Project Number: **215219**

Project Acronym: **SOA4ALL**

Project Title: **Service Oriented Architectures for All**

Instrument: **Integrated Project**

Thematic Priority: **Information and Communication Technologies**

D8.2 Semantic Telco Analysis

Activity N:	4 – Exploitation and Impact Activities	
Work Package:	8 – BT W21 C	
Due Date:		31/08/2008
Submission Date:		05/09/2008
Start Date of Project:		01/03/2008
Duration of Project:		36 Months
Organisation Responsible of Deliverable:		BT
Revision:		2.5
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Version History

Version	Date	Comments, Changes, Status	Authors, contributors, reviewers
1.0	26.06.2008	ToC and initial structure outlined	
1.1	29.07.2008	Structure revised, content added	
2.0	04.08.2008	First draft with initial contributors	
2.1	05.08.2008	Updated following internal comments	
2.2	06.08.2008	Applications of SOA4All added	
2.3	15.08.2008	Updated following internal comments	
2.4	22.08.2008	Updated following internal comments	
2.5	05.09.2008	Final draft ready	Authors as listed above

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Glossary of Acronyms

Acronym	Definition
21CN	21st Century Network
ANI	Application Network Interface
API	Application Programming Interface
BB	Broadband
BSS	Business Support Systems
BT	British Telecom
CRM	Customer Relationship Manager
D	Deliverable
DT	Deutsche Telekom
EC	European Commission
FT	France Telecom
GoS	Grade of Service
ICT	Information and Communications Technology
iDEN	Integrated Digital Enhanced Network
IM	Instant Messaging
IP	Internet Protocol
IPTV	Internet Protocol Television
ISP	Internet Service Provider
JAIN	Java APIs for Integrated Networks
LLU	Local Loop Unbundling
Ofcom	The Office of Communications
OS	Operating System
OSS	Operations (or Operational) Support Systems
OTT	Over-the-top
PCS	Personal Communications Service
PSTN	Public Switched Telephone Network
PTT	Postal Telephone and Telegraph
QoE	Quality of Experience
QoS	Quality of Service
REST	REpresentational State Transfer
SDK	Software Development Kit
SIP	Session Initiation Protocol
SLA	Service Level Agreement

Acronym	Definition
SOA	Service Oriented Architecture
SOA4All	Service Oriented Architecture for All
SP	Service Provider
VISP	Virtual Internet Service Provider
VoIP	Voice over IP (Internet Protocol)
WLAN	Wireless Local Area Network
WP	Work Package
XMPP	Extensible Messaging and Presence Protocol

Executive summary

Telcos such as BT are faced with increased competition and declining revenue in traditional telecoms services, with the emergence of WebCos and "Over the Top" (OTT) providers. Telcos are forced to react and change and a new set of business models is being evolved, dubbed 'Telco 2.0'. The initiative aims to leverage some of the unique value that Telcos have by being the provider (and the central hub) of communications, moving the Telco up the 'value chain' by using information that it has (such as user location, or web browsing habits) to partner with advertisers to sell contextual advertising such as Google.

BT has identified that Internet based communication is important in the vision of a 21st century Telco business and, in July 2007, it became one of the first Telcos to release a web based API for accessing a variety of telephony services over the web, named Web21c. Work package 8, BT W21C, builds on the BT Web21c infrastructure and leverages SOA4All research and technology to allow end-users to access, use and create services based on BT's 'capabilities' (such as VOIP, SMS etc.). This deliverable aims to analyse the ideas of Telco 2.0, and discuss the business models that might be useful in creating a successful and profitable business from a SOA4All enabled Web21c platform.

Deliverable D8.5 'Telco 2.0 recommendations' will further develop the ideas presented here into a solid business model for building a Web21c business based on SOA4All technology using Telco 2.0

1. Introduction

1.1   Introductory explanation of the deliverable

This document will investigate issues surrounding the move from a traditional telecom company to a more open 'Telco 2.0' business.

Telco's such as BT are faced with declining revenue in traditional telecoms services such as fixed line PSTN, and increased competition in the Telco sector. Competition in the sector has become intense in recent years as many media and Internet companies have sought to expand into telephony and ISP services. Competition in the Broadband and fixed line market has been assisted by Local loop unbundling (LLU) in the EU, which has sought to remove the monopoly of incumbent Telco operators and allow other operators to install equipment in exchanges.

The increase in high speed broadband connections over the past few years, has also had a huge impact of the business of Telco companies. Technologies such as VOIP and Instant messaging has affected the way in which people communicate, and has impacted on the revenues of fixed line operators.

BT has identified that Internet based communication is important in the vision of a 21st century Telco business. In July 2007, It became one of the first Telcos to release a web based API for accessing a variety of telephony services over the web, named Web21c. As methods for communication evolve over time, the methods for running a successful communications business need to evolve also.

Companies such as BT have identified the changing Telco landscape and are looking for new ways to do business in the 21st century. Traditionally business models for telephony and data services have centred around billing on usage (i.e. per minute of call, or per megabyte). A new way of thinking, and set of business models for Telco's in the 21st century is being investigated. Dubbed 'Telco 2.0' this initiative aims to evolve Telco business models to fit in with the 21st century web enabled society. The ideas and business models from Telco 2.0 aims to leverage some of the unique value that Telcos have being the provider (and the central hub) of communications. For example, rather than seeing the raw calls and data as the revenue generator, Telco's should look to move up the 'value chain' by using information that it has (such as user location, or web browsing habits) to partner with advertisers to sell contextual advertising such as Google.

The WP8 Web21c case study will create the next generation of Web21c using SOA4All technology. The aim of this is to increase the uptake and use of Web21c services. While the case study implementation addresses the technical challenges in having an open easy to use Web21c API, it does not discuss how to make a successful business from it.

As BT opens up its systems and services to third party access, it faces a radically different business model in terms of how it engages customers, receives revenues and manages its telecommunications infrastructure. This deliverable aims to analyse the ideas of Telco 2.0, and discuss the business models that might be useful in creating a successful and profitable business from a SOA4All enabled Web21c platform.

1.2   Purpose and Scope

The purpose of this document is to provide a current view of the state-of-the-art about rapidly changing business models in the telecommunications sector and the relevance of SOA4All technology.

1.3 Structure of the document

Section 2 of this document provides background to the business models used in the telecommunications sector, which is followed by an overview of the technology and business issues driving the market changes (in Section 3.2), resulting with a demand for a response in the way Telcos generate revenue. It looks into both current Internet trends (Section 3.2.1) and the use of SOA within Telcos (Section 3.2.2), and on the relationship between Telcos and Webcos. Focus of the document is BT's perspective and the state on the UK market, as shown in Section 3.4, with brief look at the Telcos and applications outside of the UK. As a conclusion, this document provides a summary of current technology and limitations in moving to Telco 2.0 (Section 3.5.1), with Section 3.5.2 showing a potential for the SOA4All to help in that move.

2. Background

2.1   Traditional Telecommunications Business Model

Traditional telecommunications business models, now sometimes named Telco 1.0 and Telco 1.5, involve Telcos selling services themselves and hence controlling the value chain.

2.1.1   Telco 1.0

The 'Telco 1.0' business model is the classic telecoms business model, which has proved successful since the creation of the telecommunications business. Telco 1.0 is the mass market or "regular" business model, offering the customer services such as SMS and voice, and charging for use. There are two key aspects to the classic business model:

- *Vertical integration*, where the telecoms operator owns (or has control over) the network, and bills users for services making use of the network.

- *Simple revenue model*, where the operator incurs cost by maintaining the network, buying equipment & content, and receives revenue by billing users for services.

This model has remaining fairly static since the birth of telecommunications, and has survived many technological advances, such as digital switching networks, fibre optics and the emergence of wireless and mobile communications. Since the whole vertical stack is controlled by the operator they are able to provide services, bill for and support them in a controlled and well understood manner.

2.1.2   Telco 1.5

The rapid take up of high-speed residential Internet access last 5 years has provided a challenge to the two pillars of the classic Telco business model, as users can acquire services on the network, independently of the operator. This horizontal market structure has been challenging to operators, leaving them essentially as the provider of raw data services, while other 'upstream' businesses make money by providing content and receiving advertising revenue by targeting the customers of their content.

In parallel to the Internet boom, the mobile boom has caused a shift in use from fixed line telephony to mobile. Companies such as BT have sought to maintain customers and reduce churn by offering consolidated services, such as combined voice, video and data services. Telco have also sought to enrich the service offering in an attempt to gain a bigger footprint, and tap into the 'upstream' revenue. Internet based communication services, with protocols such as Parlay[1] and JAIN[2] (Java API for Telecom Networks) have been developed with an aim to bridge the world between traditional telecommunications, and the new Internet enabled world.

This period has also seen a large scale investment in infrastructure to keep up with the demands of high speed data services.

2.2   Changing landscape of Telecommunications in 21st Century

In the previous years, operators have tried to replicate traditional telecommunications business model in adjacent markets, moving from fixed into mobile or broadband markets, to mitigate the decline in traditional fixed line business. Table 1 shows the continuing decline of

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[1] See www.parlay.org

[2] See http://java.sun.com/products/jain/

BTs revenue in traditional areas. Expanding into broadband, mobility and networked IT services (known as the 'new wave' areas) has enabled BT to maintain revenues, but concerns about increased competition, market saturation and declining margins means that BT can not rely on growth in new wave areas, (using old Telco 1.0/1.5 business models) indefinitely.

Table 1 : Decline of traditional revenue in BT

Revenue Category	Description	Percentage of Total Revenue in 2006/2007	Year on Year Growth 2006/2007
Traditional			
Exchange Lines/ISDN		7%	-4.2%
Private Circuits		5%	-2.8%
Calls	Traditional voice and VoIP, inbound, wholesale	3%	-21.9%
Other	Other traditional business such as customer premises equipment	18%	7.1%
New Wave			
Networked IT Services	CRM solutions, managed collaboration solutions, data centre services, security solutions, IT optimization IP network solutions, professional services	44%	30.2%
Mobility	Mobile data, voice, FMC, mobile applications, WiFi/WLAN	2%	65.9%
Broadband		1%	33.1%

As new wave markets are becoming more competitive and demanding, with the emerging new types of customers, increase of flexible working and need for the next generation networks, traditional Telcos are pressured to change – both internally and externally. All core products, voice, messaging, broadband access, are demanding a change in the business model, one where Telcos will not only create revenue from its end customers, but also from new customers, in line with the concept of 2.0, where suppliers and customers are working together to unlock the technology and the possibilities.

