Digital Help Service Opportunities For Communication Service Providers in the Convergent Digital Home
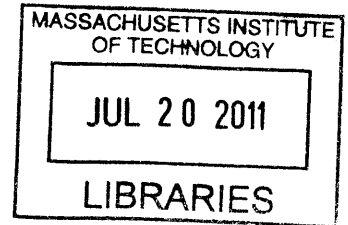
by

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Submitted to the Systems Design and Management Program in Partial Fulfillment of the Requirements for the Degree of Master of Science in Engineering and Management

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Abstract:

Homes are becoming increasingly connected as new technologies allow users to access media and information from any-device at anytime. Notebooks, HDTVs, smartphones, media servers, photo cameras, and video cameras, all form part of this new digital ecosystem where – the vision says – information and content will flow easily across devices, enabled by simple and intuitive user interfaces.

These new home technologies are, however, often too complex for most users. Only "digital-natives" or technology savvy groups have the necessary skills, knowledge or confidence to adopt them and to use them effectively. For the rest, trying them becomes painful and frustrating. Moreover, the ecosystem itself adds confusion, given the large number of players involved and the many different kinds of relationships. Unless a dominant player gains enough power to establish a dominant digital home architecture, or this happens in some other way, most companies will continue to innovate around device-specific features that don't address the overall complexity of the complete systems that users have to work with.

Digital help services can assist users by simplifying the selection, installation, learning and troubleshooting of new services and devices; facilitating the adoption of new convergent technologies. There is a broad range of potential services, including, for example, 'over the top' (OTT) television integration, smartphone mentoring services, WiFi network configuration and desktop support services.

Communication service providers should pay close attention to digital help services as an opportunity to differentiate their offer, strengthen their relationship with end-customers, reduce customer support costs and simplify the adoption of bandwidth-intensive technologies. Moreover, digital help services can speed up the adoption of OTT television services, and companies can use them strategically. The technology help space is evolving and communication service providers need to figure out how they want to participate: offer help services themselves; partner or acquire a existing technology support company; and/or create an open marketplace for technology help services.

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1 Introduction

1.1 Context

This Thesis sits at the intersections of three arenas undergoing rapid innovation: communication services; home technologies; and users' ability to interact with technology. Each one of them is going through major transformations.

Communications services are evolving very rapidly, enabling new opportunities and threats. The exponential growth of bandwidth is creating new convergent services that are erasing the old boundaries amongst telephony, Internet and video services. Meanwhile, communications service providers face significant threats as their role in the value chain changes. Telephony revenues are declining; Internet prices remain constant despite the huge investments needed to upgrade networks; and video services face new competition by third-party Internet streaming services.

The new digital home is becoming increasingly connected through devices and services such as IP-connected HDTVs, media servers, smartphones, tablets, Wifi routers, smart-meters, etc. In the future –the vision says – any media and information will be available simultaneously on any-device at anytime. Early adopters, especially technology-savvy users, appreciate these new opportunities.

However, opportunities enabled by higher bandwidth and new connected-devices are limited to a small number of users that have the necessary skills, knowledge and confidence to use new technologies. All too often, trying to adopt new technologies becomes a painful experience, in particular for those who are not "digital-natives".

Overall, there is a need for simple and easy-to-use technologies in the home. There are only two ways in which this vision can become reality: either the technology itself becomes simpler, or the technology retains some complexity and "is simplified" to users through help services. This Thesis explores the second case.

1.2 Hypothesis

This thesis explores the hypothesis that there is a significant opportunity for communications service providers through providing these simplification services.

Digital help services can simplify convergent home technologies for mainstream users in developed markets. Communication service providers can offer digital help services to their users and benefit from the market opportunity.

- *Who?* Communication services providers, mainly Telco's and Cable operators.
- *What?* Digital Help Services, assist users with new technologies and devices.
- *Why?* Simplify technology adoption and use to mainstream users, which can lead to several strategic benefits for communication service providers.
- *Where?* In developed markets, particularly the United States or Europe.

This thesis explores the key factors that determine the validity of the main hypothesis, together with the conditions needed to support it. **Figure 1** decomposes the main hypothesis into several questions that are addressed by specific chapters. Each one of them is analyzed in terms of the current state and the evolution path.

Thesis Chapter:

Question	Chapter
Why Communication Service Providers care?	*Communications Service Provider Industry*
Are home technologies really too complex?	*Digital Home Technologies*
Does the ecosystem influence complexity and confusion?	*Stakeholders and ecosystem evolution*
How could digital help services change this?	*Digital Help Services Value Proposition*
Is there a demand? Who, why and how big?	*Demand opportunity*
What are the benefits for communication service providers?	*Opportunity for communication service porviders*
Who benefits and looses in the industry?	*Value captured*

Motivation — Value Proposition — Demand Opportunity — Payoffs

Digital Help Services Hypothesis

Figure 1: Digital help services hypothesis decomposition

1.3 Methods and tools

This Thesis relies heavily on "system thinking" tools and methods, which are based on a holistic view of systems, their stakeholders and interactions.

System dynamics, specifically causal loop diagrams, are used to model the ecosystem evolution and the conditions needed to reduce the overall complexity users face given the incentives to innovate.

OPM (Object Process Methodology) diagrams are used to present digital help services as a system addressing a specific need through a particular form. Additionally, OPM diagrams are used to decompose the need for digital help services.

Stakeholder analyses are used to understand how different players affect, directly or indirectly, the adoption and use of home technologies. Additionally, industry ecosystem diagrams, technology standards diagrams and industry revenue-flow diagrams are used to discuss the key dynamics and incentives.

Finally, a simple economic model estimates the impact of digital help services in communication service provider's revenues and profits.

Primary research was based on interviews to leading experts. Secondary research was based on industry reports, articles and academic papers.

1.4 Sources

As primary research, the author interviewed several industry experts and company executives to obtain a comprehensive understanding of digital help services, the ecosystem and the opportunities. The interviewees include executives form service providers, leading technology retail companies and technology support companies. Most of them from the US and European markets.

Additionally, the author did some anecdotal market research to understand users experiences and frustrations regarding their interactions with technology.

As secondary research, this thesis is based on industry reports, industry articles and some academic paper. Finally, the author's personal experience working for a communication service provider was used as a source of anecdotal evidence.

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2 Communications Service Providers Industry

2.1 Introduction

This chapter describes the current state of the communications industry from the service provider perspective to explain the need to rethink their strategies and revamp the nature of their relationship with customers.

First, an overall description of telecommunications industry describes its main products and trends. Then, the major threats for Voice, Internet and TV services are presented. Finally, the threats implications on the relationship with customers are described.

2.2 Telecommunications service industry

Even though definitions have become less clear, the term communication service providers (CSPs) refers to companies that offer information transportation "services" to residential customers, small companies or corporations; typically using their own network infrastructure. The term encompasses companies in the Telecom, Cable, Internet, Wireless and Satellite industry.

Traditionally, service providers have been classified based on network assets and regulatory frameworks. Telco's refers to traditional telephony companies. MSO (multisystem operator) refers to cable or satellite TV service providers. However, these distinctions have become increasingly meaningless as most players offer convergent services: telephony, video/TV, Internet and value-added services.

During the last 30 years the telecommunications industry has undergone several significant transformations. During the 80s most markets de-regulated their state-own Telco's and, in the US, AT&T was divided into several smaller regional companies. Then, during the 90s many Telco's and cable operators added Internet capabilities to their networks to offer dial-up connections and broadband services. As a result, cable operators began competing with Telco's through bundled services. During the 2000's companies continue to upgrade their networks and the triple-play concept emerged: an integrated offer of TV, Internet and wireline telephony services. While some Telco's added IPTV capabilities to their existing networks, other chose to partner with satellite TV or deploy FTTH technologies (such as Verizon's FiOS network) to compete in the triple-play market.

Meanwhile, during the last 20 years the industry has witnessed how mobile telephony has exploded. Traditional telephony revenues have moved to wireless services as users prefer mobile services to landlines residential telephony.

Currently, the communications service provider industry is a multi-billion dollar industry with its leading companies among the largest companies in almost every country. For example, in the US there are five companies with revenues above $20 billion a year (AT&T, Verizon, Sprint-Nextel, Comcast and Direct TV), with aggregate

revenues of approximately $320 billion and an aggregate market capitalization of approximately $324B [1].

Together with Northern Europe and some Asian countries, the US market is one of the most developed communications markets in the industrialized world. A Forrester report [2] indicates there are 92.7 million US internet-connected households by 2010 (77%), 90% of them with broadband connections. By 2009, 81% of households had subscription-TV services (cable – 48%, satellite TV – 25%, Telco TV – 4%) and 32% had HD service, despite approximately 57% already owned an HDTV. Triple-play services account only for 30% of the US households, probably reflecting specific US industry dynamics (AT&T and Verizon serve about 45% of wireline phones).

| 1-1 | Forecast: US Household Technology Adoption, 2009 To 2013[1] |

US households (millions)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
113.1	114.3	115.5	116.7	117.7	118.7	119.8	120.9	121.9	123.0	All US households[2]
80.7	83.2	86.4	87.6	90.1	92.3	94.3	96.2	98.0	99.7	PC
74.9	77.4	81.5	84.2	88.0	90.5	92.7	94.6	96.4	98.1	Internet[3]
31.9	40.9	55.7	65.5	74.1	79.8	84.1	87.6	90.1	92.5	Broadband[4]
6.1	13.1	26.3	36.9	46.8	57.8	67.8	76.1	82.6	85.4	HDTV
9.8	18.0	21.2	25.8	32.4	39.3	46.2	52.5	58.2	62.9	Home network
7.3	11.7	17.4	25.0	28.2	30.9	33.6	36.2	38.6	40.8	DVR

Base: US households
Source: Forrester's ForecastView Forecasts; see the spreadsheet online for full details.

Figure 2: US household technology adoption, 2009 – 20013 [2].
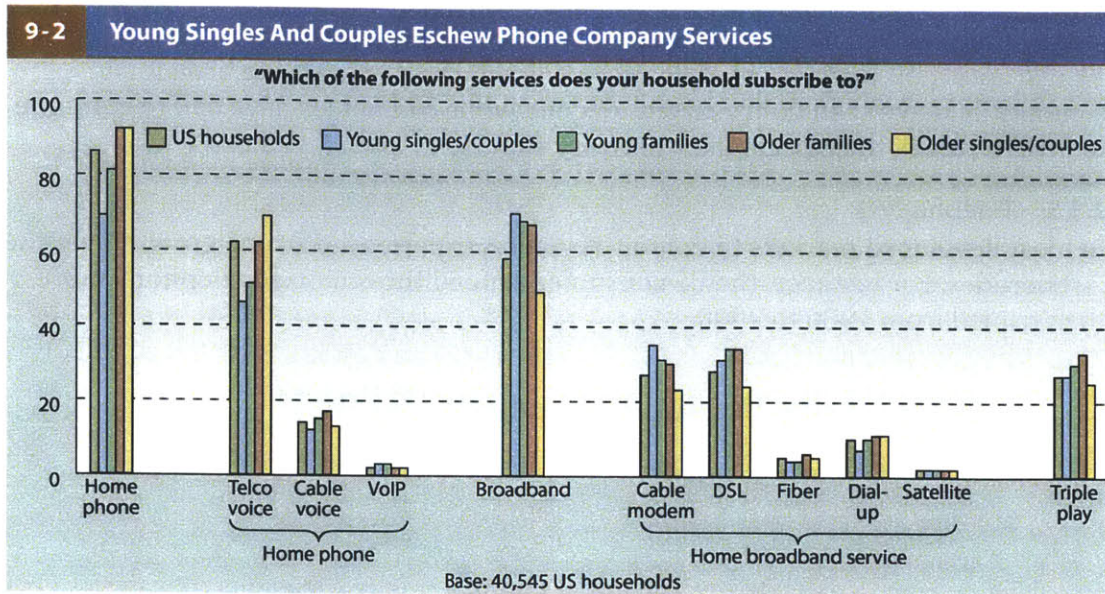
Figure 3: 2009 US Household communications services provider's networks per customer type [2].

9-1	Wireless Is The Top Expense				
"On average, how much does your household spend per month on each service at home?"					
	US households	Young singles/ couples	Young families	Older families	Older singles/ couples
Internet access	$34	$36	$33	$34	$34
TV service	$61	$59	$59	$62	$61
All cell phones	$71	$73	$81	$88	$61
Home landline phones	$40	$36	$39	$43	$41
Voice, Internet, and TV bundle	$118	$113	$118	$120	$118
Base: US households that pay for each service					

Figure 4: Average Household Expenses in communication services [2].

2.3 Communication Service Providers Threats

Currently, even though many communication service providers remain large and profitable, their products and value propositions face threats that will require new strategies to maintain a strong competitive position and drive growth. A significant part of the value has moved from traditional fixed operators (Telco and Cable) to mobile operators, which still enjoy relatively high growth rates and reasonable margins. Putting the mobile market aside, the challenges for fixed service providers vary depending on the specifics of their customer base, product portfolio and network assets. While traditional Telco's have seen declining telephony revenues

for several years, cable operators could face new challenges as over-the-top (OTT)[1] TV disrupts their business models. Moreover, markets with strong broadband competition have seen their margins decline while companies have had to continue to invest heavily to upgrade their network capacity.

