

Enabling Services – A new business perspective in Telecommunications

1. Introduction

In the telecommunications sector, the convergence of the industry sectors media, IT, and telecommunications [ZPS+00] and the deconstruction of the telecommunications value chain [LW02] leads to a distributed production of end customer services: end customer service providers increasingly look for options to outsource parts of end customer service production and application developers make use of preliminary services during end customer service development.

The deployment of platforms, which offer access to preconfigured modules, often referred to as Enabling Services, is predicted to significantly facilitate distributed ICT service production. Nevertheless, up to this date there does not exist a clear and common understanding of Enabling Services. The paper fills this gap by providing a definition. Moreover, it presents an approach to the segmentation of Enabling Services. In contrast to previous research in this field, the paper does not base on purely technological considerations, which focus on network architecture. Rather, a business oriented analysis based on the demand for end customer services in the ICT sector is carried out.

Service oriented approaches to the provisioning of telecommunication services emerged with the design of convergent network architectures such as the IP Multimedia Subsystem [KK05]. A comprehensive environment for the development and execution of end customer services in such architectures is provided by Service Delivery Platforms (SDP). Services on SDPs represent network capabilities, which facilitate the development of heterogeneous end customer services in convergent networks.

Network capabilities only account for a small part of the value, which characterizes sophisticated end customer services. Developers of end customer services potentially want to make use of preliminary services far beyond network capabilities. This demand has not been sufficiently addressed by former research. In contrast to prior research in this field, we approach the identification of preliminary services by analyzing end customer demand. In our concept of Enabling Services we combine results from the demand analysis with the technology oriented concepts of service provisioning.

This research is based on workshops and interviews with ICT service providers and draws on intensive desk search.

The paper is structured as follows: In Chapter 2 we analyse former approaches to a service oriented provisioning of network capabilities. Chapter 3 presents end customer service trends and introduces a value chain for the production of end customer services. In Chapter 4, we propose our definition of Enabling Services and a segmentation of Enabling Services along the value chain. The paper concludes with an analysis of the benefits, Enabling Service platforms provide to end customer service providers in Chapter 5.

2. Service Oriented Provisioning of Network Capabilities

The evolution of network technology is strongly influenced by the growing importance of data services. As opposed to voice traffic, data traffic is increasing exponentially [PBS06]. The data capacities of mobile and fixed line access networks now support high value data services. Such services should ideally be delivered to customers regardless of their current type of network connection. In order to facilitate the development of access agnostic and seamless services, Service Delivery Platforms (SDP) are introduced into networks.

A **Service Delivery Platform (SDP)** is an environment or framework that enables the development and deployment of telecommunication services. (cf. [Pav07] [Mul06], [Bie06]). Such an environment offers pre-configured service modules, which provide network agnostic next-generation network functionalities.

SDPs enable a 'bottom-up' development of end customer services: end customer service developers can design services out of preconfigured components. As Figure 1 illustrates, the developers create and manage their end customer services in separate execution environments. An SDP enables the usage of preconfigured components and offers standardized interfaces to end customer service developers. The components in an SDP can operate on various physical networks and heterogeneous implementations. Depending on the specific access type of an end customer, the components choose the appropriate network: components flexibly make use of infrastructure functionalities in the corresponding networks (e.g. IP Network, PSTN or 3G Networks). The specific implementation of a component's functionality resides within the networks. Supported by SDPs developers do not any more have to integrate their end customer services into a specific network. That way, an SDP decouples end customer services from infrastructure.