Current business models in telecommunications could be described as 'one sided', where the Telco incurs costs to maintain and run the network, and receives revenue from end users of services on the network. A new type of business model is has been developed by an

organisation called STL partners[3], which proposes a two-sided telecoms market, as depicted in Figure 1 bellow.
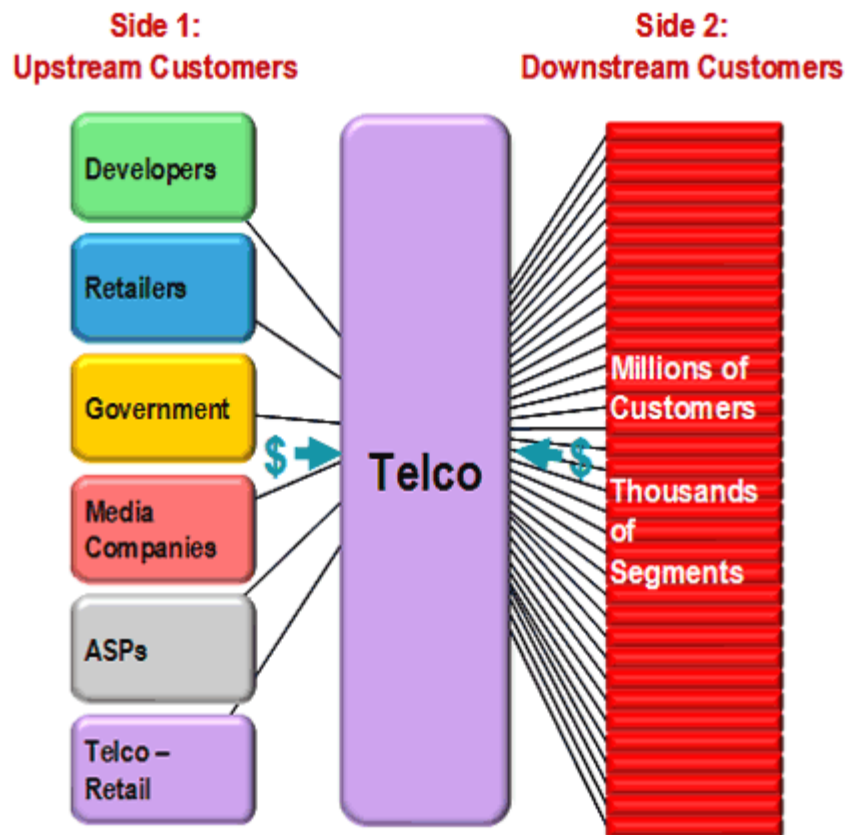

Figure 1 : The Two-Sided Telecoms Market / Platform Services Opportunity[4]

The focus of this model is advertising and adding value to both upstream (government, advertisers, merchants, application developers, content owners etc.) and downstream customers (end users – businesses and consumers), generating revenue at the same time. In comparison to one-sided model which is used today, revenue is generated not only from end users (e.g. consumers, SMEs, enterprises – the 'downstream' customers), but also from the 'upstream' customers, e.g. from media and advertising. As that market is fairly small, Telcos should consider expanding to more markets, as shown on the Figure 1, to developers, retailers, government, content owners, etc. Example of this model is Google – allowing free search for the users, and, in addition to it, it gets a large audience to show the ads to. New Telcos have a unique chance to fill in the position of a bridge between upstream players and downstream end-users. In such new platform, users should have a plethora of new generation telecom platform services available, such as:

- Identity and Authorisation: Management of user access to products and services.

- Advertising, Marketing Services & Business Intelligence: Customer profiling information and contextual/behavioural data to enable targeted advertising from merchants and advertisers; ad-serving capabilities and performance metrics.

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[3] See http://www.stlpartners.com

[4] By STL Initiative, see http://www.stlpartners.com/telco2_2-sided-market/index.php

- e-Commerce sales: Management of sales transaction.

- Order Fulfilment: Processing of order and logistic/delivery support

- Electronic Content Fulfilment: Electronic content delivery – games, music, TV, video, etc.

- Billing & Payments: Billing for products and services and cash collection.

- Customer Support: Improvement of customer services by enabling other services to be better integrated with communication.

More detail of the two-sided business model is given in Section 3.4.4.

3. Telco 2.0 Analysis

The following section gives an analysis of the ideas and business models of Telco 2.0. It is focused on the analysis of Telco 2.0 in relation to the BT web21c SDK and the SOA4All project. The aim is to provide a background analysis of the emerging ideas of Telco 2.0 and establish the relevance for building a successful business from a SOA4All enhanced Web21c platform based on Telco 2.0. The strategic analysis conducted by BT, follows a number of well known theories for business analysis, combined with BTs strategy and other factors relevant to the business (as described in section 3.1). Further analysis and recommendations will be provided in deliverable D8.5 'Telco 2.0 recommendations' in Month 24.

3.1 Approach to Strategic Analysis

Whilst performing a strategic analysis of Telco 2.0, two aspects are of primary focus:

- External market attractiveness [1];

- Telco's resources and capabilities [2]
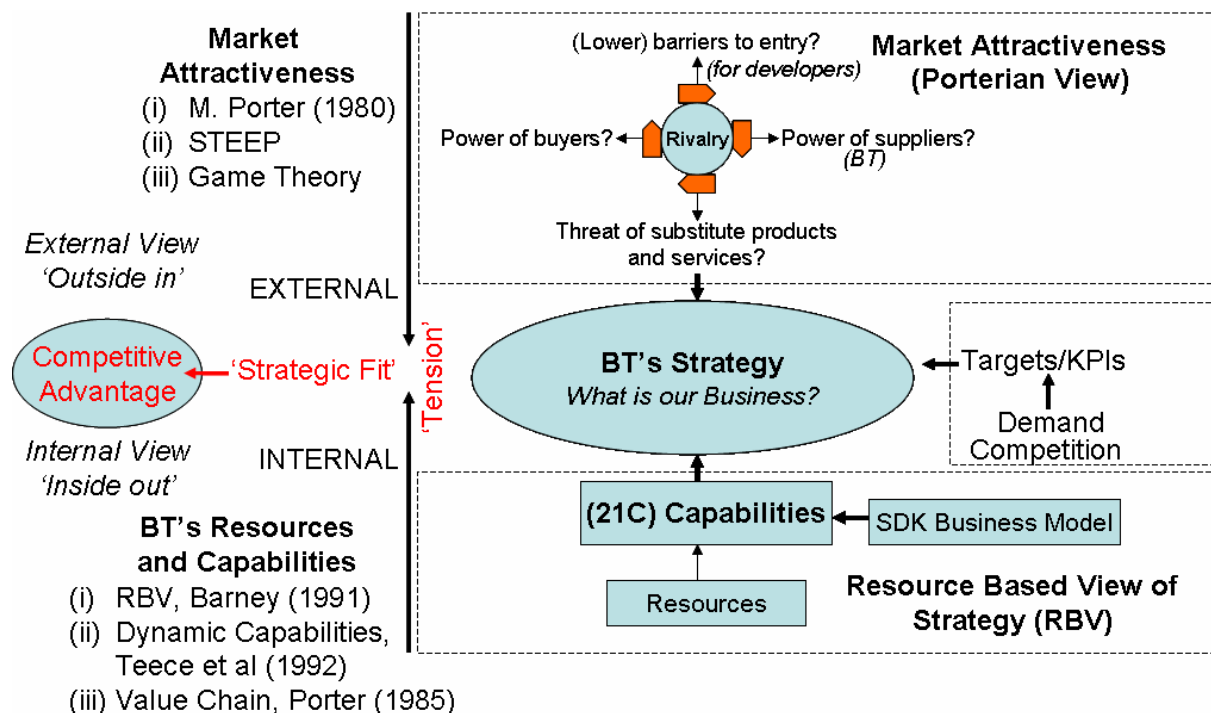
Figure 2 : BT's approach to Strategic Analysis

Figure 2 shows that in BT's approach there is an 'outside in' view of the strategy that is balanced by an 'inside out' view, and the strategy adopted by the organisation tends to be a dialogue between the two. Other factors do come into play (such as game theory) but for this analysis only the internal external tensions, which arise both within the organisations and externally, were looked at.

Another generic way of looking at strategic analysis is that it should cover (i) analysis, (ii) choice and (iii) implementation [3] and all strategic business models are grounded in one of these.

3.2 Technology and Business Drivers

This section will look at the key technological, business and market drivers responsible for change in the telecommunications sector, and motivation for analysis of Telco 2.0.

3.2.1 Web (web services, semantics, web 2.0)

With the increasing tendency of service providers of all types to publish services via the web and the emergence of Web 2.0 technologies, traditional Telcos are being forced to evolve. The key technological trends that demand Telcos immediate response come from Web 2.0 developments. Webcos - companies adopting Web 2.0 principles in their business models - are able to respond to changing demands and expectations in the marketplace by innovating at multiple levels, and exhibit several key characteristics, namely:

- *Web as Platform*: the platform is no longer a server or application, but exists on the web ("in the cloud") and encompasses devices, networks, companies, etc. (cf. Google and Amazon APIs)

- *Architecture of Participation (Harness Collective Intelligence)*: designed to encourage users to take part, to share, to customise, to connect and even to participate in future product design (e.g. User Generated Content – Flickr, YouTube, Delicious, mySpace, eBay, Amazon; Social networks, R/W sites such as Wikis, Amazon reviews, etc.; Tagging and the wisdom of crowds).

- *Network effects*: the more people use the service, the better it gets. (e.g. BitTorrent scales as more users share the network; Skype scales using their users' CPU; digg gets more accurate as more users rate stories)

- *Mashups*: light weight and rapid service/product composition in an open service eco-system. Increasingly, real impact-ful innovations are in smart and rapid assembly of services, rather than merely isolated component services. Hence rapid and light weight service composition will be a key enabler to success of a digital service ecosystem (c.f. Yahoo Pipes, Developer mashups, Widgets, etc.)

- *Long Tail*: the theory of long tail, largely instigated by the Web 2.0, allows WebCo's to tap into and monetise the demand from the large number of highly diverse potential customers with non-typical requirements, whereas traditionally Telcos focus their efforts on Short tail, where the majority of mainstream (hits) services and products are. Telcos can no longer ignore the revenues generated from the long tail.