2.3.1 Telephony

In most developed markets telephony revenues experienced strong growth over the last decades. For instance, the US consumer expenditures in fixed telephony more than tripled from 1980 to 2000.
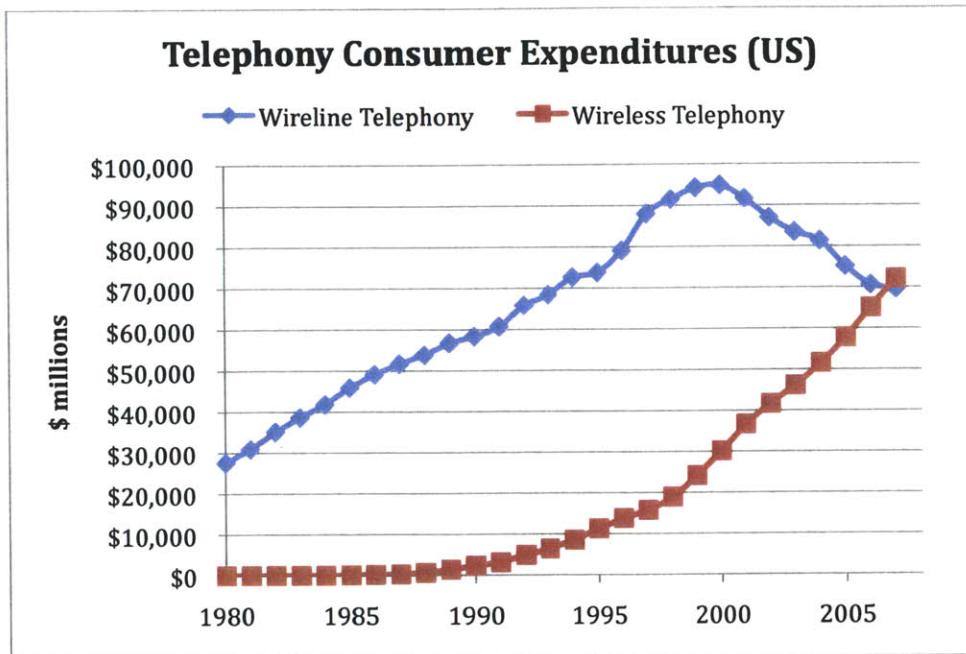
Figure 5: US Telephony Consumer Expenditures from 1980 to 2007. Data from Trends in telephony service report, FCC, 2008 [3]

However, as **Figure 5** shows, aggregate consumer expenditures in telephony peaked in 2000 and have declined ever since. Simultaneously, wireless telephony grew from almost zero to surpass wireline telephony by 2007 (in the US).

Since approximately year 2000, wireline telephony revenues have been declining in most of the developed world. **Figure 6** shows the relative wireline telephony market size for the US (based on consumer expenditures), the UK and Spain (based on fixed call revenues). To compare their evolution trends, annual revenues where divided by 2001 aggregate revenues for each country. Clearly, all three markets reduced their size since 2000, confirming the global trend. Data obtained from market reports [3] [4] [5].

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[1] Over-the-top TV refers to TV content streamed over the Internet, typically not controlled by services providers (e.g., Hulu, Netflix online, Vudu, etc.).

Relative wireline telephony market size
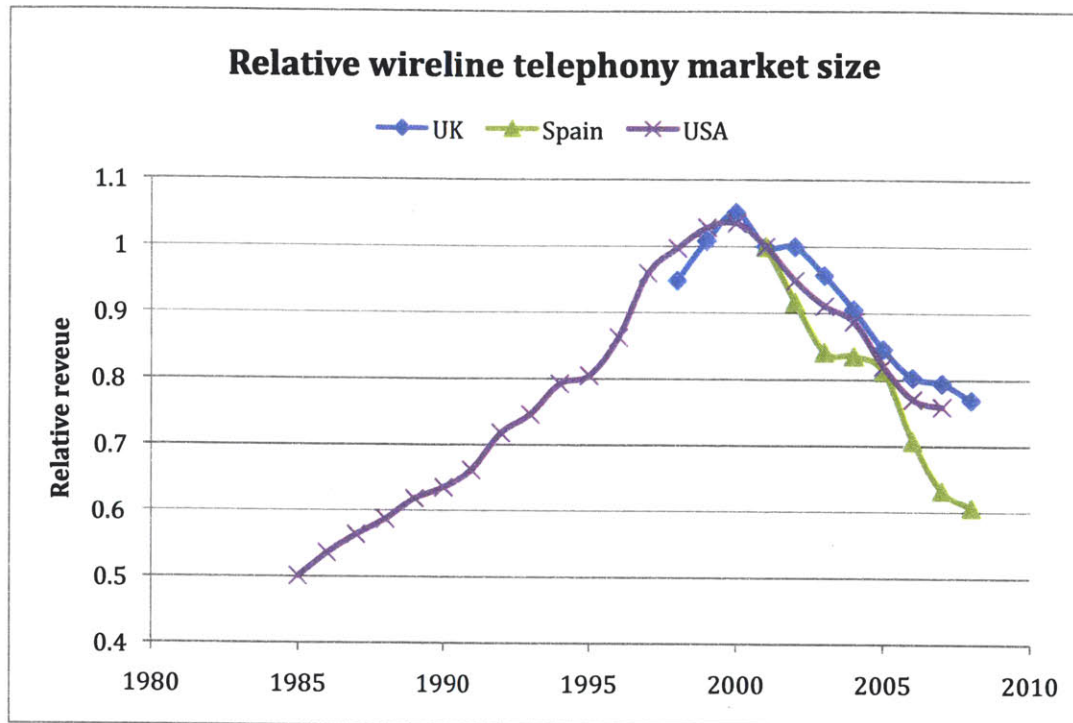
Figure 6: Relative wireline telephony market size for US, UK and Spain.

Several reasons explain wireline telephony decline depending on the local market condition, regulation and the competitive environment. Some of them are presented below.

- **Market saturation.** In many developed markets, such as the US, landline penetration has reached very high levels reducing the ability to sustain high growth rates (Landline penetration in the US was above 90% since 1970 and has been declining since 2000 [6]).
- **Mobile phone market.** A significant portion of the wireline calls and revenues have been substituted by mobile telephony services. Mobility and features-rich phones, together with similar prices-per-minute are motivating users to prefer mobile phones to landline phones. By 2006 there were about 20 million households in the US that had wireless-only phone services [6].
- **New competition.** Traditional telephony operators have faced increasing competition from new players, such as VoIP low cost providers and cable companies, disrupting their once near-monopolistic markets. Even though the US telephony market is still dominated by the traditional players (AT&T and Verizon serve 45% of homes. Cable operators 13% and VOIP less 2% [2]), competition and low cost providers have pushed prices down causing market commoditization.

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- **Additional substitute products**. Currently, users have several alternative ways to communicate, including emails, SMS and chat; reducing the relative importance of the traditional telephony.

Even though traditional telephony companies have tried to slow down the market decline, both through regulatory fights and new product offerings, wireline telephony will continue to decline in size and it will no longer be the main source of revenues for most traditional telecommunication service providers.

2.3.2 Internet

While wireline telephony decline is evident, Internet services evolution is less clear. Broadband penetration has faced strong revenue growth during the last decade, but in most countries competitive pressure has meant that unit prices in terms of $/Mbps have declined very fast while households ARPU (Average Revenue per Unit) has remain relatively stable. However, Internet Service Providers (ISPs) have invested heavily to upgrade the networks to provide higher bandwidths, even though many continue to struggle to differentiate (especially in very competitive markets).
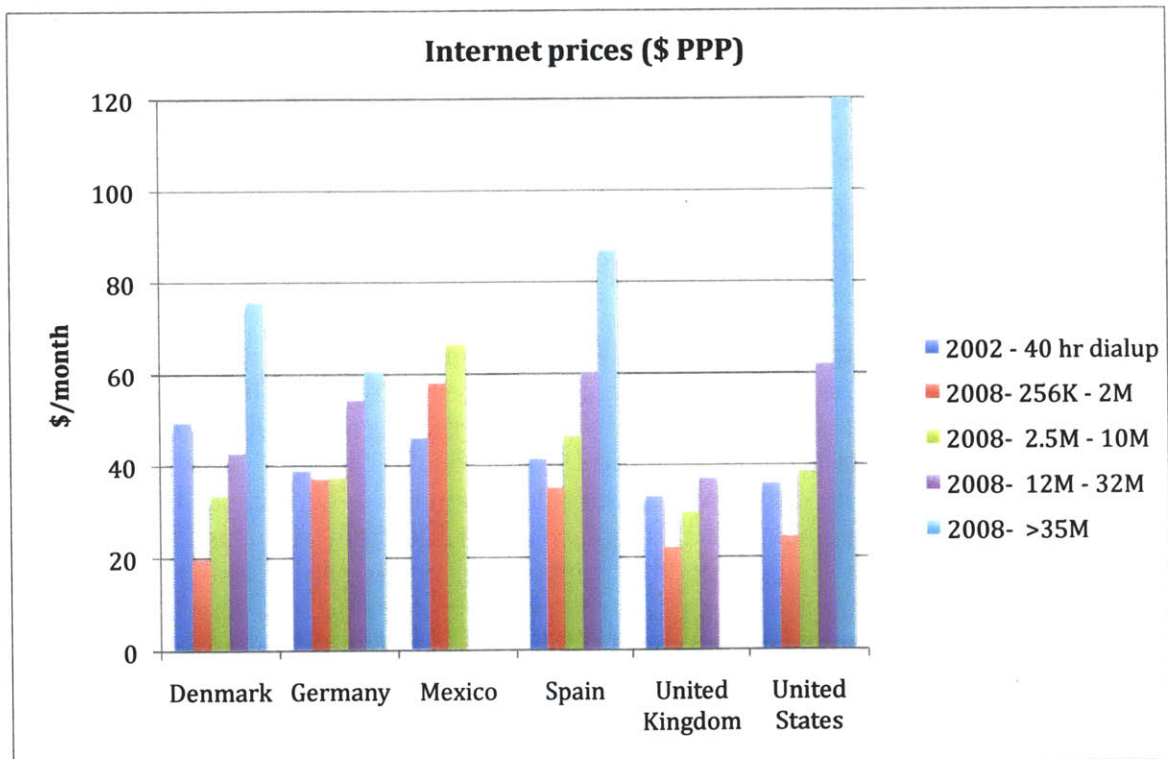
Figure 7: Comparison of Internet prices for selected OECD countries using purchasing power parity prices.

Figure 7 compares Internet prices for US, UK, Spain, Germany, Denmark and Mexico using $ PPP (purchasing power parity). For each country, the cost of using a 2002 dialup connection for 40 hrs/month is compared with 2008 cost of several

broadband speeds (Low: 256 Kbps – 2 Mbps, Medium: 2.5 Mbps – 10 Mbps, High: 12Mbps – 32 Mbps, Very High: More than 35 Mbps). Data obtained from OECD, Communications Outlook reports 2002 [8] and 2009 [7].

As shown by **Figure 7**, prices for a 2002 Internet dialup connection are relatively comparable to 2008 medium/high broadband speeds. For instance, in the US 2002 dialup costs ($34/month) are similar to 2008 medium speeds ($38/month), considering that the Internet ARPU is $32/month (based on [2]). This suggests that while Internet prices per Mbps have declined, household ARPU has remained relatively stable (same order of magnitude). Certainly, some markets have higher broadband penetration and average speeds, but generally ISPs have increased broadband speeds without necessarily increasing household ARPU.

Regardless of the massive investments to upgrade their networks (either to FTTx or DOCSIS 3.0), they are facing challenges increasing their ARPUs:

- **Dumb Pipe.** As MIT professor David Clark and others suggested during 2010 MIT Communications Future Program Conference [9], many envision Internet services to become a "dumb pipe"; the only differentiation element will be the ability to move bits from A to B in a fast and reliable way. This scenario, together with market competition, would probably lead to price and margin decline. Certainly, it isn't necessarily a bad scenario if margins are maintained high either through limited competition or regulation, but the "dumb pipe" vision has motivated Internet service providers to look for new way to differentiate and sustain their relationship with the customer.
- **Mobile Broadband.** As mobile operators improve their 3G/4G coverage, mobile broadband could disrupt traditional fixed broadband as users replace their household ISP for 3G USB connections. However, as Forrester said in 2008 report [10], mobile broadband will substitute Internet connection only for ADSL late adopters given its technical limitations. Regardless of its ability to disrupt fixed Internet, mobile Internet has once again forced fixed Internet services providers to rethink their strategy and look for new differentiation elements.

2.3.3 Television

TV is the world's most relevant medium, generating more advertisement and subscription revenues than radio, music, newspaper or magazines. A typical US adult spends on average 28 hours a week watching TV. Even though the industry varies significantly depending on market conditions, everywhere TV remains as a massive medium. While the US has a very high subscription-TV penetration, other markets are based on free broadcasting services (e.g., UK, Spain, Italy).

However, as new platforms – including IPTV, wireless networks and Internet streaming—have emerged during the last years, the traditional TV service model is being disrupted in several key ways. On one hand, IPTV has enabled new players, such as traditional Telco's, to enter the TV market (for instance, Verizon launched

FIOS TV in 2005 [11] and AT&T launched U-Verse in 2006 [12]), integrating the TV experience with other services (voice, interactivity, etc.). On the other hand, Internet's open architecture has separated content aggregation from content delivery. A new generation online video services that aggregates videos from third parties (Hulu, Vimeo, Amazon VOD, etc) are challenging the traditionally closed and vertically integrated value chain that has dominated subscription TV services. New Over-The-Top (OTT) video services delivered over any IP connection are gaining popularity especially among younger generations [16].

