Business Models of Developer Platforms in the Telecommunications Industry – an Explorative Case Study Analysis

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Abstract

Digital platforms are re-shaping organizations and markets. In particular, telecommunication companies are challenged to control digital platforms and to engage generative ecosystems. In order to provide a point of departure for future research, we conduct an explorative case study analysis to determine the state of the art of business models of telecommunication operators' developer platforms. The contribution of our study is three-fold, providing insights on business model design, platform control and competitive strategy. Specifically, we find that the business models provide the prerequisites for effective and efficient new product development and tend to leave the customer relationship to complementors. Further, we identify differentiating design decisions and demarcate capabilities that remain in control of operators. Finally, we highlight cooperation, particularly with aggregators, as a means to tackle the challenges of platform fragmentation and increase the platform's functional range. Based our findings we indicate promising aspects for future research in these fields.

1. Introduction

Digital technologies such as service-oriented platforms are re-shaping organizations and markets [1]. In this sense, the ICT industry is rapidly transformed by the rise of platform business models [2]. In particular, telecommunication companies are challenged by the evolution of digital service platforms and have experienced a significant shift in revenue streams [3]. In this context, researchers have identified a business model transformation towards the establishment and control of digital platforms as a key challenge for telecommunication operators [3], [4]. Platforms enable the owners to focus on core competencies, benefit from economies of scale, and at the same time foster complementary innovation and drive economies of scope [5]. In this sense, [6] state that "ICT-enabled services typically depend on generic functionalities like security, billing and customer data management." They do not need to be developed for every single service but can be integrated in service platforms [4], [6], [7]. As such, a growing share of businesses in the IT industry is moving to a service delivery model [4]. In recent years, telecommunication companies have moved to a Network as a Service (NaaS) model, i.e., offering third-party developers access to network capabilities to enable new service development [8]. However, they have struggled to find viable business models to engage generative ecosystems with their platforms [8], [9].

At the same time, much research has been done on the multi-sidedness of platforms regarding price regulation to stimulate adoption and minimize negative network effects [10]. However, according to [11], regulating access and interaction requires business model elements that go beyond efficient revenue distribution. Further, scholars find that platform leadership strongly depends on a viable platform strategy [12], [13]. In this sense, in the spirit of [1] we aim to enhance the understanding of platform strategies and business models in the light of digital innovation. For this purpose, we analyze the developer platforms of telecommunication network operators to provide an overview of their state of the art. Specifically, we ask how platform business models are designed and what the commonalities and differences are among them. Apart from assessing the current status of developer platforms in the telecommunication industry we aim to identify aspects of interest for further research.

This paper is structured in the following way. First, we provide an overview of the literature most closely related to our work. Second, we explain our research approach, which builds on explorative case study research, publically available information, a 3-step sampling strategy and within-case and cross-case analyses. Third, the theoretical background on platforms in technology strategy and management research is outlined and the business model perspective on platforms applied in the analyses is introduced. Fourth, we conduct the case analyses, which

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subsequently are interpreted and discussed in terms of future research potential. Finally, we summarize our findings and remark on the limitations of this study.

2. Related literature

The rise of digital platforms motivated a variety of recent publications which are related to the research in this paper. Thus, in discussing the related literature we focus on the assessment of articles that have been published in high-ranking journals or conference proceedings. With regard to platform control, a major body of identified literature is dedicated to control in mobile platform ecosystems. [14] and [15] develop research frameworks to investigate control in mobile platform ecosystems, while [16] relates the developers' satisfaction to their perception of platform openness to guide platform governance. [17] and [18] focus on platform boundary resources, such as application programming interfaces, as a platform owner's means to balance control over the platform and to foster heterogeneity of developers. In the presence of heterogeneity of use cases engagement with the developer is found to be especially important [19]. With respect to related literature that takes on a business model perspective on digital platforms we identify two different groups. First, we find studies on the developer's perspective on platforms, e.g. to analyze motivation structures [20], work practices [21] and business model preferences regarding Platform as a Service [22]. Second, we identify scholars that elaborate on the business potential of platform models of telecommunication companies [8], [9], [23], [24], [25]. The works closet in spirit to our research approach are [8] and [9], which provide an overview of mobile network operators' initiatives in moving to Network as a Service models. Both scholars find that operators have struggled to attract developers due to fragmentation in terms of multiple programming languages, network APIs, application shops, markets and platforms supported by the same operator. At the same time, recent announcements show that operators confidently embrace the service enabling proposition offered by their developer platforms [26], [27], [28]. Thus, we study telecommunication operators' developer platforms to assess their state of the art and guide future research.

