than one platform as mediation and delivery channels.

In return, we think that this will also be beneficial for the platforms, as they will be able to expose and mediate a much wider range of services and service bundles quickly. This is also better for the customers of the ecosystem, as there are no artificial technical barriers to profit from a broad spectrum of service providers. We anticipate that bigger platforms with powerful brands, combined with agile and innovative service providers can create ecosystems that are as open as possible, and as controlled as necessary to guarantee quality and reliability. With USDL, we want to create the right technical basis for a win-win interplay between internet-scale service mediation and delivery platforms and small and mid-sized service providers.

We anticipate that the basic set-up described above will develop new processes that we have not seen in the service economy so far. An example may be the innovation process around services. Most services can indeed not be protected by patents or similar forms of IP protection. A platform with a certain market power could of course introduce something similar — just based on the contracts with service providers in the ecosystem. They could set-up a registration instance, where a novel service could be registered with a time stamp. If some sort of fair decision body acknowledges the innovative character of the service, the platform could guarantee for a certain period (probably rather months than years) that no similar service may be offered in the marketplace of the platform. This would create a strong incentive for the service providers to create unique selling propositions through service innovations.

We anticipate that the overall approach for the Internet of Services and USDL will help to unlock the long tail in service networks. We think that both for the business area and consumers this will lead to a wide range of relevant new services. They will create tangible benefits for their users and economic growth with new value propositions.

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