The environment in which Telcos conduct their business today is rapidly changing, with the need to deal with unpredictability of demands and unanticipated usage, and the need to give away non-essential control to the users and customer community. Web 2.0 introduces collective intelligence and customers who want to be involved in every step of the product life cycle, as shown on Figure 3 – hence, in the new Telco product life cycle, customers, users and business partners must be at the heart of the innovation process.

Applying semantic web techniques among Telcos heterogeneous systems could provide a perfect solution to handle diverse legacy systems. Using the ontologies could provide an underpinning for information sharing and semantic interoperability, by opening a possibility of machine readability and precise understanding among parties. Modelling the semantic relationships among Web Services interfaces, it is possible to connect the missing link to automate task execution accomplished by Web Services, by using automatic service discovery, selection and composition. Linked Data[5] is one of the initiatives working towards

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[5] See http://linkeddata.org/

connecting the data available on the web in a semantic way, continuously defining best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF. Usage and development of the Semantic (Web) Technologies has the potential of accelerating the route towards ultimate integration between information systems – the point when they will autonomously talk with each other.
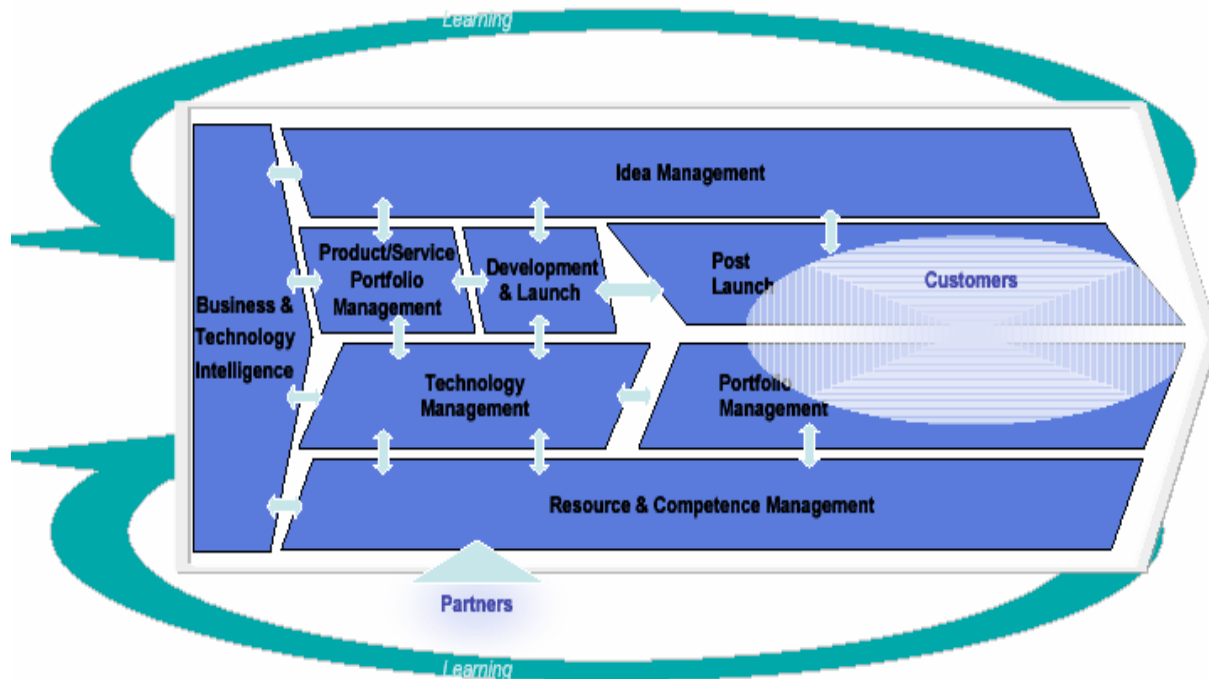

Figure 3 : Key role of customers and partners in product lifecycle innovation

Telco 2.0 is a result of the amalgamation of service assets embedded in the operator's network with internet-based services, especially those from the Web 2.0 world. The Telco world has its value seen in terms of available services, e.g. media content, location based services, voice and messaging services. On the other hand, value of Web 2.0 world is shown in terms of gaming services, user generated content, advertising, search, instant messaging and others. If those two worlds can be brought together, additional value in terms of new services could be created and released. Therefore, association of telecom web services and web 2.0 is the Telco's best chance of being included in the web services value chain, otherwise disintermediation is a possible outcome.

3.2.2   SOA

Service Orientated Architecture, with principles of modularization, reuse and ubiquitous access has become one of the biggest software engineering initiatives of the 21st century. Market research firm IDC, reported that spending on SOA-related services reached $4 billion in 2006, and grow will grow to $14 billion by 2011[6], shows that SOA has been accepted as the key technology for transforming IT systems and increasing efficiency across an organisation.

BT, along with other Telco has embraced SOA and is the process of transforming it's internal

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[6] See http://www.4js.com/templates/en/1/affiche.php?idparent=6_1&id=219

IT systems (CRM, order management, charging/billing, provisioning/activation, service assurance) into an SOA enabled infrastructure. Telcos have identified the need for more rapid product and service deployment, in order to keep up with the competition and fast-pace of the web. SOA is seen as a key enabler, allowing a products OSS 'wrap' to be developed from reusable SOA components, apposed to custom 'stove pipe' OSS solutions that have been used in the past. This should reduce a products time to market, and enable Telcos to maintain a competitive edge.

Currently most SOA deployments are concerned with transformation of internal IT systems, Telcos are starting to investigate the benefit of applying SOA principles across organisations boundaries, and either further onto the web. Ideas similar to the goals of SOA4ll are starting to gain traction. One is dubbed 'Mashups Meet SOA[7]' and envisages Telcos changing the business model to embrace external third parties and be part of a wider platform. In order to achieve this Telcos should enable connectivity with QoS (Quality of Service) and SLAs, expose a set of service enablers (as BT has begun to with Web21C), as well as OSS/BSS APIs and promote creation of an open service ecosystem. This will enable them not only to create new services to address the needs of the long tail, but also, allow third party service providers to make use of Telcos underutilised OSS/BSS capabilities to create new service offerings, and hence creating new revenue streams. Possibility of partnering with WebCo's to provide preferential treatment of their traffic can generate new revenue streams, but Telco's must also fill the gap and provide dependability for service offerings in the future digital marketplace, in terms of guaranteed QoS, through SLA management.

The changing needs of customers and users must be considered, as it is no longer sufficient to provide ICT services as basic commodity capabilities. Increasingly, customers demand QoS, GoS (Grade of Service), and now QoE (Quality of Experience), and they will put in the effort to find the offer that satisfies their needs as much as possible, hence putting QoE in a role of a key differentiator. QoE effectively satisfy emotional needs of customers and users as they interact with ICT services and the "context" in which those ICT services are used. Therefore, service offerings must take into account the "surrounding context" (business process) of user's lives and seek to add and enhance basic ICT services, in such as way that users can seamlessly move from one ICT service to another, regardless of the provider of those services, or what technology platform they are offered. Such services are termed, "blended services" in contrast to conventional bundling of services.

3.2.3   Decreasing traditional revenue

In the developed markets, voice revenues are starting to peak and fall, and the hyper-growth phase in mobile and broadband market has finished.

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[7] See http://www.telco2.net/blog/2007/01/reviewing_2007s_telecom_predic.html

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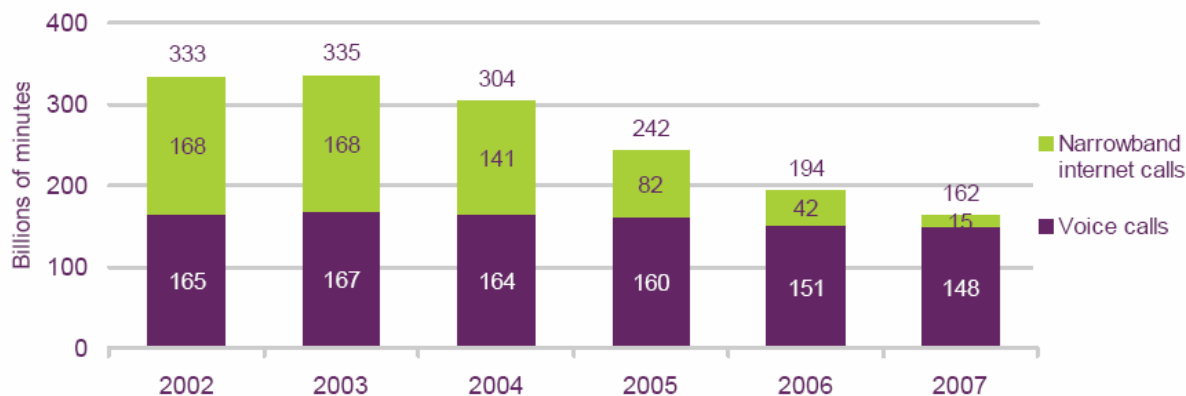
Figure 4 : Fixed telecoms call volumes[6]

Based on Ofcom's report[8], fixed line usage continued to decline during 2007 (16%), partly as a result of narrowband internet users migrating to broadband services. The numbers shown on the Figure 4 above include both narrowband internet call volumes and fixed voice call volumes (including non-geographic voice calls). Even with the migration to broadband services, the market is experiencing a slight decline in revenue from residential and SME internet connections as shown on the Figure 5 bellow. This decrease is a result of increasing migration from narrowband to broadband internet services, coupled with falling broadband prices. In addition, falling broadband prices are partly the result of increasing levels of bundling, which often enable consumers to obtain discounts by buying more than one communications service from a single provider.
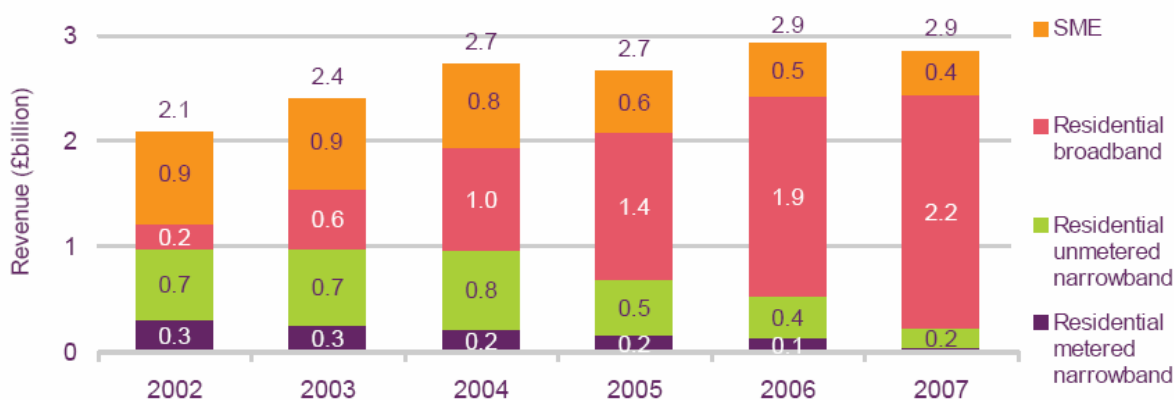
Figure 5 : Estimated UK internet and broadband retail revenue[8]

In the mobile market, recent regulatory changes in the roaming prices and international calls have decreased the profit margin even more as the average cost of a voice call minute continued to decline for both contract and pre-pay subscribers in 2007.