3. Research approach

In this paper we employ an explorative case study approach in the spirit of [29]. That is, we review available primary and secondary documentations of developer platforms and document facts that can be identified within a particular case. The assessed data is collected from publicly available sources including operator websites, press articles, product specifications and member newsletters of developer programs. In order to increase the validity of our findings and examine differences between cases, we use a multiple case study approach. We document the developer platforms provided by three telecommunication network operators, selected based on the following characteristics. First, the telecommunication operators must have a world-wide presence. Second, assessed operators need to have stated a strong commitment to digital innovation. Third, the companies should be considered pioneers in opening network capabilities to long-tail third-party developers. The companies' developer platforms should have received press attention for recent developer initiatives. Based on this case selection strategy, we chose the developer platforms Developer Garden of Deutsche Telekom [30], the AT&T Developer Program [31] and BlueVia [32], a joint initiative of Telefónica and the Telenor group. In order to derive further findings we conduct a within-case and subsequently a cross-case analysis as proposed by [29]. While a within-case analysis aims at documenting the key characteristics of a particular case, a cross-case analysis aims at highlighting major similarities and differences between cases. In both analyses it is important to reduce narrative writing in favor of a structured conceptual framework [29]. For this reason we took two measures in order to avoid typical structural shortcomings in case study research. In a first step we focus our analysis on the business model perspective of developer platforms, recognizing the importance of having a unique business model for a firm to fully realize its commercial potential of technological inventions [33]. As a second quality measure, we structure our analysis according to the business model framework proposed by [34], which provides a holistic view on digital business models. The framework considers four dimensions: (1) value proposition, which comprises the value creation for the customer through offering products and services; (2) value architecture, which focuses on the way an organization's resources are configured; (3) value network, which includes the relationships with different stakeholders to deliver the value proposition; and (4) value finance, which is concerned with issues related to costing, pricing and revenue breakdown to sustain or improve the value proposition.

4. Theoretical background

Platforms are characterized by a set of relatively stable core components connected to highly variable complements through interfaces [5]. Within a platform

architecture, component reuse often facilitates economies of scale at the core and enables economies of scope at the system level [5]. As such, platforms have played an important role in various fields of research including product development, e.g. [35], technology strategy, e.g. [36], and industrial economics e.g. [37]. Accounting for the different perspectives applied to platforms, [38] proposes a typology that distinguishes platforms according to their scope. In this sense, internal platforms are found within the boundaries of a single firm, while supply-chain platforms are shared among members of the same supply chain. From a business perspective external firms are said to be loosely coupled to industry platforms and enable the platform owner to benefit from external innovation and facilitate co-creation of value in an effective and timely manner [39]. This business perspective has gained the attention of various technology strategy and management researchers, such as [36], [40]. Scholars have provided recommendations on how to gain and retain platform leadership which [40] describe as "the ability of a company to drive innovation around a particular platform technology at the broad industry level". Especially in industries with short product and service life-cycles, the source of new knowledge is often external to incumbent firms [41], [42], [43]. Incumbents with competencies in manufacturing or marketing are often well positioned to benefit from technological change, even if it is radical in nature [44]. Thus, [44] posited that the fully integrated incumbent is the firm best positioned to benefit from innovation through exploitation of existing complementary assets. In general, it has been recognized that outside complementors are of high value in markets where consumer tastes and technological developments are uncertain [5]. This is as (outside) complementors can contribute additional skills, capabilities, customer knowledge, investment capital – without requiring a formal employment contract [5].