While there is an intense debate about the future of online TV services, the ability of OTT services to disrupt traditional TV, and which business models will succeed (subscriber paid or ad-based schemes); customers are already switching to OTT services to watch their favorite shows. More than 20% of young families/couples watch at least one full-length TV show on Internet sites [2]; and according to another report [14], this figure goes up to 82% for kids between 15 and 17 years. However, the same report indicates that, overall, only a very small fraction of the time is currently spent on online TV services.
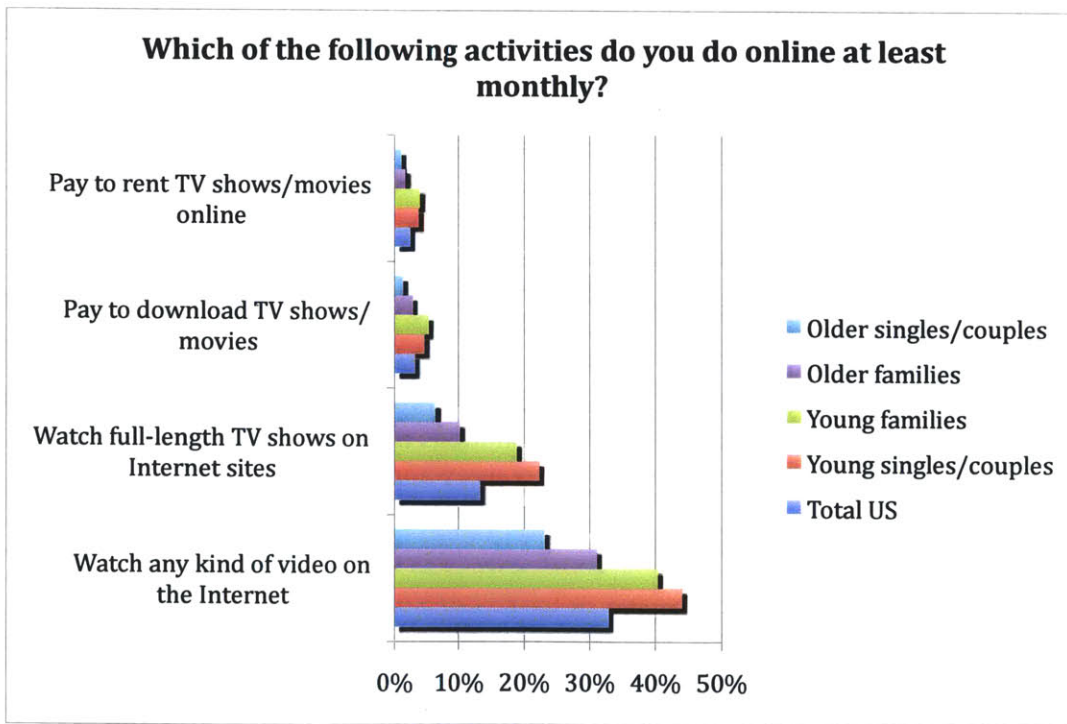
Figure 8: Survey asking US households about their online Internet patterns [2].

Subscription-TV companies need to define how to compete or integrate with OTT services. The *TV-Anywhere* approach consists in giving customers access to premium content online. However, its still unclear how the market is going to evolve. The worst-case scenario for subscription-TV providers would be that a

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significant portions of their customers switch to OTT services, reducing their revenues and being cornered to the "dumb pipe" value proposition.
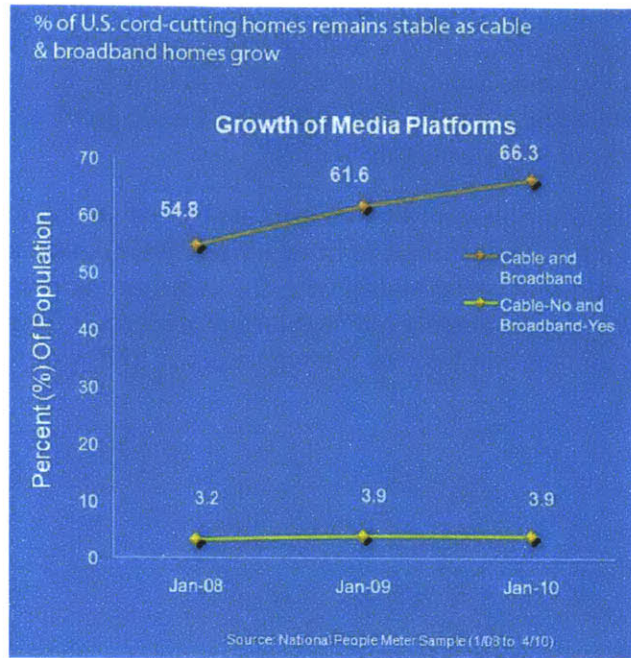
Figure 9: Growth of US cable and broadband connections versus pure broadband connections[15].

2.4   Relationship with the customer

Often, poor customer service has suggested that CSPs don't consider the relationship with customers a key component of their strategy. Whether this is the result of an deliberate strategy or an unintended consequence of massive customer service complexities, the public often perceives that service providers rely on network assets, limited local competition or contracts to retain customers.

Meanwhile, mainstream users often perceive service providers as the default "solutions provider" for any technology problem (probably that is why approximately 30-40%[2] of calls to their call centers are caused by issues not related their products). Put in another way, when users have a problem with web browsing on their computer, most of them call their Internet service provider instead of their hardware of software vendor.

The nature of the relationship between CSPs and their customers has two very distinctive elements.

- They have always provided "services" as part of a monthly billing relationship. Even when they install devices (STB, router, etc.), they are

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[2] Informal conversations with communication service providers.

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offered "as a service" per month; on the other hand, hardware and software retailers/vendors include some installation and support services, but the focus remains on the "product sale".
- They are the only player in the technology space that "goes to your home"; hardware companies don't, and retail players only go to install new systems (although a notable exception is Best Buy's Geek Squad, which it acquired as a complement to its retailing activities).

This in-home service relationship with customers can be strategic in the long run. A future in which CSPs are constrained to dumb-pipe Internet services will be characterized by a minimal relationship with the customer and very few differentiation elements. In fact, even if regulation protects their margins, they would relate to customers similarly to the way electric and water utilities do.

3 Digital Home Technologies

3.1 Introduction

New home technologies allow users to interconnect home consumer electronics appliances to store and share content, and to access any type of media from any device at anytime. However, these technologies require specialized knowledge and skills for selection, installation and use.

This chapter explains why new home technologies are limited to these technology skilled users. First, a vision for the future digital home is described. Second, the bottlenecks that are preventing this vision from materializing are presented. Third, some specific examples of 'walled garden' approaches as solutions to these challenges are described.

3.2 Digital Home technologies

During the last couple of years, partly motivated by Nielsen's Three Screen reports [17], a common vision for the future of connected-home is being established. The future will be dominated – the vision says – by three screens with content and information moving seamlessly across them: a large HDTV screen, a lightweight notebook or (now) tablet and a small but high-resolution smartphone.

Every media type will be available in real-time or time-shifted on any screen. For instance, users will be able to access Internet content, including over-the-top television and social networking content, from the large HDTV. Moreover, it will be possible to integrate smartphone Apps with large screens to share the social-TV experience. Other possibilities include receiving phone calls on the large HDTV and easily displaying movies and pictures from notebooks or smartphones on larger screens. In this vision, the definitions of TV, telephony and broadband get blurred, as they are all simultaneously integrated and available on any device.

The three-screen vision is fueled by some clear trends in developed markets. According to Nielsen report for Q1 2010 in the US [17], 36% of households have DVRs, 25% have smartphones and 52% have HDTVs with HDTV signals. Most important for the three-screen vision, despite only 3.4% of the time spent watching traditional TV is simultaneously spent using the Internet, 33.9% of the Internet time is simultaneously spent watching traditional TV. These trends suggest a convergence of media on multiple devices, together with media time-shift and place-shift.

A Week in the Life Weekly Time Spent in Hours:Minutes – By Age Demographic Q1 2010								
	K2-11	T12-17	A18-24	A25-34	A35-49	A50-64	A65+	P2+
On Traditional TV*	25:48	24:28	26:45	32:03	36:35	44:20	48:54	35:34
Watching Timeshifted TV*	1:32	1:20	1:31	3:00	2:50	2:30	1:17	2:09
Using the Internet on a PC**	0:24	0:59	2:57	5:21	6:28	5:00	2:35	3:52
Watching Video on Internet**	0:04	0:10	0:30	0:36	0:31	0:18	0:07	0:20
Mobile Subscribers Watching Video on a Mobile Phone^	n/a^^	0:18^^	0:10	0:07	0:03	0:01	<0:01	0:04

Source: The Nielsen Company. Based on Total Population in the U.S.

Figure 10: Weekly time spent by the different demographics on the different devices and content sources. [17]

However, the three-screen vision only provides a general idea about technology evolution. In order to describe these trends is further detail an "extended" vision is presented including specific devices and how they are probably going to interact between each other.

Figure 11: Extended vision for convergent home technologies.

- **Very Wide Pipe.** A key component will be a very large bandwidth pipe, probably fiber-to-the-home or some new high-speed version of HFC DOCSIS[3] networks with bi-directional speeds above 100Mbps. Wireless technologies such as WiMax or LTE will not provide enough bandwidth given intense-bandwidth HD content. Probably, it will be a pure IP connection, but some bandwidth could be reserved for digital video broadcasting. The main services provided through this wide pipe will be:

    a) Linear programming. Traditional live TV such as live sports, news and talk shows will be streamed as private HD IPTV services (i.e. Verizon FIOS TV), including value added services such as VoD, interactivity, social TV, etc. In some regions, depending on the availability of high bandwidth infrastructures, part of the linear programming content could come from satellite connections or Digital-TV broadcasting.

    b) Over-the-Top (OTT) content. A large portion of the video or TV content will be provided directly through the Internet through sites such as Hulu, Netflix, iTunes, AmazonVoD, etc. It is still unclear how traditional TV providers (i.e. Comcast, Verizon) will integrate and/or compete with the over-the-top content.

    c) IP Services. Old and new IP services will be provided, including IP telephony, fixed-mobile convergence services or other cloud-services. Independent Internet companies will offer most IP services.

- **Router and WiFi.** The Internet will connect to a home router to distribute it using WiFi networks and –maybe – some cabling. Next generation WiFi networks will provide high bandwidth and reliable coverage across the house in order to connect every IP-enabled device. Probably new standards will emerge to simplify the way coverage can be extended through multiple repeater/extender devices.

- **HDTV system.** It will maintain – or increase – its importance in the home's technology architecture. Some key elements will be:

    a) IP connected television. The TV will directly access Over-the-Top content either through software clients embedded in the TV (i.e. new Samsung TV Apps [18]) or through external appliances such as Boxee or Roku devices. However, the user will be able to manage linear programming and over-the-top contents through a simple and integrated user interface.

    b) Remote control. After many remote-control generations, their user interface remains limited and often counterintuitive. It will probably be partially replaced by smartphone Apps directly managing IP-connected devices.

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[3] HFC DOCSIS: Hybrid Fiber/Cable networks with their traditional data communication standard (Data Over Cable Service Interface Specification).

c) Set-top-box. Subscription-TV companies will continue to provide set-top-boxes (STBs) in order to provide value added services through their own network. Even though from a technological standpoint STB could be replaced or embedded inside TVs, DVRs or game console, service providers will probably keep them to control the user-interface.

d) Game console. The game-console in gaining importance in the home technological architecture as a media hub. Devices such as Windows' XBOX, Sony's Playstation and Nintendo's Wii have significant computational power and network capabilities. Most of them already include networking capabilities that can be used for online gaming, video streaming (Netflix, Hulu, Amazon VoD clients) and video. For instance, Microsoft XBOX easily integrates with Microsoft's architecture and can used to connect multiple TVs with a Windows Media Center.

e) Interactivity and applications. Rather than isolated user-experiences per device, the future will be dominated by services integrated through common and simple interfaces. For instance, users will be able to easily access media server content, over the top content and VoD services without the need to completely transition from one system to another. There is currently a huge debate about who is going to control the user-experience (hardware companies, service providers, over-the-top companies or independent user-interface companies).[19]

- **Laptop or Tablet.** Personal computing devices will continue to play a key role in the home technological architecture. Whether laptops or tablets, people will continue to rely on a mid-size screen for entertainment and work-related tasks. As opposed to the large HDTV system, the laptop/tablet is typically a personal device that users customize according to their specific needs. They will connect through WiFi networks, leaving 4G connections to mobile environments.

- **Smartphone.** The smartphone will be a key element in home networks. Following some current trends, it might be used as a remote-control device for many of the home appliances, such as TVs, DVRs and alarm systems. Transparent handoff between 4G and WiFi networks (Fixed-mobile convergence) will offload data and voice traffic from the mobile carriers. Whether the smartphone completely replaces the traditional landline phone or not; it largely depends on the coverage, safety and battery issues. As long as smartphone batteries remain limited there will be a big incentive to have a simple and reliable landline device.

- **Media Server.** More than 30% of US households use a DVR device; however, most of them are closed systems and cannot be easily integrated with other home devices. In the future –the vision says – there will be one centralized media storage device (or cloud service) that stores all kinds of media and accessible to HDTVs, laptops, mobile devices, cameras, audio systems, etc. Currently, there are some solutions that approximate this vision (for instance, Windows Media

Center described below), but huge bottlenecks such as a common Digital Rights Management remain.

- **Audio systems.** Home audio systems will become IP-appliances to allow users access their entire music library from any location. Currently there is a gap between high-end audio devices, which are typical not network-devices, and low-end music devices such as iTunes-iPods which have networking capabilities. These gaps will disappear to offer an integrated experience.

Additionally, new market trends will add some additional components to the home technological architecture:

- **Surveillance and alarm systems.** New-generation surveillance and alarm systems are Internet connected, allowing households to access the content remotely and/or receive alarms on their mobile devices. As IP-video cameras prices decline home-monitoring services will probably become increasingly popular.

- **Energy smart-meters.** Global warming awareness, energy-reduction policies and variable energy pricing are pushing for energy management solutions at a residential level. Smart-meters allow users to monitor the exact energy demand profile and take actions to reduce it. Whether these devices are controlled though the energy network (with technologies such as power line communication) or through the Internet, they are going to demand new networking capability to the home architecture.