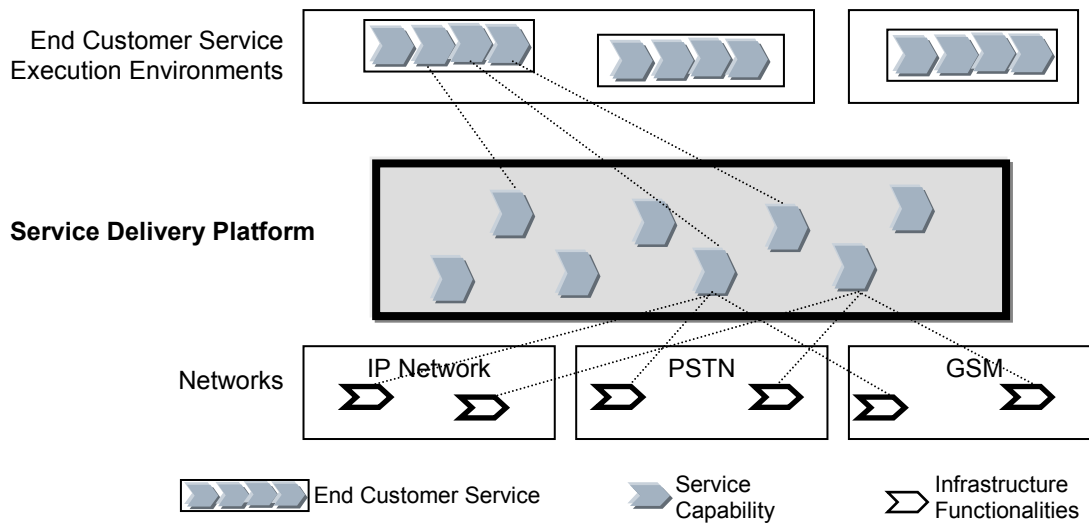


Figure 1: Service Delivery Platform

The above definition does not describe the actual components of an SDP. Such a specification is provided by the Open Service Access (OSA) standard [UVB06]. It identifies specific components, so called Service Capabilities, and describes their interfaces in an Application Programming Interface (API). Service Capabilities are defined as follows:

Service Capabilities are open and technology independent building blocks. They are needed to realize applications [end customer services] and enable them to make use of the underlying network functionality. Service Capabilities reside within network control and offer functionalities (Service Capability Features), which shall be applicable for a number of different business and applications domains through standardized application interfaces. (based on [3GP07], [UVB06, pg. 40])

OSA distinguishes between two types of Service Capabilities: Framework and Non Framework Capabilities. Non Framework Capabilities (e.g. Session Control, Multimedia Messaging) directly contribute to the provisioning of end customer services. Framework Capabilities (e.g. Registration, Discovery) support the development and management of end customer services.

The scope of functionalities, which are addressed by Service Capabilities and provided on SDPs, only cover infrastructure and network functionalities such as data transport and control. In contrast, to develop integrated ICT applications, end customer service providers require functionalities, which go far beyond infrastructure and network functionalities. In the subsequent chapters, we will identify and analyze such functionalities and show how they can be outsourced as Enabling Services.

3. A Value Chain for the Production of End Customer Services

Whereas the previous chapter described network technologies, which provide the infrastructure basis for Enabling Services, this chapter focuses on the analysis of end customer demand for ICT services. We give an overview on trends for end customer services. Such trends suggest required activities to produce future end customer services. We structure these activities in an end customer service value chain, which determines the future demand for outsourcing services in the ICT market.

In order to give an overview of potential demand for end customer services in the future, we distinguish five segments of end customer services and briefly describe important trends.

- **Information Services** support the provisioning of information to end customers by creating and processing information, and by aggregating and organizing various information sources. Within the Information Services segment, developments around Web 2.0 [O'R05] are currently dominating the market. New services have an increased degree of user participation and create an overload of redundant, excessive, noisy, or unhelpful information. This in turn generates a demand for applications that support end customers by automatically pre-selecting, refining and personalizing information.
- **Communication Services** support the exchange of messages between humans and machines by transmitting text, speech, graphics, and data. A major trend in Communication Services is the convergence of telecommunication and IT infrastructures and devices. This enables highly integrated applications, which provide and combine communication functionalities with traditional IT applications such as enterprise resource planning systems. A second trend is Communication as a Service (CaaS). Similar to Software as a Service, CaaS is the combined provisioning of communication applications and the underlying hardware technology as a service over a network.
- **Transaction Services** encompass all types of services, which support business-customer transactions in the information, contract, and settlement phases. A main issue in Transaction Services is marketing [Pri07]. Outdated concepts of mass marketing are not compatible to modern media distribution and fragmented audiences. There is a strong need for more efficient personalization, privacy, and trust systems. As well, customer participation empowerment plays an important role. It describes the involvement of end customers in the production process (cf. [Gou04]). Mainly, this concerns two stages of production: the engagement of customers as co-marketers for marketing and the installation of self-service tasks in order to support distribution. A second trend for Transaction Services is personalization [AM05], which

has the objective to analyze customer interests and behavior. It enables end customer service providers to deliver only content to their customers, which is relevant to them. To assess relevancy, data mining techniques and other artificial intelligence applications can be used.