In the context of platforms, the business model encompasses the aspects inferred above, i.e. the way a company aims to benefit from complementary innovation around a particular technology. The business model comprises how a firm economically engages with external parties outlining the value proposition and its delivery towards stakeholders and customers [45]. In this regard a key role of the business model is found in converting value inherent to new technologies into market outcomes [33]. According to [34], a business model details four dimensions: value proposition, value architecture, value network and value finance. Drawing from studies on network operators' platform business models and developers' perception on platforms, [8], [16], [22], the following value proposition components can be distinguished: knowledge exchange with the platform owner and among developers, service enabling through offered APIs, technical and business support provided for application development as well as the facilitation of software distribution. Considering the challenge of fragmentation as in [8] and [9], important aspects of the value architecture consist in network interoperability and hosting of APIs, while the value network is characterized by the key partnerships necessary to deliver the value proposition [34]. Finally, the price models dominating pricing of API usage and of software monetization are core to the value finance dimension [22].

5. Case analysis

The case analysis is guided by the business model perspective as introduced in the previous chapters and depicted in Table 1. While Table 1 illustrates and compares the developer platforms' business model specifications, Table 2 details the platforms' service enabling propositions and the way they are facilitated through the design of the value architecture, the value network and the value finance. The definitions and categorization of the specific service enabling concepts are adopted from [46].

5.1. Within-case analysis

In May 2009 the German incumbent carrier, Deutsche Telekom, launched its developer ecosystem Developer Garden. Developer Garden offers a product portfolio of APIs, development tools, web services and components. Developer support and knowledge exchange, both with the platform provider and among complementors, is facilitated through a variety of services and resources, such as technical documentation, development tools, newsfeeds, blogs, forums, seminars, conferences and hackathons, as well as a business incubator and a venture program. As detailed in Table 2, apart from classical telecommunication services, such as messaging or voice calling, in particular, the Telekom Tropo API stands out. It provides access to multiple unified communication features, e.g., conference calling, text-to-speech and voice recognition. Since July 2012, the platform integrates a leading mobile development marketplace to facilitate access and monetization of software components and markets sophisticated tools for code analysis and application visualization. Deutsche Telekom has integrated all APIs into its private cloud infrastructure to benefit from the high reliability and security of its network. Developer

Garden relies on a diverse partner network. The Tropo API is founded on white-label technology of the leading cloud telephony provider Voxeo (www.voxeo.com) that runs on Deutsche Telekom's private cloud infrastructure. Developer Garden's component marketplace and cloud-based development tools are provided by partner companies. Key strategic partnerships include large software companies to drive availability of software components and application innovation. Additionally, Deutsche Telekom cooperates with other carriers to drive the standardization of network APIs and cross-carrier interoperability. As a result, in February 2013, the launch of the API broker platform GSMA OneAPI Exchange has been announced. The platform enables operators to integrate standardized or proprietary APIs that interoperate across the networks connected to the platform. With respect to value finance, registration to Developer Garden is free of charge and facilitated via an easy sign-up requiring name, email address and agreement of terms and conditions. The developer is provided a prepaid account based on credits to manage all monetary transactions within the developer platform. Payment APIs employ a revenue sharing model, while charges of all other APIs are usage-based or free. Monetization of software components and tools in the component marketplace as well follows a straightforward revenue sharing model.