- **Tele-heath.** Given large heath costs, problems associated with moving patients to hospitals and the convenience of health alarms for lonely elderly, some are suggesting a movement towards tele-health. Patients would have sensors and exams could be taken from home, with results instantly available online. These services and technologies would add new networking requirements to the home architecture with a clear need for simplicity and reliability.

3.3 Required technology capabilities

The extended three-screen vision is far from being a reality; some technological capabilities need to first be developed, regardless of market adoption dynamics.

Technical requirements	Current State	Bottlenecks	Confidence to overcome bottleneck
High Bandwidth	OK	Capex and competition	High
Reliable Wireless Network	OK, but complex	Lack of simple and reliable coverage extension technologies	High
Topology discovery, management and media sharing standards	Not fully operable standards	Muti-vendor interoperability	Medium

Digital Rights Management standards	Fragmented solutions	Rejected by users, multi-vendor interoperability	Low
Integrated user-interface	Fragmented solutions	Multi-vendor dominance competition	Medium

Table 1: Extended three-screen vision bottlenecks.

3.3.1 High Bandwidth.

New network technologies such as Fiber-to-the-Home (FTTH), Fiber-to-the-Curb (FTTC) and DOCSIS 3.0 enable very high bandwidth, especially as fiber optic networks are deployed close to the consumer demand. As long as companies can monetize capex intensive infrastructures, residential speeds will continue to increase. The bottlenecks for widespread availability of speeds above 20 Mbps are demand concentration (specially in rural areas), unbundling regulatory threats and the lack of sufficient market competition. Bandwidth shouldn't be a technical limitation for the evolution of the connected home, at least in developed urban areas.

3.3.2 Reliable WiFi Coverage.

The new digital home requires a reliable IP connections throughout the home rather than to a single point; in practice that means WiFi, and its coverage needs to provide enough bandwidth to devices such as TVs, mobile phones and surveillance cameras. Even though WiFi coverage might seem simple, it can be challenging for large or old houses, especially in concrete thick-walled homes. Currently there are several technologies or workarounds to extend the networks through multiple devices but the lack of simple universal standards add significant complexity. Some alternatives are:

- Multiple WiFi routers. It usually requires installing Category 5 UTP cables to connect them. Some devices do not support handoffs between routers.

- WiFi extenders. It can be a good solution depending on proprietary device features. Network throughput is degraded unless expensive dual-band devices are used, limiting the use of HD video.

- To avoid wiring issues MoCa, HomePNA or Homeplug [22] devices can extend Ethernet over existing coaxial cables, landline Category 3 cables or the electric network, respectively. Choosing the right technology is challenging and costly.

However, despite the additional complexities, standards to simplify the installation and use of large WiFi networks will probably emerge and wireless coverage is unlikely to present a major technical bottleneck.

3.3.3 Topology discovery, management and media sharing standards.

Connectivity is necessary but not sufficient. In order to allow users to access and share content through multiple devices, reliable technical standards embedded in the devices must enable remote management, automatic network topology discovery and device role definition for media sharing and rendering. Even though there is some concrete progress, in particular with the DLNA (Digital Living Network Alliance) standard at the lower level of the stack, there is still limited interoperability.
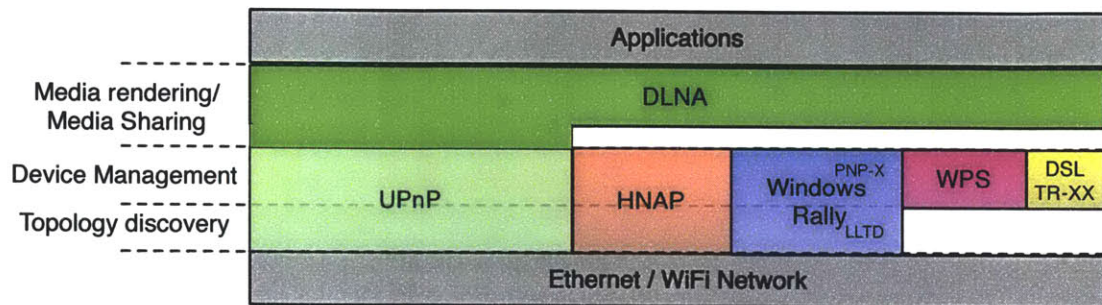
Figure 12: Home networking standards [23][25][26]

a. UPnP (Universal Plug&Play Forum) protocol allows devices to automatically join the network, share their name and learn about other devices capabilities. It includes some management features, but they haven't been widely adopted. More than 900 companies have joined the forum.

b. HNAP (Home Network Administration Protocol) is a simple HTTP Cisco protocol for remote management of home devices. Additionally it includes topology discovery. Apparently, not many devices include the protocol yet.

c. Other management protocols such as WPS (Wireless Protected Setup), DSL forum TR-64/69 and Windows Rally protocols enable remote management and topology discovery. Most of them haven't been widely adopted.

d. DLNA (Digital Living Network Alliance). It's a collaboration of around 250 brands to create interoperable standards for the home entertainment environment. Its goal is to enable interoperable home networks where images, music and video can be easily shared across PCs, mobile devices and consumer electronics. More than 5000 products have been certified and it has gained significant market traction during the last years. However, since not every device is certified for every feature, end-users still experience frustration as they try to integrate multiple certified devices[27].

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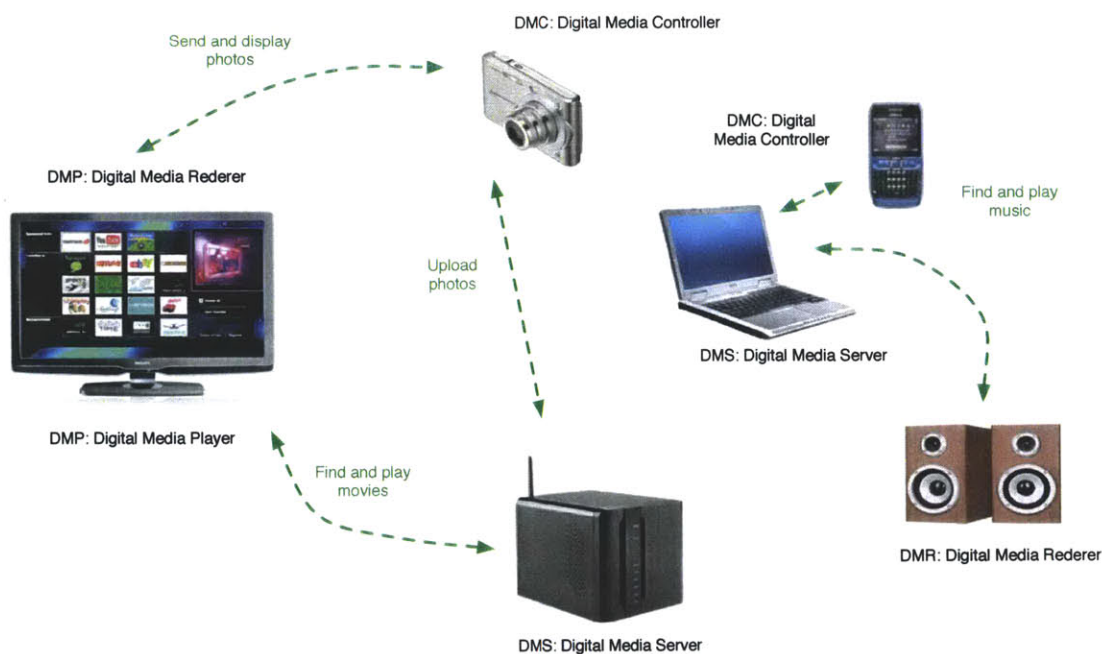
Figure 13: DLNA devices types and media sharing possibilities.

3.3.4 Secure Digital Rights Management standards

In theory, Digital Rights Management (DRM) exists to protect the copyright of content-makers as they sell or rent their creative products online. In practice, the role of DRM in media industries has been a matter of huge debate and unclear success. Even though many have tried to establish DRM standards and marketplaces for music and video, including Google, Microsoft and Apple [28]; so far most of them have been unsuccessful. Having a common and open DRM-standard (as DLNA attempts to include) still seems to be a distant goal.

On one hand, there are basically three alternative arguments against the adoption of DRM schemes. First, consumers don't care about DRM and the "right" to access some content, they care about the content itself and that is what they want to own; DRM – the argument says – will never pick up since end-users don't want it. Second, Apple has shown that consumers are willing to pay for media even if they can get it for free somewhere else (neglecting costs associated with legal risks); if users are willing to pay for content even without DRM then the focus should be on creating good marketplaces (such as the Apple Store) and not on DRM schemes. Finally, efforts to create DRM-controlled marketplaces have failed and the trend would be for DRM to go away. If even narrowly defined DRM schemes such as iTunes FaiPlay are going away, the promise of a universal open DRM standard becomes even more distant.

On the other hand, some analysts are now suggesting that DRM may have a new chance [28]. On May 2010 DRM had a regulatory win when the FCC approved the Motion Picture of America Association to use selectable output control flags on Video on Demand movies, allowing studios to remotely disable analog outputs on

cable boxes for a specific time window (90 days after release) [30]. This new regulatory framework might strengthen the adoption of DRM schemes. The growing business of IP-delivery and over-the-top content is developing with DRM schemes; Google TV, Boxee and Vudu support DRM. Additionally, consumer electronic companies, as opposed to IT and high-tech startups, have had long relationships with studios and accept DRM as part of their culture. Overall, media delivery is moving more towards streaming media and less to towards owing the media files, simplifying DRM schemes [31].

The future for DRM is still unclear, probably adding confusion and complexities to end-users for quite some time.

3.3.5 Integrated user-interfaces

The digital home vision requires simple user interfaces to allow users easily manage all their content, regardless of their source or type. This won't happen easily given the large diversity of players and their attempts to control the user's experience, especially around the HDTV subsystem.

Subscription-TV providers (e.g., Comcast, DirectTV) want to control the TV experience in order to retain the relationship with the customer and capture additional revenues opportunities. However, they will probably try to protect potential revenues sources, which will inevitable lead to a closed ecosystem and slow progress. Unless they feel threatened by potential disruptors, they won't open their interfaces to third party home networking elements (for instance, imagine controlling a third-party DVR system from your service provider interface).

Meanwhile, consumer electric companies also want to dominate the user interface. New HDTVs, BlueRay players and Game Consoles often come with software clients to directly access OTT TV services, such as Netflix, Hulu and Youtube. In particular, Microsft Xbox easily integrates with the rest of Microsoft's Media Center architecture and Tivo[4] appliances include tuners and cablecard slots[5] to add cable TV content through their interface.

HDTVs and video appliances are now embedding App stores into their user interfaces, trying to replicate Apple's success with smartphones. The market for TV Apps is growing rapidly (a GigaOm Pro report projected that it will reach $1.9B by 2015 [33]). If HDTVs were to follow the same disruption path the iPhone had, it doesn't seem unreasonable to imagine a leading HDTV manufacturer establishing an exclusive agreement with a cable operator and building an App Store with a direct billing relationship with the end-customer.

Finally, there are a few technology startups that are trying to create dominant interfaces for over-the-top content, such as Boxee and Vudu. As innovative startups,

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[4] Leading DVR Company.
[5] Tuners decode radiofrequency signals and CableCards provide the user-specific encryption keys to decrypt to content based of the subscription plan.

they are agile and have the potential to disrupt the most the conservative players through new user experiences, in particular Social TV experiences.

Controlling the user interface can have significant implication in terms of ad-based revenues, value added services and relationship with the customer; it is unlikely that any player will give up the possibility to control it. In particular, communication service providers will protect it as a way to fight against the dumb-pipe scenario, attempting to extend their interface to new devices for online content (TV anywhere approach). Therefore, the user interface is probably going to become increasingly fragmented with multiple confusing options and complex trouble-shooting across the different platforms.

3.4 Examples of current possibilities

Even though the full convergent digital home is still a distant vision, there are some specific solutions to share content across multiple devices. Below, three examples show what is currently possible.
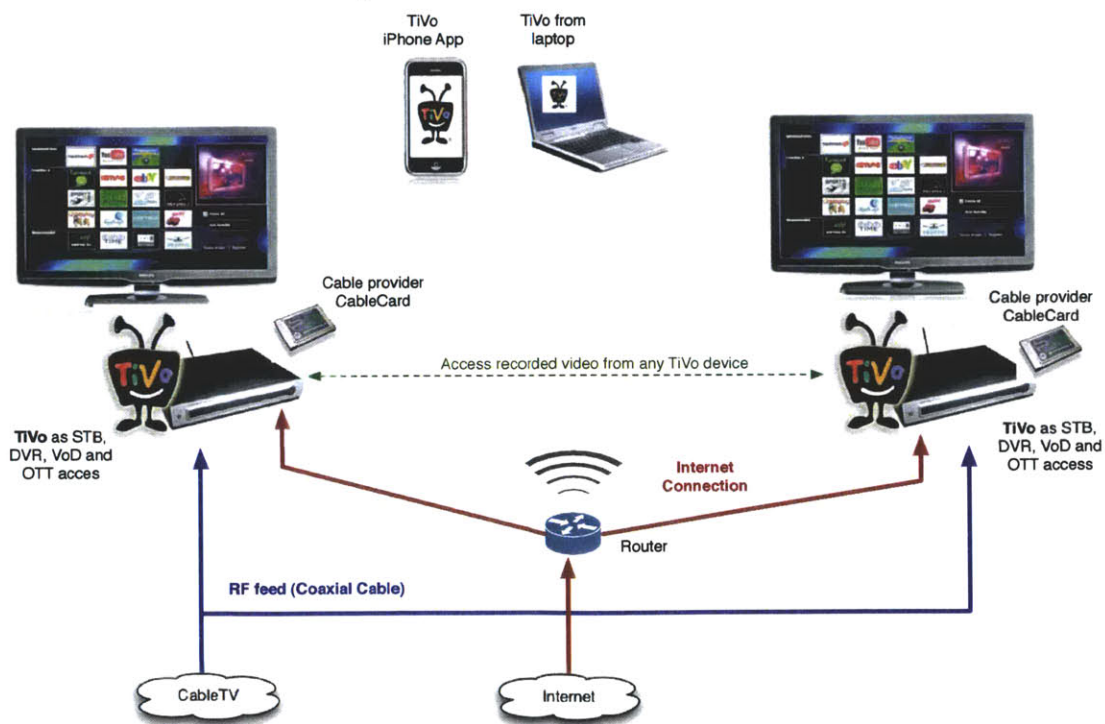
Figure 14: TiVo solution.