- **Enterprise Services** support the general cooperation of enterprises and institutions as well as internal (business) activities and processes. A major trend in this segment is flexibility [PFK07]. It deals with a company's adaptability to environmental changes and new requirements. Today's markets are generally characterized by a high competition and environmental complexity due to globalization. Enterprises react by focusing on their core competencies and by decreasing their degree of vertical integration. This trend increases the requirements on systems to support inter-enterprise collaboration and a fast and cost efficient recombination of functions and processes.
- **Entertainment Services** provide multimedia content to end customers over a network. A major trend in the entertainment sector is a shift from passive media consumption to a more active role of the user [KNP06]. This is reflected in the different applications and Web tools like weblogs, wiki, simulated worlds, massively-multiplayer online games (MMOG), and Mash-Up content. It increases the demand for virtual reality and real user services like voice, data, and video. Another trend is the convergence of devices. Devices must be able to handle many different media formats without requiring the user to have profound technical knowledge. Another example is the convergence of Digital Video Broadcasting and IPTV, two different network technologies, into a single TV application. Technological developments enable user participation during TV consumption and better customer retention with new revenue models. Future services might include polls, direct shopping via an IPTV-Channel, a personalization of video on demand recommendations [KNP06].

As these trends suggest, the production of future end customer services requires a wide range of activities. We give a general overview of different fields of activity by using the concept of a value chain [Por80]. The result, an end customer service value chain, is presented in Figure 2. Production activities are for the most part carried out by end customer service providers. Our value chain can serve as a framework for the identification of preliminary services, which an end customer service provider can outsource.

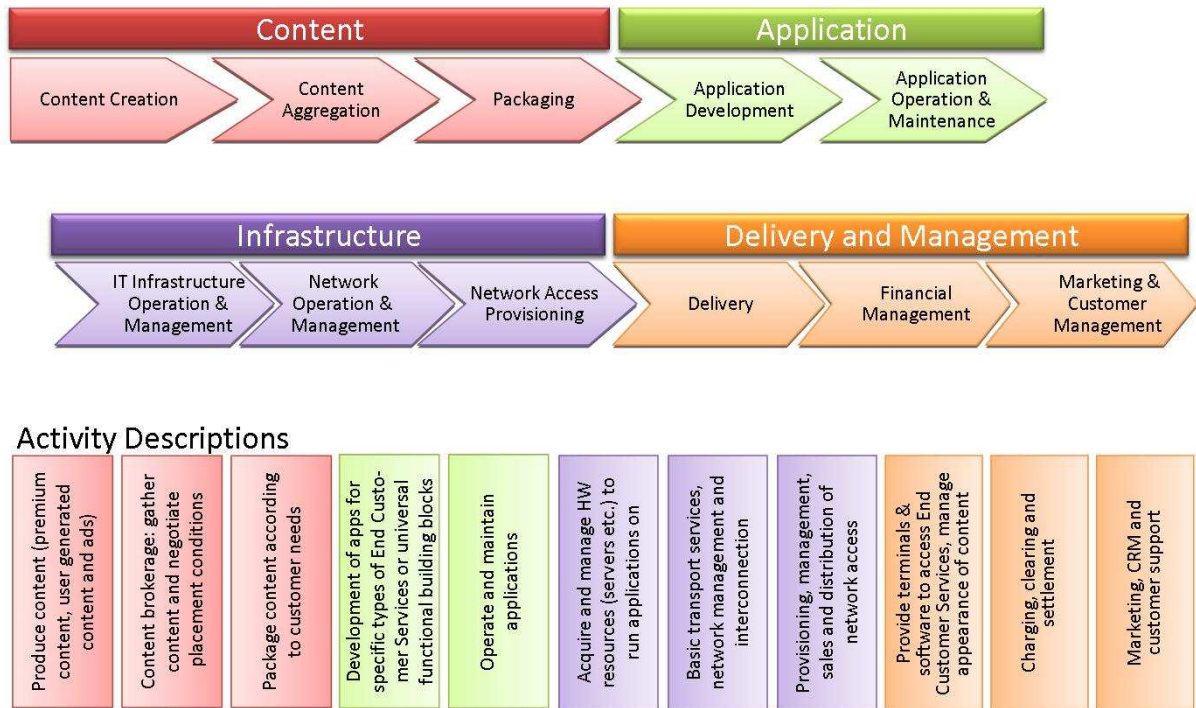


Figure 2: Value Chain for the Production of end customer services

The value chain in Figure 2 is subdivided into four segments: Content, Application, Infrastructure, and Delivery and Management. The linear design of the value chain does not necessarily imply that all segments and activities have to be processed consecutively. The intention is to provide an overview of all required activities. Activities in all four segments are a necessary prerequisite to provide a complete end customer service over a telecommunication network. The four segments are described in more detail in the following.