The data market hasn't shown the revenues predicted for it, as users are confused with the pricing system and are beginning to be vary of using mobile downloads and roaming. Feedback received shows that customers would prefer 'postage and packing' to be included with the device or content. Although mobile data usage is rapidly growing, more than 90% of

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[8] See http://www.ofcom.org.uk/research/cm/cmr08

the traffic comes from laptops, which do not generate adequate revenue.

Even the hyped 'new wave' revenue is decreasing, in February this year BT has announced[9] 7% rise in the 'new wave' revenue, comparing to the 10% rise in the November last year. What we see nowadays, is an increasing price competition and additional constraints on the regulatory environment, with unbundling rules, reduced termination fees and roaming rates cuts. With all that, Telcos are forced to reconsider their business models and quickly find new revenue sources.

3.2.4 Increased competition

The privatization of Incumbent Telcos in the EU over the past 15 years (and associated regulation), has lead to an explosion of competition in the fixed line, mobile and ISP markets. In areas where there was previously only one supplier, consumers are now presented with a wealth of choice. In parallel to this, a new threat from "Over the Top" (OTT) service providers has emerged. OTT providers do not own the network but provide services on top of someone else's, usually over the Internet. The next section describes some of key areas where competition has increased, and provides motivation for identifying new sources of income through Telco 2.0 business models.

3.2.4.1 Increased competition in traditional Telco space

Local Loop Unbundling (LLU), the process where the incumbent operators makes its local network (the copper cables that run from customers premises to the telephone exchange) available to other companies, has changed the competition in the telecom market. More operators are now able to upgrade individual lines using DSL technology to offer services such as always on high speed Internet access, direct to the customer. The increase in number of operators, both ISPs and VISPs (3, AOL, Be*, BT, Demon, eclipse, madasafish, O2, Orange, PlusNet, Post Office, Sky, T-Mobile, TalkTalk, Tiscali, Toucan, UK Online, Virgin, Vodafone) , has reached high enough level of competition that the Ofcom has recently released the announcement that they would be deregulating 70% of the UK's broadband market. Within that document[10], Ofcom has defined classification to be applied to exchange areas:

- Market 1 - Exchanges where the incumbent operator (BT Wholesale) is the only provider of broadband services

- Market 2 - Exchanges where two or three operators provided broadband services (including BT)

- Market 3 - Exchanges where four or more operators provided broadband services

- Hull area - Exchanges in Hull are served only by Kingston Communications

Deregulation only applies to the Market 3 exchanges, as Ofcom deemed that there was sufficient competition in these areas to keep prices at a reasonable level whilst also driving innovation. Subsequently now, with alternative providers increasingly investing in their own networks and building out to connect to the incumbent's local loop, we can see a rise in differing conditions of competition across the UK.

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[9] See http://uk.reuters.com/article/businessNews/idUKL0716377420080207?sp=true

[10] See http://www.ofcom.org.uk/consult/condocs/wbamr07/statement/statement.pdf

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3.2.4.2 Convergence of Web world and Telco world

Increasing competition from the OTT service providers shows the danger for Telcos to become dis-intermediated from the digital supply chain; that Telcos become merely a commodity "dumb pipe" provider. WebCo's traditionally have had different business models, collecting revenues from advertising, whereas Telcos collect revenues through usage based and billing, now these two sectors are converging, in terms of the service they offer, the challenge for Telcos is to reconcile these two different models, finding ways to generate revenue from advertising, while continue to offer billable services.
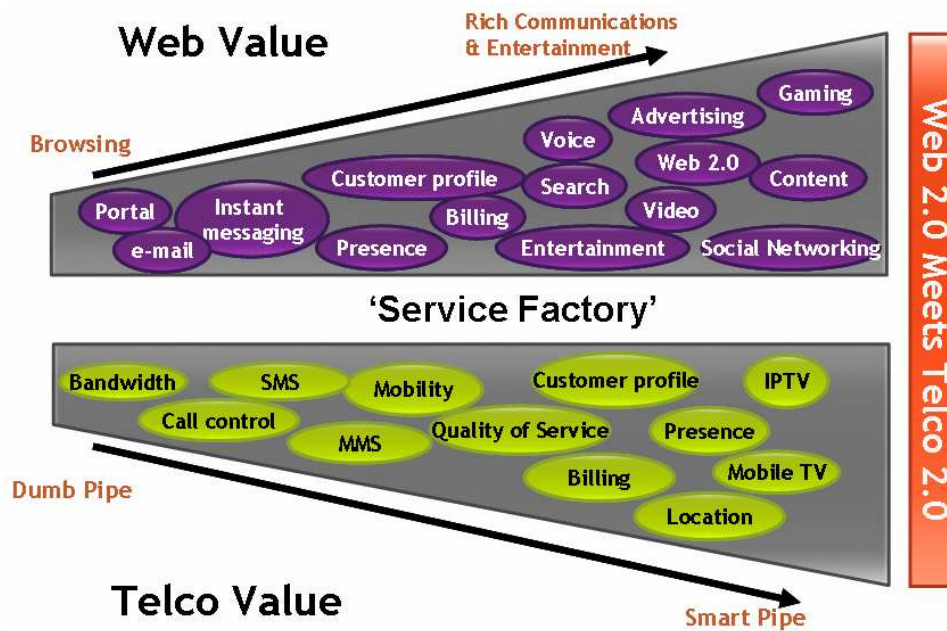
Figure 6 : Convergence of Web world and Telco world

As OTT provider traffic increases at a rapid rate mostly because their "compelling" service offerings (e.g. Google, YouTube, Yahoo!, etc.), monetising it is a key challenge for Telcos.

Secondly, Telcos need to consider the threats and opportunities the OTT present.

Threats:

- Loss of revenue
- Increased average user's bandwidth
- Price pressure on unlimited access
- Monopolise bandwidth, leading to QoS degradation
- Need for additional policy based "fair-use" capability
- Challenges to monetise OTT traffic

Opportunities:

- Deeper BB penetration for traditional service providers
- Provide QoS and hence QoE leading to premium services and revenues (as SPs control e2e connectivity)
- Leverage QoS for a share of "advertising" revenues from OTT

It is interesting to note that OTT's traffic is increasing at an alarming rate. For instance, some studies show that user's traffic is growing at a rate of 100% per year [4]. In addition, increasingly, customers are willing to pay for additional QoS that Telcos are best positioned to provide. Hence, monetising OTT traffic is a key challenge for Telcos. Many traditional Telcos already have developed monetisation strategies. For Instance, BT and FT have policy based "fair-use" capabilities for monitoring and charging for OTT traffic, so that users exceeding their agreed traffic limits are charged accordingly. Shaw Communications in Canada, collaborating with Vonage, preferential treatment of their VoIP traffic and hence charge users on a fixed monthly basis. Moreover, Verizon, in partnership with Google YouTube, provide preferential access to mobile devices for a monthly or daily charge to end users.

The notion of "Sofnet" (which is software + network) is also being mentioned as a possible reply to OTTs. As OTTs (e.g. Google) can deliver services faster then most traditional providers, Telcos should be more about software themselves, which brings us to the term of a Telco moving towards a "SoftCo".

3.3   Business Models and Implementation

Traditional business models are representing yet another challenge for the new Telco, as the new digital world requires radical and dynamic business model innovations.

Telcos have been using Telco 1.0 and Telco 1.5 technologies for some time and these both involve selling services themselves. The former is the mass market, business as usual model using the Intelligent Network, offering selling services such as Voice, SMS, and Premium Voice services. Telco 1.5 involves an incremental change and enrichment of services through the use of increased network capabilities, leveraging IP technology and protocols such as JAIN SLEE (Service Level Execution Environment), Parlay, and SIP, however both these models involve retaining control of the values chain, selling Telco services through traditional retail channels. The Telco 2.0 long tail business model is potentially different it, as it involves letting the market innovate, by using third party developers to define how the new personalised services will be generated. This requires some loss of control as it involves opening up the network. Telco's have been used to controlling the value chain in terms of Telco 1 and Telco 1.5. In Telco 2.0 the technologies employed will be telecom web services, representing an amalgam of Telco services and Internet services, requiring the Telco to manage a large number of third party developers in order to access the long tail revenues. In business model terminology this means that the Telco is taking over the role of an aggregator.