Table 1. Business model components of telecommunication operators' developer platforms

BM components			Developer Garden	AT&T Developer Program	BlueVia
Value proposition	Knowledge exchange		Newsfeeds, Blogs, Forums, Seminars, Conferences, Hackathons		
	Service enabling		Content aggregation (CA) and personalization (CP), Financial management (FM), Communication[1] (Co)		
			IPTV		*M2M,* ***Authentication (Au)***
			M2M	***mHealth (mH), Digital rights management (DRM)***	
	Technical support		Technical documentation, Development tools		
			Quality assurance tools		
	Business support		Business incubation and venture programs		
	Software distribution		***Component marketplace***	*Application certification, Marketing support*	
				Application store	
Value architecture	Interoper-ability[3]	Internat.	CA, FM, Co, M2M	CA, Co[2], DRM	CA, FM, Co, M2M, Au
		National	CP, IPTV	CP, FM, IPTV	CP
	Hosting		Private cloud infrastructure, Integration of white-label APIs		
Value network	Key partnerships		API aggregators, Large software companies, Cross-carrier cooperation		
			Component marketplace provider, Development tools provider		***Payment solution providers, Financial intermediaries, OEMs***
Value finance	API usage		***Pay-per-use***	***Subscription-based allotment***	***Revenue sharing***
	Software monetization		Revenue sharing		

Legend: Commonality – *Diffentiator* – ***Unique Differentiator***; [1]*includes Unified communications, Messaging, Telephony (only Developer Garden), Mailbox (only AT&T Developer Prog.);* [2]*except for Messaging (National);*[3]*for mH API information on interoperability not applicable*

AT&T's developer program has experienced a significant boost in recent years: According to [28], API calls on AT&T's network have increased from 300 million to 4.5 billion per month by the end of 2011. The value proposition of AT&T's developer program builds on APIs as specified in Table 2, development tools and content, as well as technical and go-to-market support. Developers are encouraged to benefit from an incubator and established sales channels, like the AT&T Appcenter, its Certified Solutions Catalog, and its Small Business Catalog. Further, AT&T implemented a white-label technology for unified communication solutions in its private cloud infrastructure to extend its value proposition. From an organizational perspective, AT&T partners with large software companies to enhance availability of software tools and other resources for long-tail developers. After Deutsche Telekom, AT&T is the second major operator to partner with the cross-carrier cloud telephony provider Voxeo. While pricing for AT&T's payment and advertising APIs follows a simple revenue sharing model, other APIs are priced according to subscription-based allotments: i.e., for a yearly

membership fee an initial allotment of monthly API calls is free of charge, while calls above this threshold are charged on top in smaller allotments. This pricing is designed to set low entry barriers to encourage experimentation and profit from applications that have become successful. Developers receive a revenue share for applications sold through AT&T channels.

In December 2010, Telefónica released the first version of its BlueVia platform. BlueVia provides development tools, developer support, facilitates information exchange and offers access to its incubators in multiple countries. The platform offers APIs for messaging, location request, authentication management, user context information, advertising and payment of digital goods as listed in Table 2. Additionally, a unified communications API is provided in an alpha version. Further, BlueVia has established a dedicated marketing support team, promotes applications on various media channels and offers application accreditation. APIs are made available through various affiliated networks within the carrier's footprint in Europe and South America. In particular, Telefónica's aims to expand the reach of its payment API and make operator billing capabilities available on affiliated and partnering networks. Since October 2012, Telefónica and the Telenor group run the BlueVia initiative in a joint effort integrating Telenor APIs in the BlueVia platform. Both operators show a strong commitment to jointly drive service enablement based on operator-billing capabilities. In this regard, announcements have been made to especially target the Latin American market. For this purpose a network of partners including mobile payment solution providers, financial management providers, financial intermediaries, such as app portal operators, including Google, Facebook, Microsoft and RIM and most recently in May 2013, the original equipment manufacturer (OEM), Samsung, has been established. Cooperation with large software companies for tool development has been set up as well. BlueVia implements a price model that is based purely on revenue sharing with the developer: revenues the developer generates through messaging transactions, payments and advertisement services facilitated by BlueVia APIs are shared, while usage of other APIs is free of charge.

5.2. Cross-case analysis

The business models of all three developer platforms comprise the means to provide knowledge exchange, service enabling, support in technical and business matters and facilitation of software distribution. Knowledge exchange is facilitated through various offerings, including newsfeeds, blogs, forums, seminars, conferences and hackathons organized by the developer programs. Besides informing on technical and business matters, the knowledge exchange proposition aims to incentivize idea generation and conceptual design of innovative services.