- The **Content segment** consists of the activities content creation, content aggregation, and packaging. The term ‘content’ does not only refer to information and entertainment content, which is paid for by consumers, but also to user generated content and advertising. Content creation covers all tasks that are needed to produce content such as pre-production¹, production², and post-production³. Content aggregation, as the second activity, includes the gathering of content from heterogeneous sources and the digital rights management. Packaging is the last

¹ Pre-production encompasses all activities that precede the production of content, such as research or script editing.

² Production is the principal process in which the content is produced, e.g. the shooting of a movie, audio recording or the composition of an essay.

³ Post-production comprises all tasks for the final editing of content, e.g. adding visual effects or formatting.

activity in this segment and encompasses the bundling of content according to customer needs. This includes personalization and content protection tasks. The Content segment is traditionally a core competence of the media industry (e.g. TV stations, newspaper publishers, book publishers, and movie studios). More and more, content is also generated by non-commercial users such as bloggers, website owners, amateur film-makers, and musicians, or by users of a service such as VoIP.

- The **Application segment** is traditionally a core business area of IT companies. It comprises all tasks for the creation of software, which supports the production of end customer services. Application operation and maintenance is a prerequisite for the provisioning of applications, e.g. in Application Service Provisioning (ASP) solutions.
- The **Infrastructure segment** is subdivided into IT infrastructure operation and management, network operation and management, and network access provisioning. The IT infrastructure operation and management activity focuses on acquiring and managing hardware resources to run applications. Network operation and management is the core competence of the traditional telecommunication industry. It consists of providing data transportation services and network management. Network access provisioning is offered by retail access providers and includes the provisioning, management, sales, and distribution of network access.
- The **Delivery and Management segment** of the value chain contains activities, which were part of the formerly separate value chains of the media, IT and telecommunication industries [ZPS+00]. With the convergence of these three value chains the delivery, financial management, and marketing and customer management activities will very likely be carried out by just one of the players of the three former industry sectors, namely by the one who maintains the end customer relationship. Delivery covers all tasks that are related to providing terminals and software for the access of end customer services and to the management of the content appearance on the terminal devices. Financial management tasks include the accounting of end customer services as well as of all preliminary services that are used in the production process. Tasks in the last activity in the value chain focus on the management of marketing, CRM and customer support.

4. Enabling Services – Definition and Segmentation

The previous chapters focused on the ‘supply’ and ‘demand’ for preliminary services: All-IP Networks, as described in Chapter 2, supply a service platform to facilitate the ‘bottom up’ development of end customer services. End customer service trends and value chains (Chapter 3) determine an end customer service provider’s future demand for preliminary services. Our definition of Enabling Services in this chapter brings together the supply and

demand view and establishes a common understanding of preliminary services in the ICT sector.

Enabling Services exhibit a number of typical characteristics. These can be summarized as follows:

Enabling Services are characterized as **(1)** well defined preliminary services of end customer services, which are **(2)** offered by preliminary service providers to reduce the end customer service provider's complexity of developing and providing end customer services, and which are **(3)** made accessible through a dedicated IT platform.

Each characteristic is now explained in more detail:

- (1)** As preliminary services, Enabling Services contribute to the production of end customer services. They represent modules with a well defined functionality, which become an integral part of the end customer service. Ideally, an end customer service provider has a large pool of such preconfigured and versatile modules at hand. End customer services could then be mainly assembled by combining and aggregating preexisting Enabling Services.
- (2)** Enabling Services are preconfigured service modules offered by preliminary service providers to application developers in order to facilitate end customer service development and provisioning. They reduce the end customer service provider's complexity of developing and providing end customer services. Application developers can make use of Enabling Services that are implemented and managed by preliminary service providers. Enabling Services only have to be designed and implemented once. Application developers can use them for various end customer services and do not repeatedly have to deal with their implementation. As a consequence, overall development efforts and costs for end customer service providers are lowered significantly and a shorter time-to-market for new services can be achieved. In this sense Enabling Services enable a cost efficient creation of end customer services with shorter development cycles for the end customer service provider.
- (3)** Enabling Services are accessible via software interfaces on a dedicated IT platform. Figure 2 illustrates how end customer service providers make use of Enabling Services during the development and production of end customer services. Application developers use directory and retrieval functions offered by the platform to select an appropriate Enabling Service. Enabling Services are integrated via standardized access methods (interfaces and protocols), which support the use of Enabling Services without requiring a profound understanding of technical and