SDKs are being made available to third party developers and thru them new service creation is being made available. Various initiatives transfer customer loyalty to the associated brands, e.g. SDK for Apple's iPhone or Google's Android (SDK for Linux based mobile phone platform). They are allowing developers to create their own applications, but also providing them an option to be a part of an ecosystem, e.g. 'iPhone AppStore', and take a piece of the revenue, hence implementing new business models.
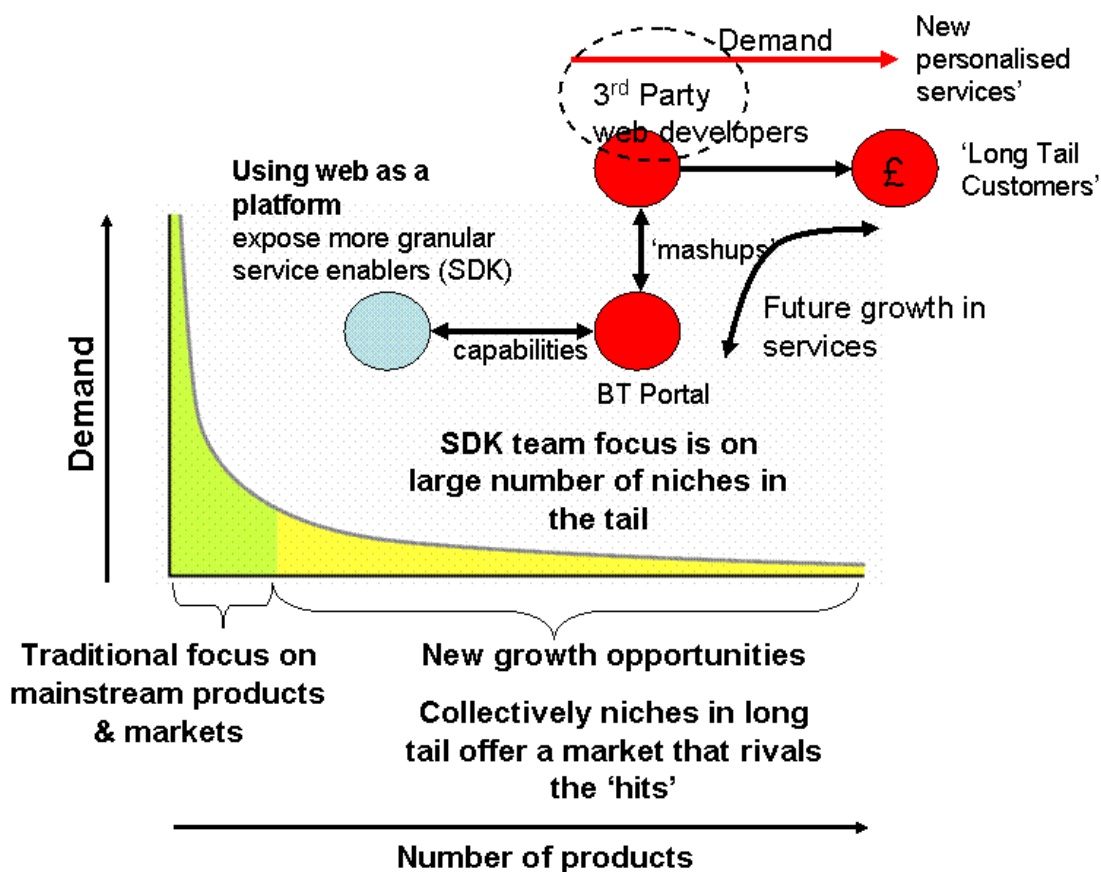
Figure 7 : The Long Tail in Telco 2.0

Figure 7 above shows the long tail, representing the untapped new business revenues, and the short tail, representing the conventional Telco business revenues. It can be seen that the new growth opportunities will arise from externalising current capabilities, exposing them on a web portal and allowing the third party developers to address the long tail demand for mass personalised services.

Secondly, the long tail concept lies where 'endless choice fuels demand' [5] where customers find value in a host of niche services. For example, the number of books stocked by Amazon far exceeds the numbers stacked by physical bookstores, which provides Amazon with its successful business model.

Figure 8 bellow shows a similar representation from Aepona[11]. It illustrates two streams serving customers, with the first stream serves the long tail market from the wholesale division of the Telco, the second (lower) path is serving existing enterprise customers. Here we see the positioning of Enterprise Mashups and Web 2.0 technologies being merged with the Enterprise Workflow systems. Companies such as Aepona are already working with companies such as Sprint and Tellus in this respect and see this market ahead of the long tail market above.

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[11] http://www.aepona.com
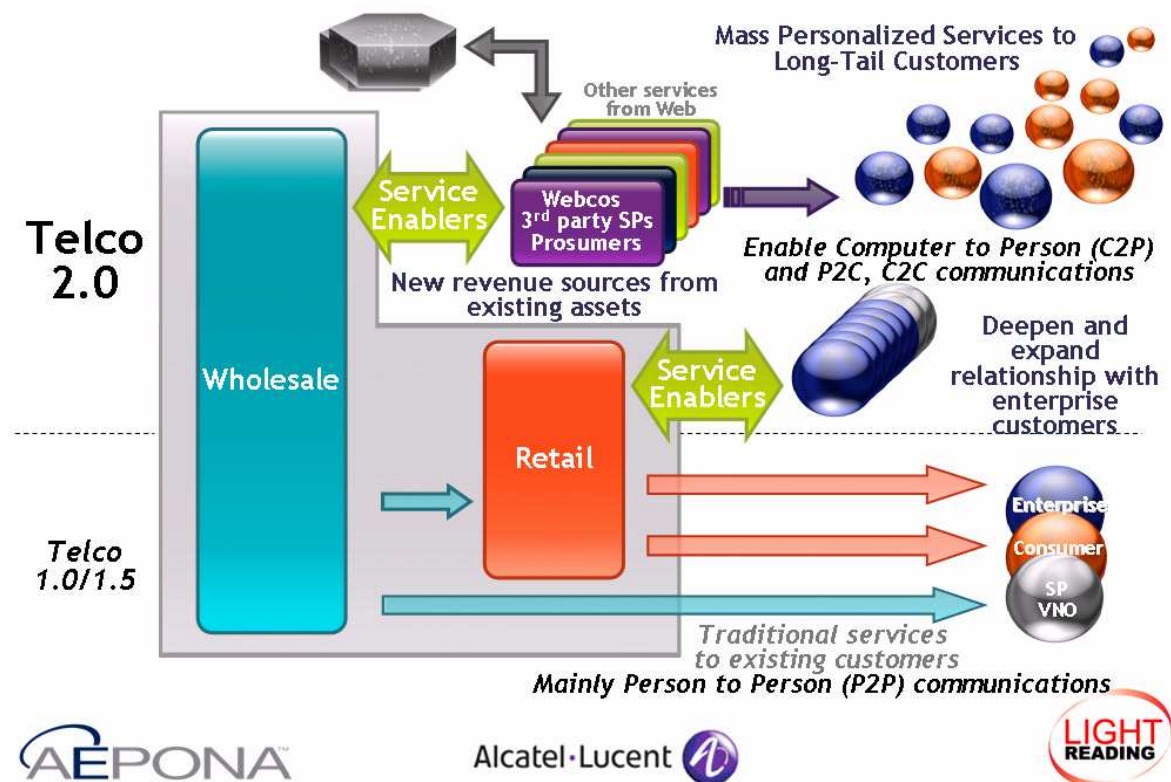
Figure 8 : The Telco 2.0 business model

In terms of the long tail, the business model from Aepona is slightly different as it can be seen addressing the needs of developers and service providers.

3.3.1 Telco API

One of the routes for Telcos to expose their capabilities to the third party applications is known as Telco API (or ANI, Application Network Interface, or third party interface), which can be divided into three main segments[12]:

- Operator branded services – using core operator branded services (e.g. telephony) in combination with third party features or other operator services to create a new offering

- Co-branded services – services that enable a brand's customers to be accessible to an operator, e.g. operator's Facebook widget.

- Long tail services – services they are generally too niche for operators to consider offering to customers; there are separated into three categories:

   o Enabled Applications – they do not necessarily have an operator brand association (e.g. free phone services)

   o Endorsed Applications – they have a preferred search position and

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[12] See http://www.alanquayle.com/blog/2008/03/the-telco-api-potential-to-rai.html

> endorsement of the operator. This is the classic third party enabled application.

- o Internet Applications – when an operator exposes the capabilities that will be used in ways over which it has not control, e.g. Google Maps API.

The introduction of APIs, gives Telcos the potential to raise their ARPU (average revenue per user), but to achieve this there must be flexibility in the pricing models (e.g. per transaction, fixed fee or ad sponsored). Some commentators believe there is potential to raise ARPU by between 12-36%, [8] depending on the operators' situation

Having and exposing the Telco API is not enough, operators must implement an application developer community (innovation community). For the API to be used it is necessary to make it easy for the applications to get on the operator's network, easy to be discovered by early adopter customers, and to have an easy to use community tool that enables continuous application development. Based on [6], these six things are needed for a successful community:

- Know the Audience: identify and build a strong relationship with the innovators

- Tools and Education: examples and sample code available

- Communications and Marketing: Bridge developer and non-developer community

- Metrics: need to be linked to business performance

- Business Model: needs to be integrated into the API

- Integration into the operators' core processes

3.4   Market changes occurring in the Telco 2.0 space

Market changes are apparent in the web space from non-facilities based service providers such as OTT service providers e.g. Skype and Google's YouTube, are in evidence providing services across the raw internet. Several questions are coming from the Telco's perspective:

• How does the Telco stay relevant in this changing Web 2.0/Telco 2.0 space?

• How can Telco's monetise this OTT traffic?

In addition, other changes are apparent - such as the rise in social networking, the rise of more intelligent devices such as portals, the emergence of alternative access networks such as WiMax, and finally the emergence of enterprise mashups where enterprises are combining Web 2.0 applications with their traditional workflow processes.

3.4.1   Applications in the UK Market

3.4.1.1   BT Web21C SDK

BT's 21st Century Network (21CN) initiative is a comprehensive transformation programme underway in the telecoms industry and provides the infrastructure for growth at BT. As a single network for voice, data and Internet services, 21CN is aimed at delivering unprecedented levels of choice, control and flexibility to end customers around the world. 21CN will enable BT to bring a host of new services to market much faster whilst radically reducing BT's costs and simplifying its operations. As the digital networked economy evolves, this broadband network will become its, "nervous system". To tackle the change towards Telco 2.0, BT has set up an ambitious goal: to completely remake itself from a

telecoms services provider to a leading global provider of networked IT services.

BT is currently exploring the Telco 2.0 business model with its Web 21C SDK[13], a set of developer tools where service APIs are being offered for sale to third party developers. BT's assets/capabilities are being externalised to developers – services such as Outbound Messaging, Inbound SMS, Voice Call, Conference Call, Authentication, and CallFlow, are being offered to developers in order to harness long tail revenues. As a result, a separate ecosystem is being created between developers and their customers resulting in a revenue flow downstream.

Current pricing model for the use of SDK services is fairly simple and straightforward.

Developers are able to test their applications in the sandbox environment free of charge, but with certain usage limits (Sandbox certificates are only valid for 30 days, and it is possible to only register 5 sandbox certificates), as shown in Annex A.

As use of the Web21C SDK requires programming skills, the Web21C SDK team has developed Mojo[14], the Portal that allows the use of Web21c securely through gadgets. It is built with Ruby on Rails and MySQL, using REST for communication and OpenId credential for authentication and it is currently in the beta stage.