The TiVo solution (**Figure 14**) is based on their latest appliance, the TiVo Premiere, which includes a DVR, cable TV inputs, CableCard support, VoD services through Amazon VoD and access to over-the-top content. Video stored in one TiVo appliance can be accessed from other TiVo's. Additionally appliances can be managed through an iPhone App or laptops (www.tivo.com).

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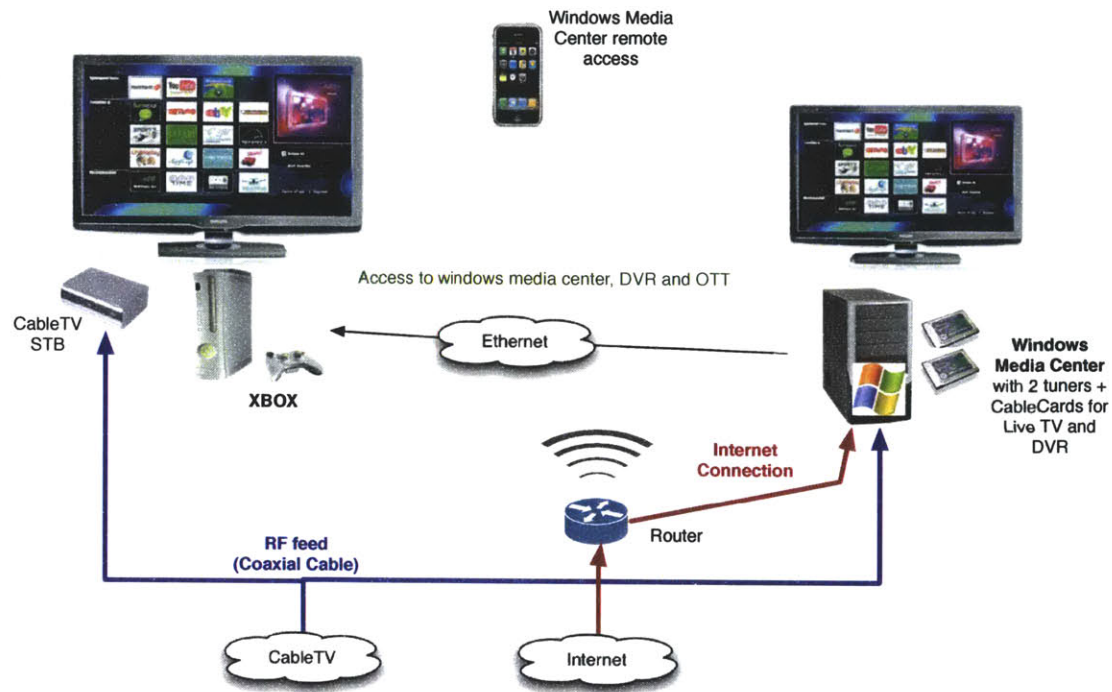
Figure 15: Microsoft Media Center solution.

A Microsoft solution (**Figure 15**) can be installed using a desktop computer with Windows Media Center, two PCI digital tuners and two CableCards. Media content can be stored and managed using Windows Media Center, including local media, live TV, DVR videos and access to OTT sites through a simple unified interface. Additionally, other HDTVs can connect to Windows Media Center through an XBOX console. However, the second HDTV needs a separate set-top-box to access live TV or premium content (Source: Windows media center homepage and several Internet forums).
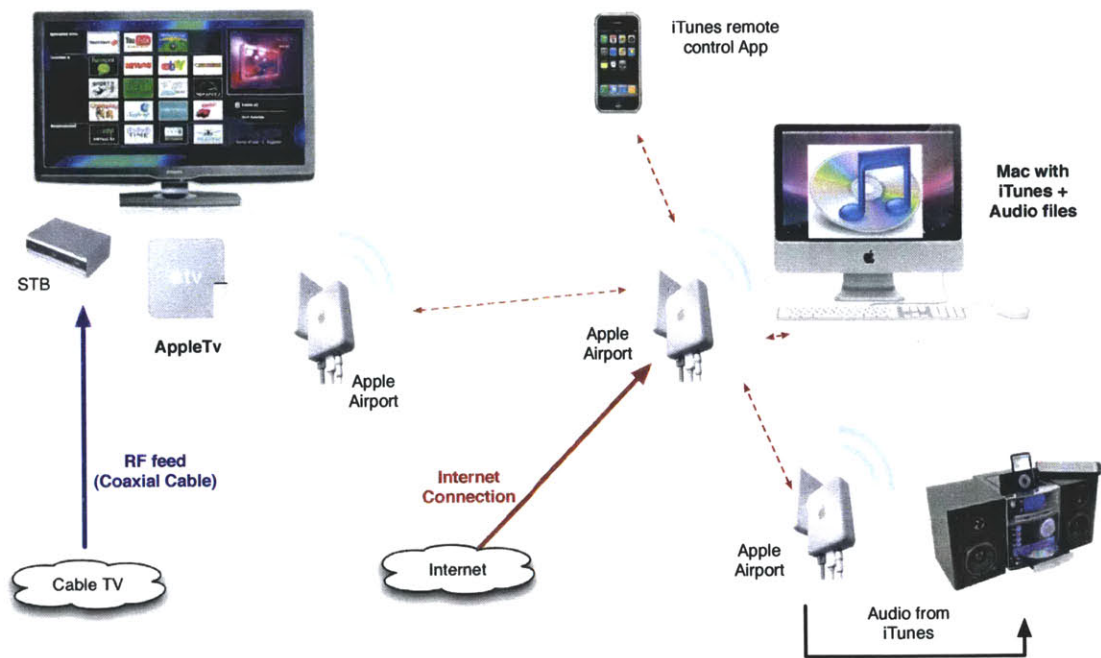
Figure 16: Apple solution.

Apple's solution (**Figure 16**) would be based on a desktop computer with iTunes, an Airport-based WiFi Network and an AppleTV appliance. Content stored at the desktop computer or at the Apple TV can be accessed and managed from any device. Additionally, using specific Airports features, audio can be extended to remote audio-systems through the WiFi network. This solution includes the DRM scheme being used by iTunes to protect video content. Unfortunately, AppleTV does not include a digital cable TV tuner and an independent set-top-box is needed for live TV and DVR content.

3.5 Technology complexity hypothesis

As explained in previous sections, future users will be able to access information and media from any-device at anytime, through simple and integrated user interfaces. However, even though there are some solutions that allow early adopters to benefit from these new opportunities, the general solutions remain complex and confusing.

Some technologists assume that innovation and standardization efforts will naturally and inevitably create better and simpler products, ultimately resulting in products and services simple enough for mainstream users. For them, it is just a matter of time and product development effort to simplify technologies.

This thesis considers a different hypothesis, supported by the technology trends and bottlenecks described in this chapter. Even though the innovation focus is clearly moving towards user interfaces and end-user-experience, with great progress in some cases, the widespread adoption of new home technologies will requires a different kind of effort. Convergent home technologies will remain complex and confusing for mainstream users. The next chapter explains *why* based on an analysis of this complex and competitive business ecosystem.

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4 Stakeholders and Ecosystem Evolution

4.1 Introduction

The previous chapter described digital home technologies and their expected evolution path for appliances, screens and services. Home technologies will probably remain complex and confusing for mainstream users.

Confusion is not only caused by technology bottlenecks. The ecosystem structure influences the type of technologies, devices and user interfaces that can be commercialized, as well as the direction of the overall system architecture. Additionally, the ecosystem structure by itself adds complexity given the many and diverse relationships they need to establish.

This chapter presents the digital home ecosystem in terms of its main stakeholders and its evolution. First, current stakeholders and their relationships are described. Second, the ecosystem evolution is described.

4.2 Stakeholder Analysis

Users interact with technology devices to access some type of content or information: peer-to-peer communications such as telephony, videoconferencing and chat; Internet content; Video/TV content and private media such as pictures and music. Originally, each type of content was tied to one specific device (P2P – telephony, Video – TV, Internet – computer, Music – CDs, Photo – printed albums). Now content flows across multiple devices.
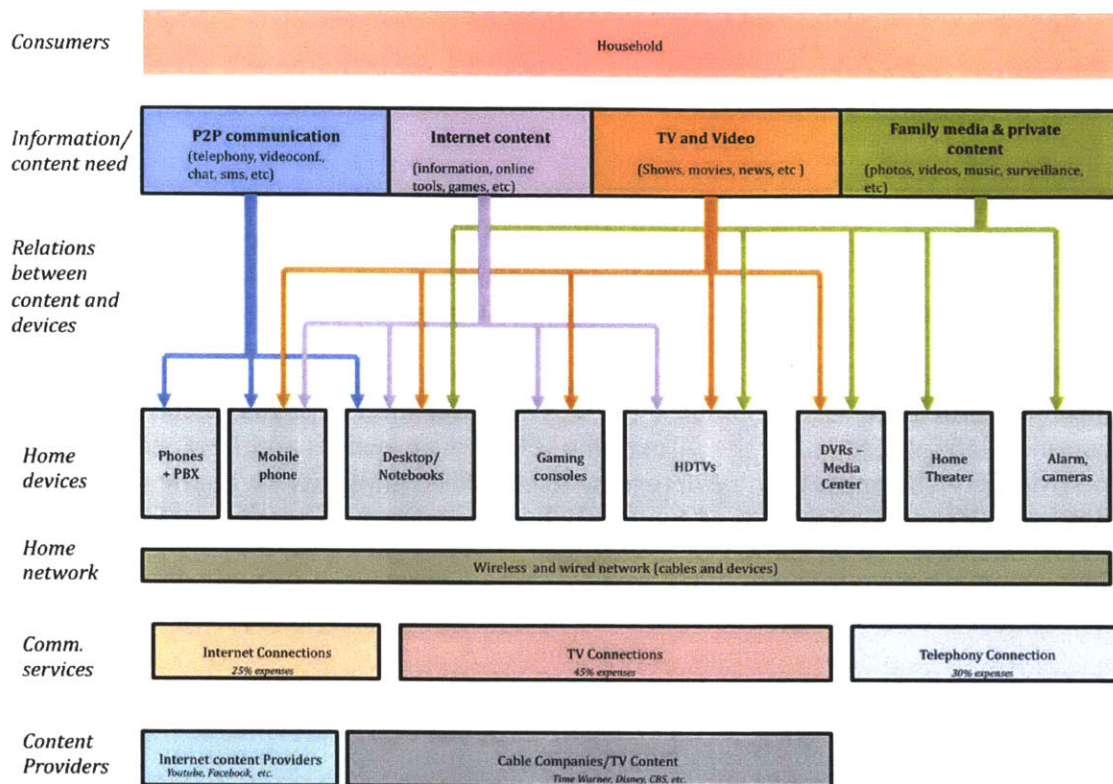
Figure 17: Content –Device-Source diagram.

Figure 17 shows how content flows from users to content providers. Users need to go through devices, home networks and communications service providers to access the content and information. The figure suggests the type of relationships each stakeholders has with the end-user. Even though their goal is to access the end-content, they need to establish direct relationships with retail players (devices) and communications service providers.

Not only device manufacturers and communications service providers influence technology products and services. **Figure 18** present a stakeholder diagram that represent the most common scenario.
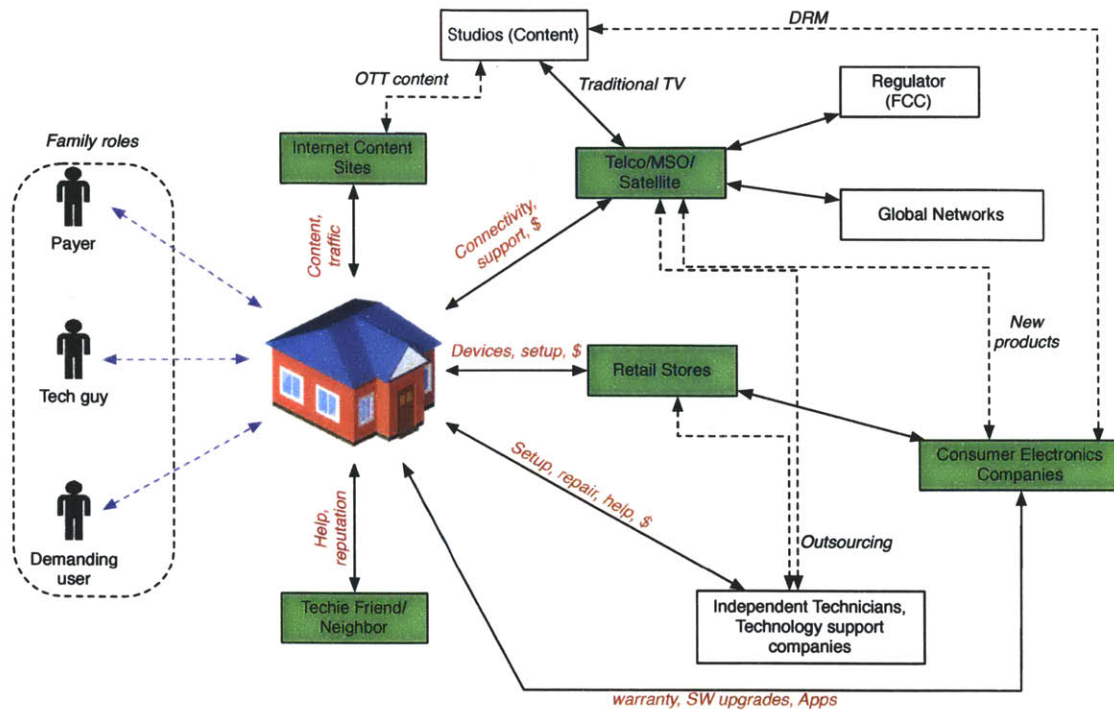
Figure 18: Digital home stakeholders diagram.