implementation details. For example, an Enabling Service that offers integrated IP video streaming keeps the end customer service developer from having to deal with technical IP communication details. The Enabling Services platform offers tools to support management tasks of the end customer service provider such as Enabling Services subscription and execution control. Moreover, it facilitates activities of the Enabling Service provider such as charging and clearing for Enabling Services usage. In contrast to SDPs, the Enabling Service Platform not only offers access to network functionalities and information but to all kinds of preliminary services, which support different activities of the value chain. The production of Enabling Services, including the operation of the necessary production environments, lies fully in the Enabling Service provider's responsibility.

Having established a common understanding of Enabling Services, one can now use the end customer service value chain (Figure 2) to identify services, which an end customer service provider could potentially outsource. In the following we present Enabling Service segments and name exemplary services.

- **Content creation services** address all issues related to the actual production of content. An exemplary Enabling Service in this field is the provisioning of applications for content editing and postproduction.
- **Content aggregation services** focus on gathering multimedia content together with the corresponding licenses from different sources. An exemplary Enabling Service, the advertisement brokerage service, manages the placement and personalization of advertisements as a service for end customer service providers and advertisers
- **Packaging services** deal with preparing the content of the end customer service according to the needs of the specific end customer. Based on information about the end customer and his context, content is selected from the aggregated content pool and possibly bundled, for example by using location information to bundle information with advertisements.
- **Application development and maintenance services** cover the creation of software and its operation to provide specific functionalities within the end customer service production process. E.g., authentication procedures are essential parts of many end customer services. Such functionalities can be outsourced to providers, which offer remote access to such functionalities and manage the operation of the necessary applications and the underlying hardware.
- **IT infrastructure operations and management services** encompass the management of the entire IT hardware infrastructure, which is necessary to produce

end customer services. E.g., utility computing services provide hardware resources (such as storage capacity) as standardized commodity services, similar to traditional utilities such as water and power supply.

- **Network operation and management services** primarily deal with network related tasks, i.e., the installation and operation of networks. Moreover it encompasses the integration of traditional telecommunication networks with IP-based systems. An exemplary Enabling Service is the aggregation of WLAN access points of various Internet Service Providers (WiFi Roaming). Using this service, an Internet Service Provider can interconnect his own network with other networks to increase network range. As well, it can outsource authentication, authorization and accounting services.
- **Network access provisioning services** encompass the provisioning, management, sales, and distribution of network access to end customers. Access providers can be offered outsourcing services in financial management and marketing and customer management (see below).
- **Delivery services** address all issues associated with the provisioning of end customer services to the end customer. This includes technical aspects such as the provisioning of terminals and software to access end customer services. Moreover, it comprises the appearance of the delivered content, i.e., the adoption of content to terminal capabilities and to customer specifics such as his language. E.g., a content terminal adaptation service adjusts content to the capabilities of an end customer's terminal.
- **Financial management services** focus on the accounting of end customer services, which are sold by end customer service providers to their customers, as well as of preliminary services. It includes charging, clearing and settlement issues. E.g., a charging service tracks service consumption and debits user accounts.
- **Marketing and customer management services** encompass all activities with direct end customer contact. It comprises customer support during service delivery and customer relationship management. An exemplary Enabling Service in this field is a usage data analysis service, which helps an end customer service provider to examine end user behaviour.

5. Benefits of Enabling Service Platforms

An essential component of the Enabling Service definition presented in the previous chapter is the application of a platform concept. Similar to SDPs, features of Enabling Service Platforms offer significant benefits to application developers.

End customer service providers make use of an Enabling Service Platform during the development and execution of end customer services. Such a platform supports end customer service development by offering preconfigured components through standardized interfaces. Platform management tools such as Enabling Service search and execution control functionalities⁴ provide additional support. By making use of an Enabling Service Platform, end customer service providers benefit from reduced development costs and a shorter time-to-market. Moreover, a platform allows flexible B2B relationships through the exchangeability of standardized Enabling Services.