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[13] See http://web21c.bt.com

[14] See http://mojo.bt.com
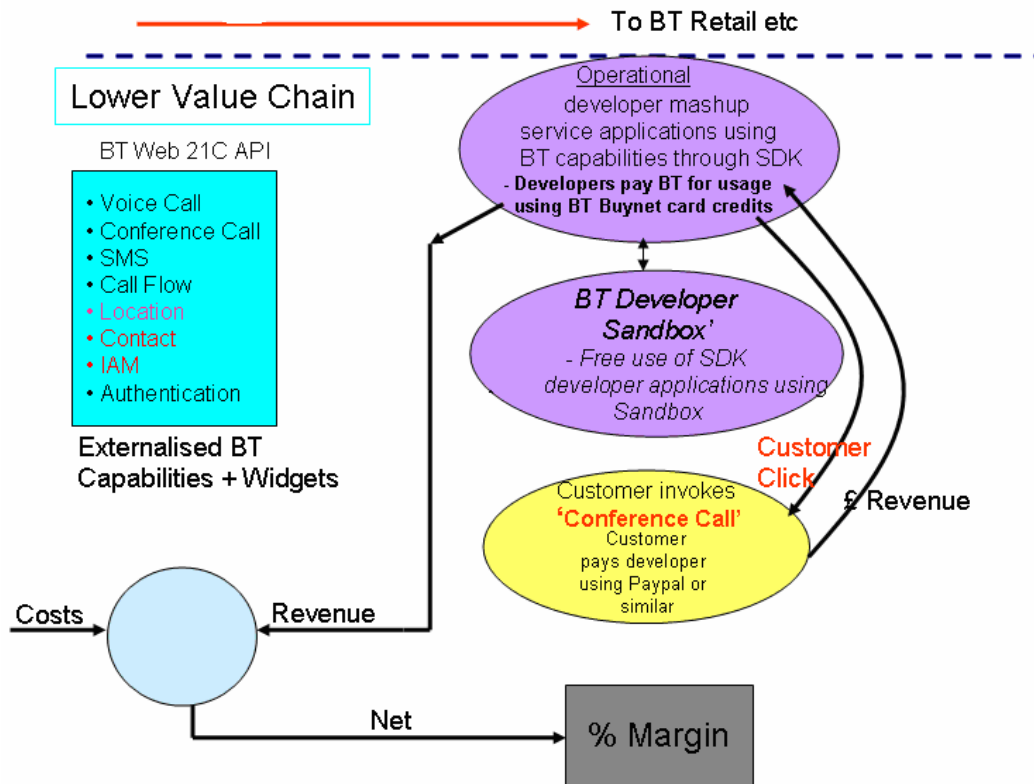
Figure 9 : Business Model for BT Web21C SDK

Current business model enables BT to make its revenues by monetising its assets upstream to the developers who purchase 'up front' credits using a BT 'Buynet' card, as shown on the Figure 9. The credits enable usage of these APIs to an agreed tariff. This business model is called the 'upstream/downstream' model. This model allows developers to access the long tail using Telco assets as building blocks. Telco's realise new revenue streams together with participating in the Telco 2.0 value chain. It is quite likely that if Telco's do not participate at this early stage then the OTT providers will see to dis-intermediate the Telco's in this respect.

Figure 10 : Possible enhanced business Model for BT Web21C SDK

Future BT Web21C SDK's business model, as seen in the Figure 10, shows BT as a broker and clearing house, selling APIs from other providers and managing the net flow of revenue to the providers, thus making sure that everyone in the ecosystem gets paid for their products. This is a key role in the Internet business. Taking an analogy of Apple iTunes, a payment service is one aspect which Apple has been keen to provide in the iTunes ecosystem, and which is a key to their success. In music, there are many ways to provide downloads, but few which ensure that the content providers get paid. Indeed there is little need these days for record labels at all, but they do ensure that content rights are observed.

In addition, advertising the BT Web21C SDK could be profitable for 3rd party service providers, when they receive free credits in return for advertising BT capabilities on their websites.

Both current and enhanced business models have a higher value chain where service providers could purchase white label applications, such as click to call, fleet finder, and people finder.

3.4.1.2   Android - An Open Handset Alliance Project

Android[15] is a software stack for mobile devices that includes an operating system, middleware and key applications. Developers have full access to the same framework APIs used by the core applications. The application architecture is designed to simplify the reuse of components; any application can publish its capabilities and any other application may then make use of those capabilities (subject to security constraints enforced by the

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[15] See http://code.google.com/android

framework). This same mechanism allows components to be replaced by the user.

Underlying all applications is a set of services and systems, including:

- A rich and extensible set of Views that can be used to build an application, including lists, grids, text boxes, buttons, and even an embeddable web browser

- Content Providers that enable applications to access data from other applications (such as Contacts), or to share their own data

- A Resource Manager, providing access to non-code resources such as localized strings, graphics, and layout files

- A Notification Manager that enables all applications to display custom alerts in the status bar

- An Activity Manager that manages the life cycle of applications and provides a common navigation stack

Although Android has been designed to include a rigorous security model, currently it is in the active deployment stage and has not yet been subjected to an extensive security review.

Since Android is an open cell phone platform, anyone will be able to build their own devices that run the core Android OS. There is no requirement that any given phone includes any Google software, or even be associated with Google at all.

3.4.2 Applications outside of UK

3.4.2.1 Ribbit[16]

Recently acquired by BT, Ribbit is an open platform for multi-protocol communication, primarily focused on a market of voiceware applications and services. It provides the developers the API to create new communications solutions, combining voice calling with Web 2.0 regardless of device, location or network.

Behind the scene, Ribbit has developed a carrier grade softswitch and integrated it into a Telco-style stack of APIs to OSS, with billing and other back-office services included. Whole thing is accessible on the front-end via Flash. It is using several communications protocols (XMPP, Skype, Flash Media Server) and various IM clients, with a standard SIP stack handling the Voice.

Creating developers account and downloading the SDK enables the user to create its own application using the Ribbit Voice Platform, in which voice is a programmable feature that is free from the traditional device. Developers are building rich voice applications in available using either Flex or Flash, and have the possibility to deploy them as an add-on widget on Amphibian, Ribbit's consumer application. That way they can push their applications to the wider community using the Amphibian as a distribution channel, and Ribbit takes a piece of the revenue.

3.4.2.2 iPhone Developer Program[17]

Recently, Apple has released a comprehensive program for iPhone software developers. It has three different releases:

- Enterprise Program, intended for companies with 500 or more employees who are

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[16] See http://www.ribbit.com

[17] See http://developer.apple.com/iphone/program/

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creating proprietary in-house applications for iPhone and iPod touch.

- Standard Program, intended for developers who are creating free and commercial applications for iPhone and iPod touch and want to distribute applications on the App Store.

- iPhone SDK, software development kit that will allow third parties to create applications that can run directly on the iPhone and the iPod Touch.

The iPhone SDK is free, but developers will be required to join the iPhone developer program (Standard or Enterprise) which allows developers to test their code, get tech support, and distribute their applications (requires a yearly fee to be paid before joining, $99 for Standard and $299 for Enterprise).

Applications will be distributed through Apple's App Store[18], which is built in to the iPhone but is also accessible through iTunes. Developed applications are fairly constricted as Apple plans on personally approving every application destined for the iPhone and SDK currently only works on Macs. When bought, applications are wirelessly downloaded to the iPhone over either EDGE or WiFi. Developers can set the price of their applications themselves and get 70 percent of the revenue from sales of their apps while Apple gets 30 percent. Free applications will be listed for free on the App Store and iTunes.

Security component requires developers to electronically sign their applications to participate in the program, allowing Apple to track them down if a malicious application makes it through the gauntlet of Apple's approval process. Since the App Store is the only place where applications can be obtained, Apple can shut off the App Store if a malicious application appears.

As Apple cannot possibly anticipate, nor produce, all the applications that people might want to use on an iPhone, they are counting on the SDK to expand what business users and consumers can do with their mobile devices. In the process, some of those newly created applications might convince people who were not sure about the iPhone to buy it.

3.4.2.3 Orange Partner Programme[19]

Orange has opened up several Orange network services, personal and communication services as well as multimedia solutions and made them available via APIs. The APIs are available either in 'alpha', 'beta' and 'release' mode, and they enable integration of the Orange functionality with third party solutions. This step fits into Orange's strategy for Web 2.0, as it stimulates co-innovation for all types of Web 2.0, SaaS (Software as a Service) and Social Network solutions.

Currently available APIs are as follows:

- Contact Everyone API – enables broadcasting of messages in various formats (SMS, voice mail on fixed or mobile phone, e-mail, fax) to more than 200 countries.

- Multimedia Conference API – allows several people to work on the same document on-line. The API handles scheduling, invitations and call session management.

- Device Capability Enabler API – allows developers to query mobile devices database maintained by Orange. The content can be used to adapt application screens to the capabilities of mobile devices.

- SMS API alpha – allows sending and receiving of text messages via web application.

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[18] See http://store.apple.com

[19] See http://www.orangepartner.com

- email API alpha – allows sending and receiving emails via web application.

- location API alpha – allows locating a user's mobile location via web application.

- click-to-call API alpha – allows user to establish phone calls between two numbers via web application.

- Authentication API alpha – this API is a part of the Personal APIs suite and has two different purposes: basic authentication and privacy functionality (it must be used before using any of the other APIs); and it simplifies the access to users' website for Orange users by allowing them to use their existing Orange account credentials.

- Personal Calendar API alpha – also part of the Personal APIs suite. It allows user (via user's website) to access and update the Orange calendar of an Orange France customer.

- Personal Contacts API alpha – a part of the Personal APIs suite. It allows user (via user's website) to access and update the Orange address book of an Orange France customer.

- Personal Messages API alpha – a part of the Personal APIs suite. It allows user (via user's application) to access information about the messages received (email, SMS and MMS) of an Orange France customer.

- Personal Photos API alpha – a part of the Personal APIs suite. It allows user (via user's website) to access and update the Orange photo albums of an Orange France customer.

- Personal Profile API alpha – a part of the Personal APIs suite. It allows user (via user's website) to access profile information of an Orange France customer.

- bubbletop developer platform – Bubbletop allows end-users to create a personalised view of the web and keep on top of what interests them. Users can view content by personalising it in their own specific way. It is also possible for users/developers to build widgets for bubbletop to create new services.