4.2.1 Retail Stores

Consumers buy most of their technological devices from technology retail stores, e-commerce stores or supercenters. In the US consumer electronic stores aggregate $84 billion in revenues, clearly dominated by BestBuy with 41% of market share (RadioShack follows with 5.2% market share) [36]. US e-commerce stores sell approximately $23 billion in consumer electronic and computers, dominated by companies like Amazon, Dell and eBay [35]. Finally, department stores (Target, Sears, Macy's etc.) and Supercenters (Wal-Mart, Costco, etc) are increasingly adding technology products to their stores.

Some retail stores offer installation or setup services (except e-commerce sites). Often, consumers go to technology retail stores to learn about the new devices, and ask for recommendations.

Retails stores get devices from consumer electronic companies and often outsource the installation or setup services to independent technicians or support companies.

4.2.2 Telco/MSO/Satellite service providers

Communication service providers (Telco's, Cable operators, Satellite TV, etc.) have direct relationships with households through their monthly communication services (telephony, internet or TV). Despite all too often their customer services have bad a reputation, they visit customer's homes; unique among the rest of the stakeholders.

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They sign contracts with cable networks to aggregate content (HBO, CBS, ABC, etc.) and with Tier-1 network providers (MCI, Sprint, etc.) to access the global Internet backbone. Traditionally, they have been heavily regulated companies.

As retail stores, they often outsource some of the support activities to independent technicians or support companies.

4.2.3 Consumer electronics

Consumer electronic companies –including computer hardware – invest heavily in product innovation and brand equity, but only rarely have a continuing relationship directly with end-consumers after the product sale (Apple is an exception). Usually their post-sale relationship with consumers is limited to warranty services, and in some cases software upgrades and updates. However, some of them also offer post-sale support services to reduce return rates (according to a NPD Group report, 13% of consumers return one electronic device after being frustrated in trying to get it to work, although 68% said "proper tech support" would have eliminated the need to bring it back [37]).

4.2.4 Internet Content Sites

Some time ago, no Internet site was relevant enough to consider them as an active stakeholder in the digital home eco-system. However, OTT TV sites such as Hulu, Youtube and Netflix; or social networking sites such as Facebook and Twitter aggregative significant traffic and content. In particular, OTT television companies are establishing direct relationships with studios and cable networks.

Perhaps surprisingly, Internet sites have managed to operate with very little end-user support services. Users don't expect to call Facebook or Youtube if there is any technical problem. On the other hand, users expect to get every problem solved by communication service providers. Several elements explain the differences, including the fact that online services are usually free.

4.2.5 Techie friend/neighbor

It is surprising how often households rely on a friend, neighbor or relative to get help with a technology problem. People with above average technical skills often get asked for help, ranging form computer problems to home theater setup.

Traditionally, being able to help others and show your technology skills has been a source of reputation among peers. Probably, the "reputation reward" feedback played a key role in technology adoption and the fragmented nature of tech support industry.

However, several industry experts suggest that current technologies have become too complex and the "techie friend" model is becoming obsolete. On one hand, solutions require more time and knowledge; on the other hand, users need reliable solutions they can depend on.

4.2.6 Household stakeholders

Households are usually not a one-person entity. Over time, whether spontaneously or organized, different family members adopt different roles.

- **Payer.** The one that pays for the services and often buys most of the devices. It is usually one of the parents and the decision-maker for non-free services or technologies.
- **Tech guy.** The one that "better understands" the technologies and products. Often a teenager. Regardless of his "real" technology skills, new technology decisions are often consulted to him.
- **Demanding user.** The one that asks for more performance. Depending on family habits, it can be a heavy music fan asking for more Internet bandwidth, or a movies fan asking for the latest home theater system. He/She usually convinces the rest (especially the payer) about the need for new products or services.

4.3 Ecosystem evolution

The stakeholder diagram presented in **Figure 18** is not a static picture. The nature of the relationships and the role of each stakeholder are evolving over time.

4.3.1 Stakeholder relationships

In terms of stakeholders' relationships, there are three clear trends that could modify the structure of the digital home ecosystem.

- **Internet sites**

Major over-the-top content or social media sites have become relevant players in the digital home ecosystem. As an example, The Economist magazine recently asked what made Facebook, with more than 500 million users, different from any nation. If OTT TV growth continues, leading online sites will shape the ecosystem evolution.

There is yet no dominant OTT TV business model: advertisement-based, end-user subscription, ISP subscription (or TV Anywhere), etc.; adding uncertainty to the ecosystem evolution. Additionally, the type of support-relationship with end-users is unclear. *If I pay for online content, can I call them if the video quality is not good enough?* The answer remains unclear.

- **Consumer electronic companies.**

Consumer electronic companies – including computer hardware – are strengthening their relationships with end-customers. Several companies are embedding App Stores into their devices, especially around HDTV devices. If TV App stores succeed, they would significantly influence the ecosystem structure.

Others, such as Apple and Sony, manage their own retail stores. Additionally, consumer electronic companies actively participate in technology standards bodies together with large studios; they are playing a key role in DRM efforts.

- **Independent technology support companies.**

The technology support industry has traditionally been highly fragmented. Hundreds of small companies, often own by a local technician, have provided technology support services such as installation and PC help. Many small computer stores have added simple support services. Most of them attend local demand only.

However, new innovative start-ups are now offering technology help services to households based on the latest remote support technologies. Companies such as iYogi, Firedog and Virgin Digital Help (UK) [38] are trying to become the default "digital help" solution, establishing a direct relationship with households. Even though most of them started as PC support companies, they are adding new devices to their services portfolio (printers, cameras, game consoles, etc.). Similarly to GeekSquad-Bestbuy, these independent companies are trying to simplify the use and adoption of home technologies.

Some are partnering with service providers to acquire new customers. Others are trying to build their own brand.

4.3.2 Help services stakeholders

Three stakeholders have direct "help-relationships" with households: communication service providers, retail stores and desktop support companies (even though less relevant, we could add device manufacturers with their warranty services).
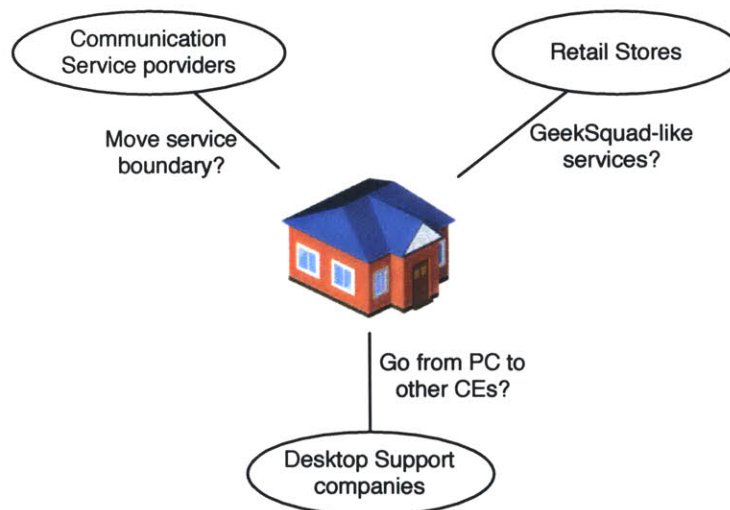
Figure 19: Options for "help-services" stakeholders.

Each one of these stakeholders could extend their services. Communication service providers could move their now clearly defined service-boundary (usually up to the ADSL or cable modem, without including interior cabling) to include home-network home services. Retail players could extend their installation and post-sale services as BestBuy-Geeksquad has been doing for several years. Finally, small desktop support companies could extend their services and cover the complete digital home architecture in order to provide an independent and integral service.

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Who is well positioned to extend their services and capture new opportunities inside the future digital home? Probably there is a role for each one of them depending on the specific opportunities, as explained in the next chapters.

4.4 Ecosystem Dynamics – Avoiding system complexity

The digital home ecosystem can be characterized as a complex system with multiple stakeholders, no dominant architecture and uncertainty about its future evolution. Its complexity is creating confusion among mainstream users.

This section presents a simple dynamic model to explain why the digital home will remain complex. The structure of the system leads to complex and incompatible system-level solutions unless some very specific conditions are met. The main balancing and reinforcing loops are first discussed separately (*innovation around the product, innovation around the system* and *too complex for me*) and then presented as a complete system, with unique characteristics.
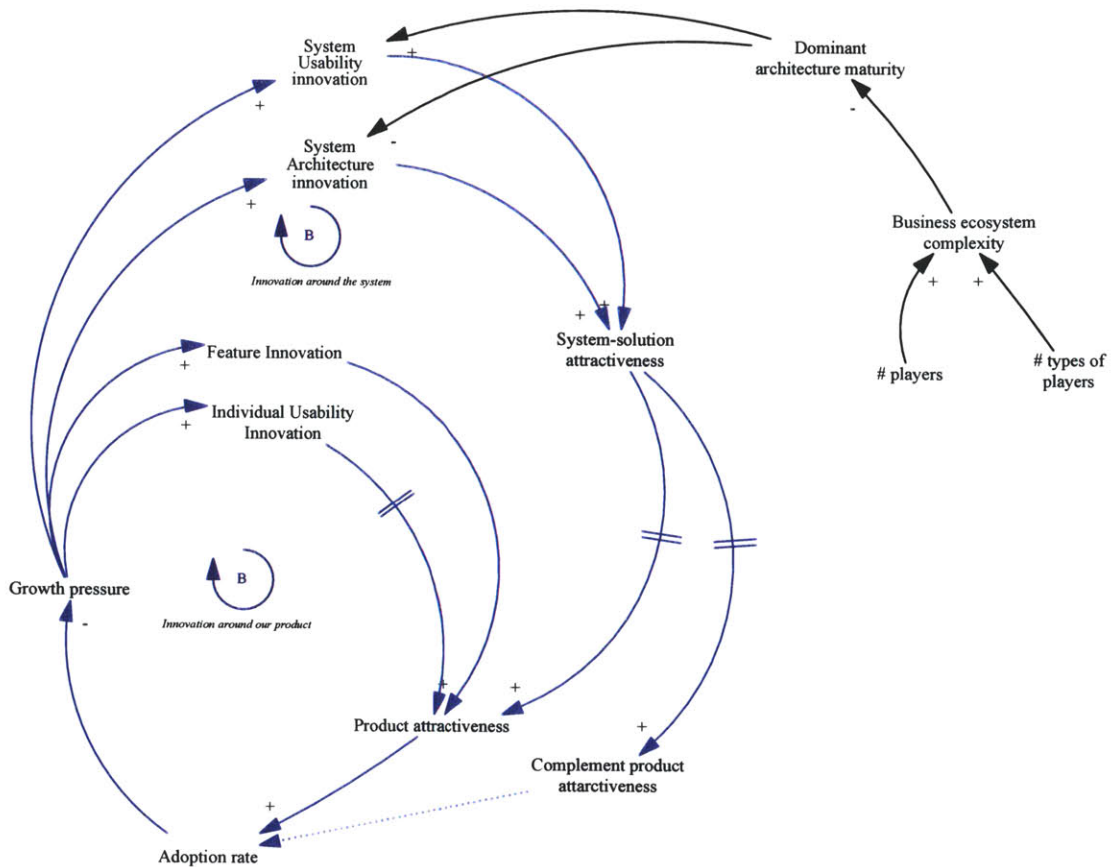
Figure 20: Innovation around the product and innovation around the system causal loops.

4.4.1 Innovation around the product

Managers of home technology companies face pressure to grow, increase revenues and profits. Companies innovate in order to differentiate in a competitive market. The most common and probably easiest option is to innovate around the company's own product features ("feature innovation"). All things being equal – feature innovation leads to an immediate increase in "product attractiveness", which then leads to an increase in the adoption rate, finally balancing the initial need for growth (balancing loop).

Companies can choose to invest in usability around the product ("usability innovation") – better device interfaces, simple process, etc. Even through usability is valuable to users; it is typically not as relevant during the purchasing decision. Thus, usability innovation increases product attractiveness, but it usually after some time (delay). Anyway, innovating around the product usability – if done right – ultimate leads to an increase in adoption rates and balances the initial growth pressure.

4.4.2 Innovation around the system

Often companies realize that innovating around one specific device or service is not enough; the digital-home system needs to be modified. One option is to innovate around the digital home architecture: modify the interactions and roles of different devices and services. Another option is to innovate around the system usability: improve the way users interact with the system as a whole, for instance, through better system-wide interfaces and configuration tools.

System usability innovation and system architecture innovation can increase the overall "system-attractiveness", creating value to the ecosystem as a whole. However, companies usually hesitate to invest in system-wide efforts since payoffs are diluted among every player. In theory, it should lead to a better product and adoption rate, but it is hard to predict if the innovation would end-up helping a future competitor (e.g., IBM and the rise of WINTEL computers).