As platforms for third-party development, service enabling is at the core the value propositions. As seen in Table 1 all three platforms enable services for content aggregation, content personalization and financial management. Enabling services for communications, such as telephony, mailbox and messaging solutions, are provided either through one API for unified communication solutions, or separately via specific APIs. Apart from these similarities, the service enabling propositions differ in the following aspects. While both Developer Garden and BlueVia offer APIs for M2M solutions, AT&T plans to open its mobile health platform to developers. Regarding the development of IPTV applications, AT&T already offers an interface, while Developer Garden has announced similar intentions. Further, AT&T offers a specific API for digital rights management, while BlueVia provides access specifically to authentication capabilities.

With regard to support in technical and business matters the following observations can be made. While all platforms provide technical documentation and development tools, Developer Garden has integrated a SaaS tool for quality assurance that stands out in terms of sophistication and price tag. In all three cases business support is fostered by the establishment of incubation and venture programs through which developers may benefit from assistance services, expert knowledge and networks, funding, office space and equipment. In the cases of Telefónica and AT&T, software distribution is supported via application certification services and access to established sales programs. On top of that AT&T runs its own application storefront through which developers may sell applications supporting Brew Mobile Platform. In contrast, Developer Garden provides a component marketplace for software distribution and monetization. Integrating such a marketplace, Developer Garden also may serve as a platform for software acquisition, highlighting its commitment to technical support.

To deliver the service enabling proposition, the platforms expose specific network capabilities to

developers who implement these capabilities in end-customer applications. The size of the addressable customer segment is determined by the reach of interoperable networks participating in the service delivery. Content aggregation and communication solutions are commonly enabled at an international level, while content personalization is provided at a national level in all cases. If offered, M2M capabilities operate internationally, while solutions based on IPTV APIs work nationally only. Interoperability of financial management capabilities has an international scope in the cases of Developer Garden and BlueVia and a national scope in the case of AT&T. All APIs are hosted in the network operators private cloud infrastructure, including white-label APIs for unified communications. Developer Garden's unified communications API is powerful in the way that it provides multiple network capabilities at an international level through only one interface. BlueVia and AT&T announced the provision of similar functional ranges and interoperability through their unified communication APIs. However, technical specifications were not yet available.

Pioneering strategic cooperation with API aggregators, the companies have integrated white-label technologies into their platforms that enable unified communications solutions across multiple networks. In addition, BlueVia focuses on cross-carrier cooperation to enhance its proposition as an enabler of operator-billing solutions. To this end, Telefónica joined forces with the Telenor group and further expanded its value network through cooperation with financial management providers, financial intermediaries and OEMs of mobile devices. In a similar way, Developer Garden's aim to support software development and monetization is based on strategic cooperation with the largest software component marketplace and a leading provider of application security testing solutions. All three platforms cooperate with large software companies to develop software components and tools as well as applications implementing their APIs. Finally, the three operators cooperate to enhance the standardization of network APIs and drive cross-carrier interoperability. In this regard, they recently announced the launch of a broker platform that enables operators to integrate standardized or proprietary APIs that interoperate across the networks connected to the platform.

In terms of value finance three basic price models for API usage can be distinguished. Developer Garden predominantly applies a pay-per-use model, AT&T provides subscription-based allotments, and usage of BlueVia APIs is based on revenue sharing. Finally, application distribution through AT&T's own storefront as well as monetization of software components through Developer Garden's component marketplace are based on revenue sharing with developers.