- pikeo developer platform – Pikeo is a picture sharing application that allows users to store, share and manage their pictures. Pikeo API allows users/developers to build their own applications.

To use the API, one has to register for the Orange partner program and obtain the account. API's currently in alpha mode are free to use and have certain service limitations.

3.4.2.4 *Grand Central from Google*[20]

GrandCentral, acquired by Google a year ago, is a service that lets users integrate all of their existing phone numbers and voice mailboxes into one account, which can be accessed from the web. This way, user's phone number is tied to the user, and not to the user's location. Via the service, it is possible to have multiple phone numbers (e.g., home, work, cell), but to set rules to ring all, some, or none of user's phones, based on who's calling. User has the ability to manage voicemail, address book and other features online or from any phone.

Service is currently available only on the US market and it is closed for the new users.

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[20] See http://www.grandcentral.com/

3.4.3 Other Telcos

3.4.3.1 France Telecom

France Telecom, FT, represents a traditional PTT, as a still part-nationalised company with a dominant position in fixed-line, ISP, and mobile markets at home. Recently, they have rolled entire consumer side into Orange, one of the strongest brands in the industry.

In terms of a business model, FT/Orange is very keen on bundling. As an integrated full-service carrier, in France it offers quad-play. FT is offering IPTV and carrier-VoIP over its DSL network, in an attempt to replace the vanishing revenue by introducing new service revenues[21]. The key to this effort is the Livebox, the WLAN router/modem/set-top box that is distributed to all subscribers. Livebox gives the user possibility to use technologies such as VoIP, Bluetooth radio and IPTV – enabling a user to become its own Telco.

So by opening up and expanding to new ideas for revenue generation, FT is giving us a preview what their platform for new services looks like. Once you have a little box in the customer's living room with an IP address, a general-purpose OS, and remote admin access, you are in a position to come up with new ideas and get them out to the market very quickly. To compliment that, a range of Orange branded APIs has been made available, as mentioned in Section 3.4.2.3.

3.4.3.2 Deutsche Telekom

Deutsche Telekom, DT, considers Web 2.0 as "as the synonym for active Internet design, and personal and social networking among users". As Web 2.0 is considered to be a huge new development area for telecommunications companies, DT is aiming to develop and market services for communities, interest and user groups[22]. Via the T-Community, DT is offering community service for German-speaking users. They are granted access to content services geared to their interest profiles regardless of their location (e.g. blogs and other personal and social networking platforms). With customers actively involved in product development via interactive communication platforms (best achieved through communities), DT is benefiting from the direct communication among and with consumers and improving its products and services. Mobile product "web'n'walk" allows users the possibility of "Internet on the go" and makes it possible to use DT's (or their partners) stream of Web 2.0 services (e.g. MyFaves, service that addresses customers' growing need for easy-to-use contacts in their personalized networks) and provides access to users' favourite websites and Internet services such as eBay, Windows Live, Google, and Yahoo!.

3.4.3.3 Telecom Italia

Telecom Italia is considered an industry leader in fixed-line/mobile telecommunications and the internet in Italy and abroad and it is actively seeking additional business in high growth business areas (e.g. ICT, PayTV), enabled by innovative technologies and platforms, to be able maintain its strong competitive position. The Italian fixed-voice market has been influenced by the development of mobile operators that attract voice traffic through the advantage of mobility, a wide range of Value Added Services and high performance

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[21]   From   http://www.telco2.net/blog/2007/07/telcos_under_strain_france_tel.html   and http://www.telco2.net/blog/2007/07/france_telecom_part_2_little_b.html

[22] See http://www.annualreport2007.telekom.de/en/klb/konzernstrategie_und_konzernsteuerung/index.php?page=58

terminals. In addition to it, it has been subject to cannibalization by the increasing penetration of alternative communication solutions (messaging, e-mailing, chat). As a response to it, Telecom Italia has launched NexTIM[23], their website for exposing new services for their early adopters or, as they call them, their '360 degree innovators'.

3.4.3.4 Telefonica

Telefonica has started its response to the ongoing industry changes and it is focused on the new competitors, new user needs/expectations, broadband explosion and digitalisation of content[24]. It has taken a defensive and growth-driven approach, as it interests lie in all platforms – Internet services, mobile market and Pay TV. By using support of existing marketing mechanism and content acquisition, it is able to focus on the innovation (technology and beyond) and creation of 360° cross- platform offers (with accent on bundling). Currently, content, broadband and digital services represent 14% of Telefonica's revenue which serves as a strong incentive for growth in the digital entertainment.

3.4.3.5 TELUS Mobility

TELUS Mobility is a Canadian wireless telecommunications provider offering wireless voice, data and Internet services to business and consumer clients via two digital wireless networks, PCS and Mike[25]. Mike network, based on Motorola's multifunctional iDEN (integrated digital enhanced network) technology, integrates digital PCS phone, two-way radio, text messaging and data/Internet services. TELUS is considered to be a thought leader in Telco 2.0 in Canada. Its WiFi Hotspots are available in key public locations across Canada and they allow users to connect to the Internet and other networks wires. TELUS Mobility is using a "pay per use" model for Wireless Web access, allowing clients to pay for the services they want and use the most. Their Wireless Web services allow clients to access directly from their phones to the online directory, mapping, financial, gaming and wireless shopping services from more than 100 online content partners.

3.4.4 Other Initiatives and Organisations

3.4.4.1 STL Telco 2.0™ Initiative

STL, as an advisory and analysis firm specialising in supporting innovation and change in the Telecoms, Media and Technology (TMT) sectors, has started the STL Telco 2.0™ Initiative[26] in May 2006. Telco 2.0™ is a collection of research, brainstorming and consulting services designed to catalyse change in the Telco-Media-Technology value chain:

- Telco 2.0™ Research & Analysis
- Telco 2.0™ Executive Brainstorms
- Telco 2.0™ Consulting

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[23] See http://www.nextim.it

[24] See http://www.slideshare.net/stephenmcclelland/digital-content-creation-where-will-the-funding-come-from/

[25] See http://www.telusmobility.com/about/company_background_telus.shtml

[26] See http://www.stlpartners.com/telco2.php

The Initiative stimulates new ways of thinking about Business Models, Service Portfolios and Technical Architectures, ultimately looking to answer the question: "How do Telcos make money in an increasingly IP-based world?"

3.5 Applications of SOA4ll technology

3.5.1 Summary of current technology & limitations in moving to Telco2.0

Various Telecoms have recognised the need of moving into Telco 2.0 space, thus bridging the gap between traditional telecoms and the Web 2.0 world. Exposing their capabilities thru APIs to the wider developer community and enabling creation of applications with third party services, new opportunities emerge. This proactive approach encourages innovation and generation of new revenue streams. In addition, it generates new challenges, e.g. protection of customer sensitive data. This is the niche for the Telcos as in the trust/identity/presence/security issue, most users (i.e. non-early adopters) still trust Telcos more then start-ups and/or IT companies.

Current market offers variety of non-Telco companies offering Telco-type services, as shown in Annex B.

3.5.2 Potential for SOA4All in helping move to Telco2.0

To demonstrate the potential for SOA4All technology in the move to Telco 2.0, we will exemplify by reference to BT's Web21C SDK initiative (see Section 3.4). The application of SOA4All technology will create a semantically enhanced and expanded version of the Web21C services platform supporting internal (BT) and external user communities. It will investigate how BT can provide third parties access to Virtualised IT and Network resources and services by exposing its common capabilities to third parties, making them easy to consume, combine and share. This will be achieved by utilising the technology developed in the various core research areas of the SOA4All project, as described below.

3.5.2.1 Web 2.0

User generated and maintained communities are an essential part of the case study, as well as encouraging ease of use and a low barrier to entry in utilising SOA. SOA4All technology based on Web 2.0 principles help encourage this, specifically to

- Encourage users to work together and innovate to create new and innovative uses for BT services by providing an appropriate Web 2.0 community environment;

- Provide facilities for user to share information about services, applications and so on;.

- Allow users to tag, rate and comment on services for improved service discovery;

- Improve the usability of SOA, and facilitate the creation and management of new composed services, in a lightweight manner, with a low barrier to entry.

3.5.2.2 Context

The use of contextual knowledge will be key for supporting both the discovery and composition of services in a customized manner. The complexity underlying this will however remain hidden from the service user, and be handled in an automated fashion.

Service composition will use contextual knowledge about both the user domain, (for example, knowing the current user is an ISP targeting rural areas), and community knowledge, (for example, knowledge of sets services tending to be used by similar ISPs) to suggest and customize solutions based on prior experience. As a result the user will obtain more specific and adapted proposals which will simplify the selection of suitable services. This can be done by pre-defining each constituent service with a number of options, by parameterising certain functionality, and by providing a context-adapted service discovery and selection process according to the identified context dimensions.

Service provisioning will also be enhanced by the use of contextual knowledge. This will be achieved at runtime by integrating execution information, together with contextual knowledge such as user preferences and trust relationships (for example, which service providers does a given end-user trust). To do this, the service execution platform will integrate the information populated by the monitoring infrastructure with the contextual knowledge base, and will seamlessly invoke the context parameterisation engine as the need arises.

To give a concrete example, the manager of a rock band may attempt to compose a service allowing users (fans) to participate in a virtual concert on their devices (desktop PC, handheld, mobile phone, etc.), by "wiring together" an advertisement service, a booking service, an audio broadcasting service and a video streaming service. The context adaptation mechanism can then configure the booking service so that users can pay in euros, pounds or dollars depending on the country in which they live, charge the appropriate rate of VAT, implement any differential pricing policies and allow spectators to use the generally accepted form of payment for their country and mobile network (eCash, charge-to-telephone-bill, credit card or bank account details). The audio broadcasting service and the video streaming service can be adapted to the type of device on which the spectator would like to watch the concert, and the advertisement service can be adapted to the regulatory context of the country where the event is advertised.

3.5.2.3 Semantics

BT will take advantage of the semantically enabled improvements in provisioning, consumption and monitoring tools that are offered by SOA4All technology. Semantic descriptions for Web Services and Goals will be built by BT and non-BT Web21C users in a straightforward way using purpose-built tools, allowing them to make available their services, or to discover and use the services of others, more efficiently. Similarly, semantics will also be important to enable new composition tools that will enable the creation of more complex services at lower cost.

3.5.2.4 Services

As mentioned above, BTs current Web21c SDK offers a variety of services for consumption as web services including: SMS Messaging, Voice Calls, Conference Calls, Location detection (based on GSM triangulation), Authentication, Automated Call Management, Calendar and Address book services. As more services are made available they will be included on the next generation platform.