The ecosystem structure influences how companies innovate around the system. A complex digital-home ecosystem can lead to an immature dominant architecture. The abundance of players with different interests decreases the chances of agreeing on a common architecture where every device or service knows how to interact with the rest. On one hand, the lack of a mature and dominant architecture will lead to separate innovations around the architecture but no innovation around the usability. On the other hand, a dominant architecture would discourage new architectural innovations and companies would concentrate on the system usability.
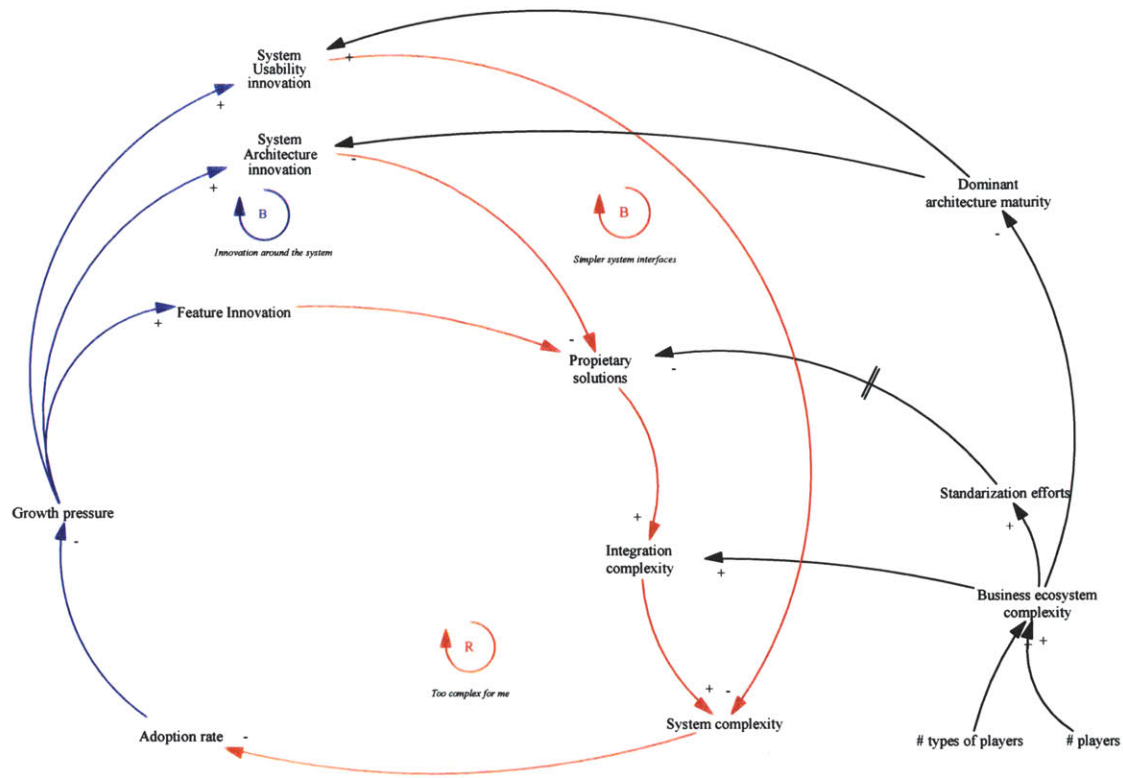
Figure 21: *Too complex for me* causal loop.

4.4.3 Complexity feedback

However, unless there are clear and mature industry standards, companies rely on proprietary solutions to innovate around the product or system. Proprietary solutions will lead to complex integration processes, ultimately increasing the system complexity and reducing the adoption rate (reinforcing loop).

Investments in system usability innovation could reduce the system overall complexity through better and simpler user interfaces/processes. However, as previously discussed, system usability innovation is only possible when a clear and mature system architecture has been established.

The number of players (companies) and the types of players (stakeholders) influences the business ecosystem complexity. For instance, if there were one dominant hardware company and one dominant service provider (2 players, 2 types), the complexity would be lower. On the other hand, if inside any household we can find a large combination of hardware and service companies, each addressing one specific part, the integration complexity would be much higher. The business ecosystem complexity affects the dynamics is three ways:

- A complex business ecosystem would attempt to develop compatibility standards to simplify integration, but that usually takes significant time (delay).

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- An industry with many players would increase the number of options, increasing the integration complexity and confusion.
- A complex business ecosystem would lead to the lack of a dominant architecture for the complete system; on the other hand, a simple business ecosystem that is effectively controlled by a dominant company could easily design a complete and stable architecture.

4.4.4 Overall system
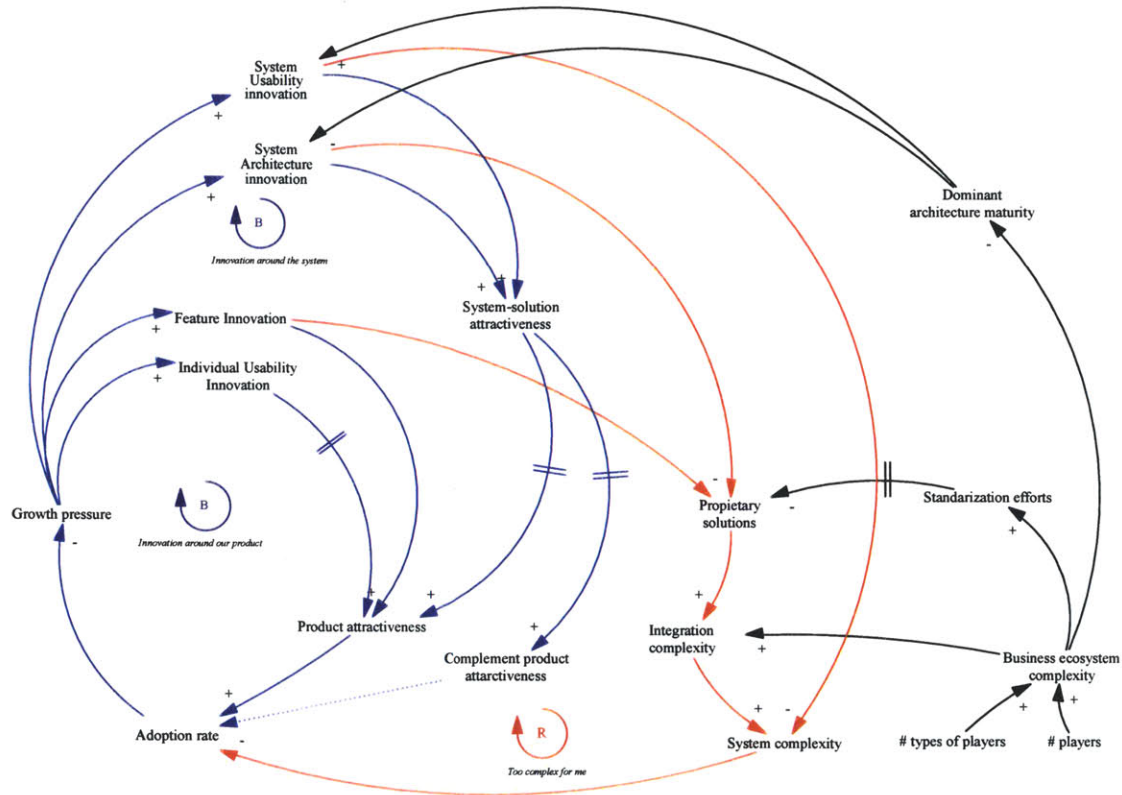
Figure 22: Complete causal loop diagram

The complete causal loop diagram provides a simple framework to understand why, regardless of sustained efforts, complexity will remain an essential part of the new digital home. Based on the model, system complexity can be reduced only if one of the following three conditions occurs:

1. <u>Dominant architecture</u>. If the industry agrees on a dominant architecture, standards would emerge, companies could focus on usability innovation and the overall system complexity would reduce. However, given technology trends and intense competition for value, agreeing on a dominant architecture is highly unlikely.
2. <u>Dominant players</u>. Of course, if a few large companies dominate the ecosystem, they could easily impose a dominant architecture to the rest,

reducing the overall system complexity; hypothetically, this would look like a world dominated by Apple solutions.

3. <u>Innovation-less differentiation</u>. A final option would be a competition based on prices or services with no significant innovation-based differentiation; even though it might happen to some specific components (Dumb pipe, Internet connections), there is still significant room for innovation in the digital home system.

Based on current technology and market trends, each one of these outcomes seems highly unlikely. If none of them are realized, households that are willing to adopt new convergent technologies will face increasing complexity.

5 Digital Help Services Value Proposition

5.1 Introduction

Previous chapters described the state of convergent home technologies, the stakeholders and how the ecosystem is expected to evolve. Based on the current trends, it is reasonable to expect that new convergent technologies will remain complex and confusing for mainstream users. Specific technology skills or attitudes are needed to select the right device, integrate it with other devices, and organically add new components.

Users that appreciate the benefit but lack the necessary skills will continue to feel frustrated by their inability to properly deal with new technologies in a reliable and simple way.

The expected complexity and end-user confusion clearly suggests the need for a service that would assist and simplify technology to mainstream users. Digital help services can help users select, install and use new technologies.

5.2 Digital Help Services value proposition

New convergent technologies offer significant opportunities and benefits to households allowing them to access, store and share media and information anytime from any device. But the complexities needed to select, install and use them limits their ability to reach them. Digital help Services (DHS), as a system, can be seen as a concept to address this general need.
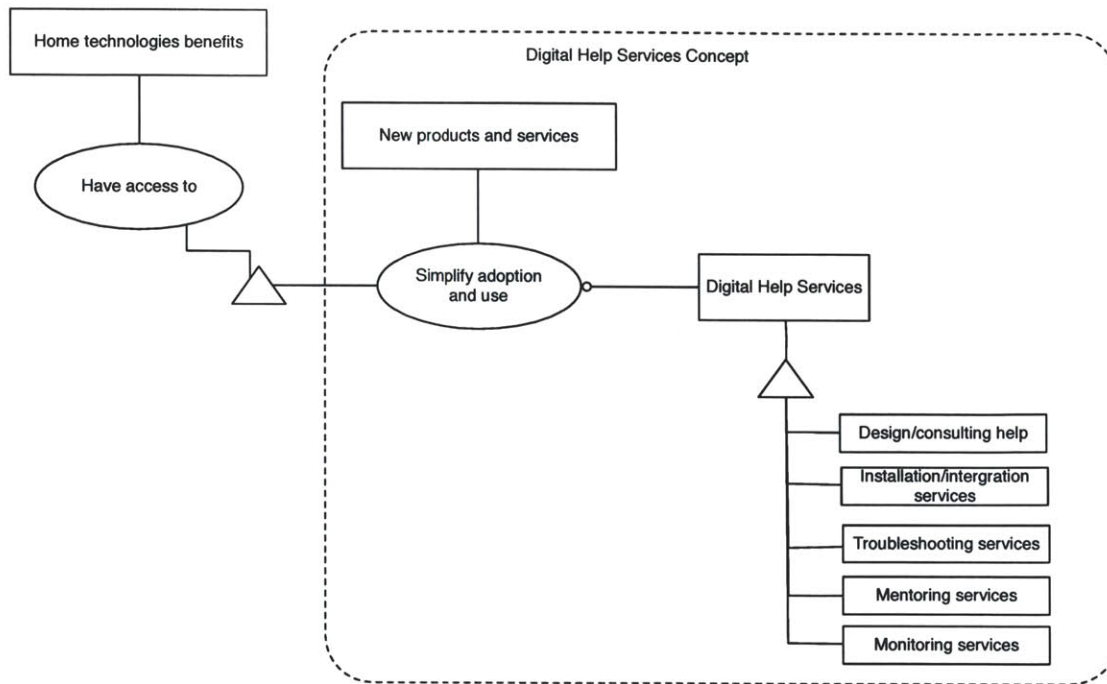
Figure 23: OPM diagram explaining the "Digital Help Services" concept.

<u>Digital Help Services Goal:</u> To simplify the adoption and use of home technology products and services, helping users to better interact with technology in at least one of the following ways: solution design and consulting services, installation and integration services, troubleshooting services, monitoring services, and mentoring or training services.

Using system architecture nomenclature, the operand would be "digital home networking products and services", the function would be "simplify adoption and use" and the form would be "Digital Help Services"; which can be decomposed in five types of services.

5.3 Digital help service options

Digital Help Services concept needs to be translated into specific services that add concrete value to specific needs. Service details will significantly vary depending on market conditions and technology adoption. For instance, some markets still require significant desktop support services while others need more Internet-TV assistance. Regardless of market conditions, services can be classified according to the product lifecycle.
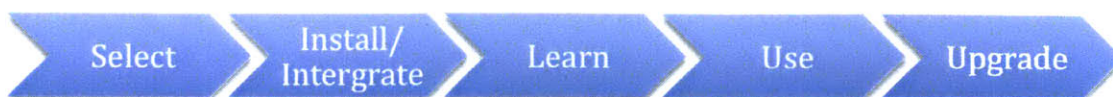
Figure 24: General product lifecycle and service needs.

Figure 24 shows a general product lifecycle framework and the service needs associated with each stage; but real cases tend to be less linear with users going back and forth between the product stages. First, a customer needs to select the specific device or service he/she is going to add to his digital home. Second, after buying the device or signing up for the service, he/she needs to install it and/or integrate it with other devices or services. Third, after devices or services are up and running, there is a learning process. Fourth, customers use the devices or services, occasionally requiring help to detect and solve problems. Finally, customers look for ways to upgrade or integrate with new devices, starting the complete process again.