6. Interpretation and discussion

The business models of the analyzed developer platforms are designed to facilitate knowledge exchange, service enabling, support in technical and business matters as well as software distribution. As such, they are designed to provide transparency and accessibility of the technical platform as framed by [16] and thus, stimulate developers' satisfaction. Likewise they provide the components to accompany the new product development process in an efficient and effective manner [47], [48]. While all platforms support the entire software-life cycle, i.e., design, development, testing, deployment and hosting, we find that business models differ mostly regarding software distribution support and their relationships to end customers. This is as platforms are positioned between two extremes: leaving the commercial relationship with end customers mainly to complementors (enabler platforms) or establishing direct customer links through own sales channels (system integrator platforms), as described by [23], [2]. Since all three carriers promote leading third-party application stores and two have shut down own storefronts recently, we observe a tendency towards the enabler business model. Therefore, it would be interesting to assess the carriers' end customer relationships in more detail and with respect to other platform businesses.

Further differentiation in the value propositions is found especially in the type of services enabled through the platforms and their emphasis on development support. Differentiation strategies, i.e., targeting different markets, like IPTV, mobile health and M2M, may address different segments of developers and should conform to their specific needs. Placing a stronger focus on technical support and quality assurance as observed in one case may be a consequence for business model design. Thus, it seems worthwhile to examine the developers' perspectives on business model design. In this regard, it would be especially interesting to focus research on platforms that are coupled more tightly with technology than those that have been subject to prior studies on developers' perception, such as [20], [21], [22].

Differentiation in service enabling is result of strategic decisions on platform openness, i.e., the capabilities that should be made available (or remain closed) to third-party developers [1]. In this regard, we find that enabling services for network optimization and for marketing remain in the control of network operators. Exposing, e.g., Quality-of-Service capabilities for data transport differentiation potentially enables the development of new services for internet-based TV, HDTV or telemedicine [49], while, e.g., user profile analysis based on real-time data has the potential to drive marketing service innovation [50]. Thus, there is potential to offer such capabilities to developers and increase competitive differentiation. However, since platform openness invites developer participation, it sacrifices direct sales [51]. In this regard, further research should be devoted to better understand telecommunication operators' strategies regarding maintaining and ceding platform control.

From a value architecture perspective we find that platform providers have tackled the challenge of fragmentation as identified by [8] and [9]. This is because successful standardization efforts across carriers are driving network interoperability. In addition, all analyzed platforms have successfully integrated white-label API technologies that enable unified communication solutions at an international level. Regarding the value network, the platforms build on a diverse set of strategic partnerships to deliver the value proposition. Partnerships are formed with the goal of enhancing different aspects of the value chain, such as product design (e.g., standardization across carriers, cooperation with API aggregators), development (e.g., partnerships with software, component and tool providers) and distribution (e.g., cooperation with intermediaries). Notably, operators pioneered strategic cooperation with API aggregators to increase the functional range and the technical interoperability of their platforms as compared to earlier studies of [8] and [25]. Therefore, we regard cooperation strategies within platform ecosystems in general and partnerships with aggregators in particular as a promising field of research.

Finally, all platforms offer the means for software monetization as revenues, either from component distribution, application sales or generated network traffic, are shared with developers. However, pricing of API usage varies by API and platform and involves three dominant models: pay-per-use, subscription-based allotment and revenue sharing. We cannot provide an interpretation for the observed variety of price models. However, one could assume that different pricing results from the variance of developers' preferences for price models as identified by [22]. Again, research on the developers' perspective on platforms could guide business model design.

7. Conclusion

In this paper we assessed three business models of telecommunication companies' developer platforms based on an in-depth case study research approach. Motivation for our research stems from the economic relevance of digital platforms in general and for telecommunication network operators in particular. We explained our methodology, presented the theoretical background of our study and conducted structured within-case and cross-case analyses.

The contribution of our findings is three-fold as we provide insights on business model design, platform control and competitive strategy. In particular we find that business models are set up to stimulate new product development in an effective and efficient manner, while there is a tendency to leave end customer relationships to complementors. Further, we identify business model differentiation mainly with respect to target markets, such as IPTV, mobile health and M2M, and to price models for API usage. In addition, we demarcate capabilities that remain in control of network operators, i.e., enabling services for marketing, such as user profile analysis, and for network optimization, such as Quality-of-Service. Finally, we observe that platforms tackle the challenge of fragmentation in terms of network interoperability and increase their functional ranges. In this regard, cooperation seems a viable strategy, particularly with aggregators of network APIs. Based on these findings we highlight promising aspects for future research in the corresponding fields.