In addition, there are also other B2B gateways and APIs that BT uses for interaction with its

customers and suppliers, such as broadband provisioning[27], repair and diagnostic services. SOA4All technology has the capability to also describe these services in the same semantic framework (see, for example, Duke 2006), allowing them to be combined with Web21C services.

The third and final class of services are third party services. One of the main aims of the cases study is to promote the uptake of Web21c by offering tools to encourage innovation in using and combining BTs services. SOA4All technology will make it easier not only to consume BTs services but also combine them with other people's services to make new and interesting applications.

3.5.2.5 *The role of Ontologies*

As described above, ontologies and semantic descriptions will form the basis for data, process and service representation in SOA4All. In the context of applying SOA4All technology to Web21C, telco domain ontologies will also be used. One example is NGOSS (Next Generation Operations Systems and Software) which is an industry-wide specification developed by the TeleManagement Forum[28] the purpose of which is to organize and guide the design and development of next generation operation systems in Telco domain. It contains a set of frameworks, high-level architecture and methodology.

NGOSS consists of four key frameworks related to the different levels of looking at business which are:

- Business process framework (Enhanced Telecom Operations Map – eTOM)
- Enterprise-wide information framework (Shared Information and Data model – SID)
- Applications framework (Telecom Applications Map – TAM)
- Systems Integration framework (Technology Neutral Architecture – TNA)

Ontologies have been developed that capture telecommunication sector knowledge from NGOSS's standards. SID model contains domain concepts related to market, product portfolio, customer, services, resources, the enterprise and supplier/partner, as well as common business terms called Core Business Entities (CBE) which are captured in the CBE Ontology (CBEO). eTOM map defines a set of functional areas which serves as a reference classification for the business goals a process fulfils, which are captured in the business goals ontologies (BGO). TAM map defines the typical IT systems map of telecommunication companies, and serves as a reference classification for a company's services map.

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[27] See http://www.btwholesale.com/pages/static/Applications/Orders/B2B_Gateway.html

[28] See http://www.tmforum.org

4. Conclusions

Traditional Telcos are pressured to change due to the more competitive and demanding markets. With the emerging new types of customers, increase of flexible working and need for the next generation networks, all core products (voice, messaging, broadband access) are demanding a change in the business model. That new model will enable Telcos not to only create revenue from its end customers, but also from new customers, in line with the concept of 2.0, as Telcos need to deal with unpredictability of demands and unanticipated usage, and the need to give away non-essential control to the users and customer community.

With the emergence of WebCos and OTT providers, the response seems to be 'Telco 2.0', an initiative that aims to leverage some of the unique value that Telcos have by being the provider (and the central hub) of communications. The idea is to prevent Telcos to become merely a commodity "dumb pipe" provider, but to move the Telco up the 'value chain' by using information that it has (such as user location, or web browsing habits), e.g. to partner with advertisers to sell contextual advertising.

Applying semantic web techniques among Telcos systems could provide a solution to handle diverse legacy systems. Using the ontologies could provide an underpinning for information sharing and semantic interoperability, and modelling the semantic relationships among Web Services interfaces, could enable automation of task execution accomplished by Web Services, by using automatic service discovery, selection and composition.

Service Orientated Architecture, with principles of modularization, reuse and ubiquitous access has been accepted as the key technology for transforming IT systems and increasing efficiency across an organisation. Telcos have identified SOA as a key enabler for more rapid product and service deployment, in order to keep up with the competition and fast-pace of the web. Allowing product's OSS 'wrap' to be developed from reusable SOA components, apposed to custom 'stove pipe' OSS solutions, products time to market should be reduced, enabling Telcos to maintain a competitive edge

Various Telcos have recognised the need of moving into Telco 2.0 space, thus bridging the gap between traditional telecoms and the Web 2.0 world. Exposing their capabilities thru APIs to the wider developer community and enabling creation of applications with third party services, new opportunities emerge constantly as current market offers variety of non-Telco companies offering Telco-type services.

BT has identified that Internet based communication is important in the vision of a 21st century Telco business and therefore released a web based API for accessing a variety of telephony services over the web, named Web21c. This document has looked into issues around adopting new business models and practices in a Telco 2.0 environment and Deliverable D8.1 has defined requirements for the next generation of BT's Web 21C platform. These will be followed by design and implementation of a prototype and they will lead to more detailed recommendations for semantic telecommunication (in the Deliverable D8.5).

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Annex A. Current Web21c Pricing and Usage limits

Table 2: Usage limits on SDK in sandbox environment

Service	Limitation
Messaging	10 international messages / day 20 characters / message
Voice Call	10 international calls of 2 mins / day
Conference Call	10 international calls (up to 4 participants max) of 2 mins / day
Authentication	100 requests / day
Information About Me[29]	100 requests / day
Location[29]	10 requests / day

The Web21C SDK services are charged through a credit system with each service having an associated credit cost. Each service cost operates on a flat rate, i.e. no per minute charges for phone calls, the cost for each service is detailed below, in the Table 3:

Table 3 : BT's Web21C SDK Service Credits

Service	Credits
Outbound Messaging	2 per message
Inbound SMS	free[30]
Voice Call[31]	5 per PSTN/mobile call leg 1 per SIP call leg
Conference Call	75 per conference call 10 per PSTN/mobile participant 1 per SIP participant

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[29] These services have been deprecated and will be removed in a future release

[30] There are subscription charges for this service.

[31] Voice calls comprise of 2 call legs - which can be PSTN/mobile or SIP.

Service	Credits
Location[29]	10 per locate
Authentication	free[32]
Information About Me[Error! Bookmark not defined.]	free[32]
Contacts[Error! Bookmark not defined.]	free[32]

In the production environment, web developers pay for credits to use the SDK services without any limits on usage. Based on a pay-as-you-use model, the developers purchase credits upfront to enable their applications to use BT Web21C SDK services. They need to top up their credits to ensure sufficient credits are available before using them on their applications.   The credits are purchased using credit cards on the BT Buynet system, according to the following four pricing packages, with discounts for volume purchase, as shown in the Table 4:

Table 4 : Web21C SDK Credits

Package	Price	Credits	Cost Per Credit	Discount
1	£10	500	2.00p	—
2	£100	5100	1.96p	2.0%
3	£1000	53000	1.89p	5.7%
4	£5000	280000	1.79p	10.7%

Additional service Inbound SMS[33] requires either a dedicated phone number, which gives user an exclusive number for receiving texts, or a keyword service where user is given a shared number and messages can be directed using a keyword that is prefixed before the message. The keyword service offers two options, which allow user to tailor the coverage to suit its needs:

- UK Long Number Worldwide - gives coverage throughout most of world excluding US
- US Shortcode - gives coverage in the US

This service is charged as a monthly rental fee (plus initial setup fee).

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[32] These services are free for use while you have a credit balance and are actively using chargeable BT services.

[33] The minimal rental period for an Inbound SMS number is 3 months.

Annex B. Applications available on the market

Market nowadays offers a variety of applications performing most of the Telco services, as show in the Table 5 bellow:

Table 5: Snapshot of applications available on the market[34]

Application Type/Description	Application Category					Business Model Options			Branding			Application Vendor Examples[35]
	Voice	Messaging	IPTV	Community	LBS	Ad Sponsored	Subscription	Usage	Branded	Co-Branded	Third Party	
Call Management → Intelligent call routing	x	x			x		x		x	x	x	GrandCentral; Iotum
Communication enabled business processes → usage of messaging, conferencing and/or calling APIs within business applications	x	x					x	x	x			BroadSoft; Integra5; Bluenote Networks
Community Widget → operator widget on internet communities that provides services such as buy ring tones, SMS friends, location of buddies, etc.		x		x	x	x	x		x	x		Flock; Ning; Oz
Conferencing / Collaboration → integrated audio/video/web-based conferencing tools across multiple platforms	x	x		x			x	x	x			PalBee; Jive; Gaboogie

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[34] For more detailed version of this table see http://www.alanquayle.com/blog/2008/07/16/Telco%20API%20Consolidated%20Business%20Models%20and%20Services%20-%20Sample.pdf

[35] More applications can be found, these are just general examples.

	1	2	3	4	5	6	7	8	9	10	
Converged Communications → integrated communications across several devices	x	x					x	x	x			Broadsoft; Integra5; Telepo
CRBT → Caller Ring Back Tones	x				x	x	x	x				LiveWire mobile; IMImobile
Directory Services → On-line, via mobile, voice or STB access to yellow and white pages	x	x			x	x				x		SI project with Yellow/White pages provider
eGovernment → government communication, advice, information and voting	x	x	x	x	x		x		x			SI project
eHealth / Telemedicine → remote diagnostic	x	x				x	x		x	x		HealthiNation; Heathline; Sermo
eInclusion → disability enablement	x	x	x	x	x		x	x	x			SI project
eLearning → distance learning for schools, higher education and private entities	x		x			x				x		SI project
Emergency Alerts → weather related or other emergency related alerts		x				x		x	x	x		Cellbridge
Family Management → planning and communication tools between family members	x	x	x	x		x	x	x				Nesting

Feature												
Fixed Mobile Convergence → common communications experience across fixed and mobile devices	x	x					x	x	x			RadioFrame; IP Access; Ubiquisys
Location Based Community → Community centres around being able to leave location notes (bookmarking places to see/visit)	x	x		x	x	x	x	x			x	Sense networks; Blackline GPS; Placestodo
Office Anywhere → Secure remote access to office, communications and business process software, all integrated into simple to use package	x	x					x		x		x	iAnywhere
One Number → Integration of users' existing phone numbers and voice mailboxes into one account, accessible from the web	x	x					x		x		x	GrandCentral
Context Enabled Communications → integration of communication services around the address book (includes presence), covering push to talk, messaging, IM, picture message, video, etc.	x	x		x	x		x	x	x			Oz; Kodiak; NEPs
Voice Community → Voice based community tool (interactive talk radio)	x			x		x	x	x	x	x	x	Utterz; Snapvine

Voice Portal → voice based content and CRM	x			x		x		x	x	x	x	IMImobile
Voice SMS → Voice messaging using SMS	x	x				x	x	x		x		BubbleMotion; Yap
VoIP → Clients and dial-out services to bypass traditional voice call charges	x					x	x	x			x	ICQphone; Skype; TringMe; WiFiMobile