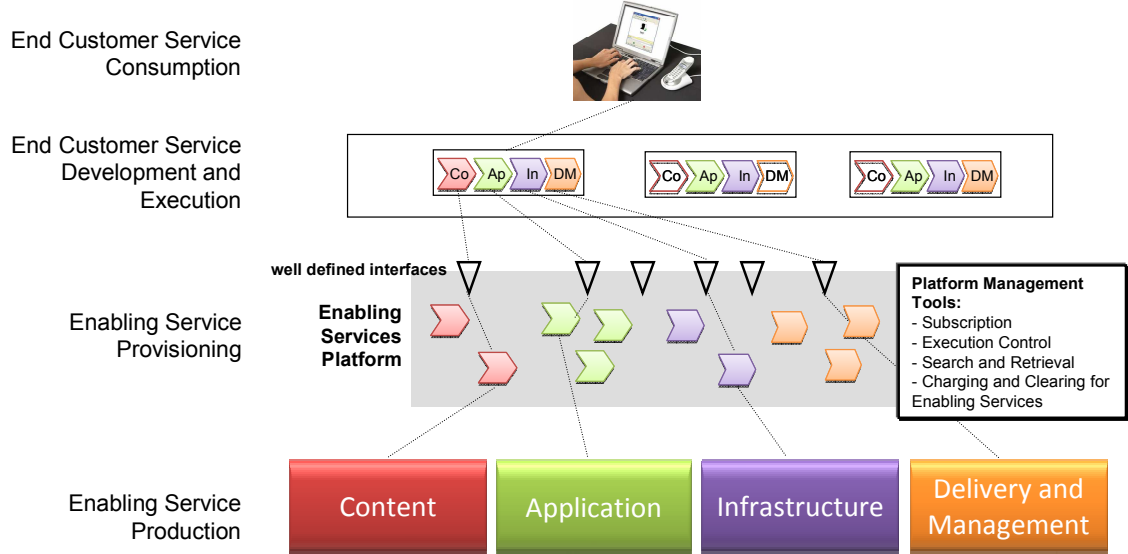


Figure 3: Enabling Services Platform

Enabling Service Platforms do not only address traditional end customer service providers in telecommunications but also new market entrants such as Internet application developers. Internet companies do not own network infrastructure and base their business models on the Internet. They are relatively new to the telecommunications market and cannot build upon established outsourcing and supply relationships, e.g. for a supply with an end customer’s location and presence information. To them, an Enabling Service Platform with a multitude of preconfigured components will significantly facilitate end customer service development.

⁴ Execution control functionalities coordinate the access to Enabling Services, manage the Enabling Service workflow, and manage failure handling.

6. Summary

The object of this paper was to establish a common understanding of Enabling Services in telecommunications and identify potential fields for service outsourcing (Enabling Service segments).

In Chapter 2 we explained the concept of Service Delivery Platforms. Such platforms are introduced to facilitate the development of access agnostic high value data services in all-IP networks. They provide a technical environment to support the deployment of preliminary services for the production of ICT end customer services. Such platforms concepts are presently restricted to hosting services, which provide network capabilities, e.g., data transportation services.

In Chapter 3 we argued, that the potential for supplying outsourcing services goes far beyond network capabilities. We identified a multitude of promising trends and described consumer services in five service segments: Information, Communication, Transaction, Enterprise and Entertainment Services. In order to illustrate the breadth of activities, which are required to provide integrated end customer services like the ones identified in the trend analysis, we designed a value chain for the production of end customer services. This value chain consists of four segments: Content, Application, Infrastructure and Delivery and Management. We take this structuring as a starting point for the identification of preliminary services, which an end customer service provider can outsource or make use of during application development.

Under the term Enabling Services we subsume all ICT services which contribute to the production of end customer services as preliminary services. In Chapter 4 we presented our understanding of Enabling Services and subsequently identified various fields for service outsourcing (Enabling Service segments) and exemplary Enabling Services.

We concluded with an analysis of the benefits of Enabling Service platforms in Chapter 5. Such end customer service development and execution environments provide valuable functionalities to ICT service developers and particularly address Internet application developers with low development experience in the field of telecommunications.

Economical developments in telecommunications such as convergence [ZPS+00] and the creation of value networks [LW02] stimulate the development of new products and services. Based on the concepts of service orientation [MBD07] and all-IP networks, the distributed production of end customer services and service outsourcing have become important economical choices of action. This paper analyses service outsourcing and service supply in telecommunications from an economical view. To fully appreciate service oriented concepts in telecommunications, there remains a strong requirement to further study the economical aspects of service outsourcing and platform deployment in telecommunications.

7. Literature

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