The generalizability of our findings is limited by the fact that they are based on a case study research approach that assesses publically available information on three developer platforms of telecommunication companies. Extending the scope of assessed information, e.g., through expert interviews, and incorporating a higher number of cases will increase generalizability. Additionally, the main focus of our case study approach is to explore the state-of-the-art of developer platforms. Therefore, our capability to draw conclusions on platform dynamics is limited. Addressing these limitations should be subject to further research.

Table 2. The enabling service propositions of telecommunication operators' developer platforms

	Value proposition		Value architecture		Value network	Value Finance
	Service enabling	**API**	**Network capability**	**Inter-operability**	**Key partnership**	**Price model**
Developer Garden	Content aggregation	Scout24 API[1]	Content pool	Internat.	Coop. content provider	Free of charge
	Content personalization	IP Location API	Location information	National	n/a	
	Financial management	Click&Buy API	Electronic payment	Internat.	Coop. financial service provider	Revenue sharing
		WAC Payment API	Charging & billing		Cross-carrier cooperation	
	IPTV solutions	APIs for IPTV platform (announced)		National	n/a	n/a
	M2M solutions	APIs for M2M platform	APIs for M2M platform	Internat.	Coop. technology provider	Subscription-based allotment
	Messaging solutions	Global SMS API	SMS	Internat.	Cross-carrier cooperation	Pay-per-use
		Send MMS API	MMS[2]	National	n/a	
	Unified communication solutions	Telekom Tropo API	Audio file play, Call management, Call recording, Conference call, Signaling, SMS, Speech-to-text, Text-to-speech, Voice call[3], Voice recognition	Internat.	Coop. aggregator	
	Telephony solutions	Conference Call API	Conference call		n/a	
		Voice Call API	Voice call[2]			
AT&T Developer Program	Content aggregation	Advertising	Advertisement brokerage	Internat.	Coop. content provider	Revenue sharing
	Content personalization	Device Capabilities	Device information	National	n/a	Subscription-based allotment
		Location	Location information			
	Digital rights management	Notary Management	Securing packaged content			Free of charge
	Financial management	Payment	Charging & billing			Revenue sharing
	IPTV solutions	AT&T U-verse enabled	IPTV control			Free of charge
	Mailbox solutions	Speech	Speech-to-text, Text-to-speech		Coll. own research center	Subscription-based allotment
	Messaging solutions	In-app Messaging	In-app messaging		n/a	Free of charge
		MMS	MMS			Subscription-based allotment
		SMS	SMS			
	Mobile health solutions	APIs for mobile health platform (announced)		n/a		Pay-per-use
	Unified communication solutions	AT&T Tropo API (beta version)		Internat.	Coop. aggregator	Free of charge[4]
BlueVia	Authentication Solutions	OAuth	User authentication	Internat.	n/a	Free of charge
	Content aggregation	Advertising	Advertisement brokerage		Coop. content provider	Revenue sharing
	Content personalization	User context API	Context information		n/a	Free of charge
		Location	Location information	National		
	Financial management	Payment API	Charging & billing	Internat.	Cross-carrier coop./ Coop. financial management provider/ -financial intermediaries/ -OEM	Revenue sharing
	M2M solutions	Arduino	M2M solution		Coop. technology provider	Subscription-based allotment
	Messaging solutions	MMS API	MMS		n/a	Revenue sharing
		SMS API	SMS			
	Unified communication solutions	BlueVia Voice API (alpha version)			Coop. aggregator	Free of charge[5]

Legend: coop. = cooperation; coll. = collaboration; *[1] = includes AutoScout24 API, ImmobilienScout24 API, Scout24 API Marketplace; [2] = outbound only; [3] = from/to device and web; [4] = beta version; [5] = alpha version*

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