5.3.1 Select

	Select
Service options	**Recommend.** Help users select the best device or service based on their needs and existing infrastructure. **Design tools.** Tools that help customers design their own solution based on simple standardized recommendations. **Compatibility check.** Validate compatibility between specific devices (particularly relevant in markets with limited return policies).
Comments	- Very hard to monetize. Users not willing to pay for recommendations. - Very large number of possible devices or services. Large knowledge base needed. - Can be done at the retail level, or remotely over phone or chat.
Technologies/ Devices examples	Selection help is usually needed when multiple devices are integrated and compatibility is not guaranteed. Ex: - Recommend and validate ways to extend wireless networks (multiple access points). - Recommend video streaming solutions (media server, DVR, game console integration, etc.)

5.3.2 Install

	Install
Service options	**On-site installation.** Go to customer's home to install devices. **Remote installation/integration.** Assist over the phone/chat and remotely take control when possible.
Comments	- Going to customer's home add significant costs. - Usually, installation services are sold together with the device. - Knowledge needed is very device-specific. - May involve new furniture, wiring and wall-mounted installations. - Retail players are adding installation services to their products (HDTVs, Home theaters, etc.).
Technologies/ Devices examples	Some common installation services are - Home theater and HDTVs installations - Home networks, including wiring, switches and WiFi devices.

	- Integrate gaming console with the WiFi network and use it to access over-the-top content. It doesn't involve new devices, but a new integration among devices and services (i.e. Netflix).

5.3.3 Learn

	Learn
Service options	**Remote mentoring**. Take remote control of devices to teach how to use them or solve simple problems. **On site brief training**. Usually included as part of an installation service.
Comments	- It is usually hard to differentiate between mentoring and trobleshooting services. Users learn while someone shows them how to solve a specific problem. - Devices that can be used in many different scenarios are better candidates for "mentoring services". For instance, mentoring services that show users how to extract value from new software can add more value (for instance, calendars, email, contacts integration). - Can be done remotely. However, people value face-to-face mentoring services.
Technologies/ Devices examples	Some possible mentoring services are - Smartphone mentoring, helping users learn how to take advantage of Smartphone advance features (for instance, http://www.mobile-mentor.com). - New Operating System mentoring services. Example: service offered at AppleStore to new Mac users.

5.3.4 Use

	Use
Service options	**Remote Troubleshooting**. Help users solve specific problems with their products/services. New technologies allow to remotely access many IP-connected devices. **Onsite troubleshooting**. Visit customers' home for standard support service. Currently, it is widely offered by independent tech support technicians. **Task outsourcing**. User can outsource some specific task, such as virus removal, CDs ripping and OS upgrade. Typically it can be done remotely. **Monitoring services.** Monitor home networked devices to proactively detect connectivity problems.
Comments	- Usually users don't foresee then need for assistance, so impulsive-help services are the best way to capture new customers (e.g., recover data from PC). However, monthly contracts can provide an "insurance" to future problems.

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	- Currently, the tech support market is highly fragmented and device-specific support services are too narrow. - There are some security concerns with remote access to devices, specifically computers with personal information.
Technologies/ Devices examples	- Monitoring tools for home networks. Given the growth of networked devices, and particularly networked TVs, monitoring tools can help users and service providers troubleshoot. However, there is no clear strategy on how to monetize them. - Desktop support services can be hired as a one-time service or as monthly contracts. Lately some companies have been extending their product portfolio to include any device connected to the computer (e.g., digital camera connected through USB cable). - Service providers (SP) usually install some devices inside customers' homes: set-top-boxes, modem and WiFi routers. Typically those devices are owned and managed by the SP, including remote and onsite support services. A clear service boundary is defined to limit the scope and responsibility.

5.4 Stakeholders and service options

Each stakeholder is better positioned to offer some specific types of help services based on their capabilities and the relationship with end-customers. While helping customers to "select" and "install" new devices can be a natural extension for retail players (for an example, read HBS Case: Best Buy Co., Inc.: Customer-Centricity [43]), service providers are probably better positioned to help customers "use" and "troubleshoot" technologies.

Subsystem	Select	Install	Learn	Use
HDTV system	x	x	x	x
Laptop or Desktop			x	x
Smartphones			x	x
WiFi Network	x	x		x
Wide pipe				x
IP- appliances (video, audio, smart-meter, etc.)	x	x	x	x
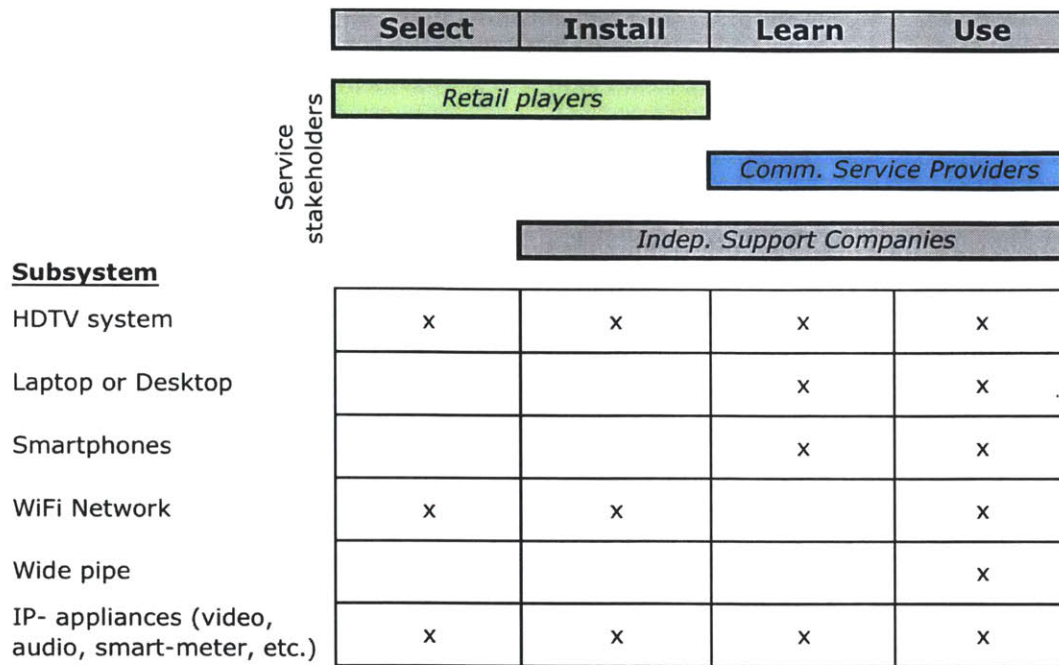
Figure 25: Digital help options for stakeholders based on their capabilities.

The nature of the billing relationship influences the services that can be offered by each stakeholder. Retailers sell products while service providers offer monthly services. Typically "select" and "install" services are a one-time sale, while "learn" and "use" require ongoing monthly contracts.

Even though new capabilities can be built, it usually requires time, investments and cultural change. For instance, while it seem reasonable to expect users to rely on retailer for installation services, it is hard to imagine retailers building monthly service relationships with their customers.

On the other hand, independent support companies could probably offer installation services, but that would probably require expensive onsite visits.

6 Demand Opportunity

6.1 Introduction

Previous chapters presented the value proposition for Digital Help Services, the overall technology landscape and the business ecosystem and its evolution. This chapter outlines the demand opportunity for digital help services.

This chapter is organized in three modules. First, the need for help services is described. Second, the market is segmented. Finally, the demand opportunity is estimated in terms of households.

6.2 Demand to go beyond current help services

The need for technological help is not new, but the type of help needed has evolved. Currently, given the increasing technological complexity, the three traditional sources of help are facing significant challenges.

6.2.1 Friend/relative support model

For years households have relied on friends or relatives to get free technology help. Often, helping others with their computer was a source of status and recognition among peers (According to *Combating Computer Stress Syndrome* report [45], 18% asked a friend or family member to solve computer problems). However, this support model is facing its limitations.

Help needed has become more complicated and time consuming. If initially households needed assistance with their PCs or home theater systems, now they need to integrate lots of devices and services. According to several industry experts, now techie friends need to spend too much time and effort, and thus are less willing to help.

Additionally, technology products and services have become critical for daily activities and users aren't willing to wait for some uncertain solution provided by an unreliable friend. They expect to have simple, reliable and fast solutions that work all the time.

6.2.2 Communication service provides support services

Traditionally, communications service providers have provided extensive customer support services, even sending a support technician onsite if needed. To limit unrelated support expenses companies define clear "service boundaries". For instance, Internet services don't go beyond the modem. When customers ask for help, they are asked to disconnect the WiFi router and directly connect to the modem. Similar support schemes are used for telephony (specially when users have a home PBX) and TV services.

Service boundaries are needed to efficiently limit unnecessary calls and visits. But a narrowly defined service scope is not very helpful for users who are sharing and integrating services across multiple devices. For instance, having to disconnect

every device to test the Internet connection doesn't help troubleshooting some problem in a large WiFi-connected network.

Additionally, not every market has large and well-established technology retailers – such as BestBuy in the US – where users can solve most of their technology needs. When users cannot easily find help options, they tend to ask the service providers for additional help and the pressure over the "service boundary" definition increases. In terms of classical corporate strategy literature, a market failure pushes companies to vertically integrate [44].

Customers need more help and assistance than simply the support services currently provided by communication service providers.

6.2.3   Hardware vendors warranty services

Usually, hardware devices come with warranty services that cover hardware manufacturing problems. Even though some companies include extended warranty services, they rarely include any type of installation or operations supports.

However, some reports have suggested that proving some support services would reduce the retail return rates and increase customer's satisfaction. According to a NPD Group report, 13% of consumers return one electronic device after being frustrated trying to get it to work, although 68% said "proper tech support" would have eliminated the need to bring it back [37].

6.3   Demand Pain points

As explained in the previous section, existing support schemes don't address the needs emerging in the new digital home. Four pain points support the need for better and more integral digital help services. **Figure 26** presents them using an OPM diagram with a general need decomposition, prior to market segmentation.

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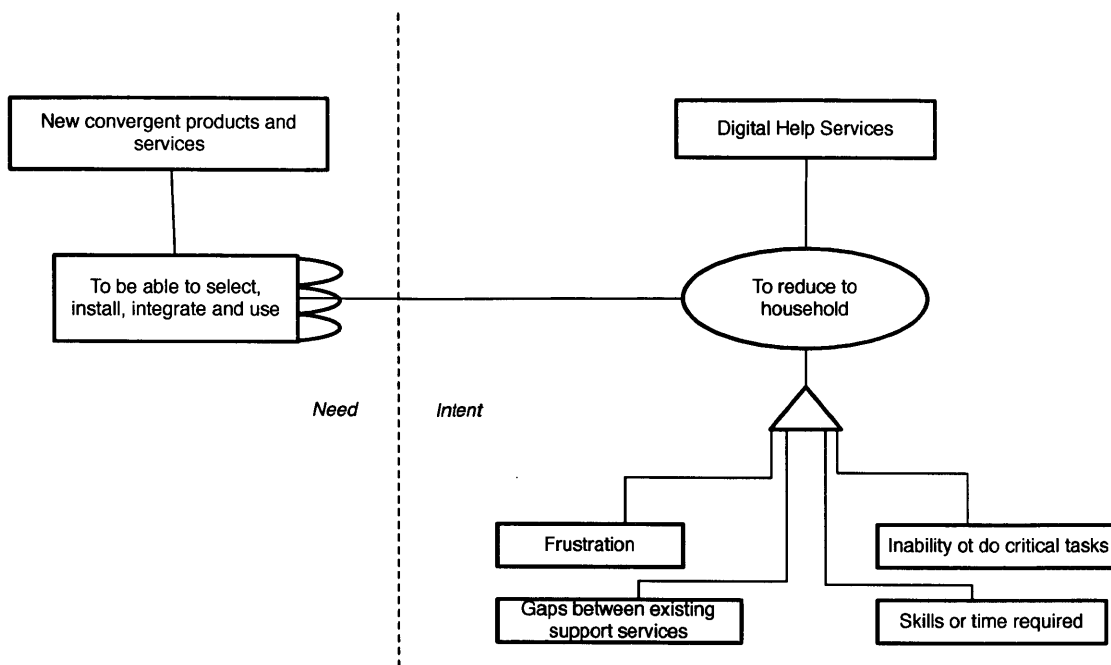
Figure 26: OPM decomposition of Digital Help Services Needs and Intents

6.3.1 To reduce frustration

Technology can cause significant frustration in people, especially the non-digital natives. As technology use increases, so does the dependence on it. When devices or services don't work as expected, users tend to become very frustrated. Often we witness how that frustration leads to strong emotions such as anger or a sense of vulnerability.

Even though obtaining concrete evidence to support technology frustration is not straight forward, anecdotal evidence is abundant. Asking among friends and family *"Have you had any bad experience with technology?"* is a revealing exercise. Frequently they express excitement about the opportunity to share how much pain they have gone through, describing their unique stories in great detail. Problems and stories vary, but the frustration memories are relatively widespread.

According to a recent report *Combating Computer Stress Syndrome* Report [45], 68% of people said *computers sometimes cause anguish or anxiety*. Another private report said *78% of Brits have shouted at a gadget; 21% thrown it against the wall; and 14% punched it*

6.3.2 To reduce the inability to do critical tasks

Regardless of the emotional frustration technology can cause, people depend on technology to do critical tasks. According to *Combating Computer Stress Syndrome* Report [45], 94% of consumers depend on their computers in their personal lives and 62% have a high level of dependency.

For instance, an increasing number of telecommuters rely on their technological infrastructure (internet, printing, file sharing, etc) to do their job. By 2008 around 8.1% of US workers telecommute at least once a week and it is expected to reach around 13% by 2016 [46], not considering the ones that run their business form home.

Additionally, families rely on technology for entertainment. All too often, parents struggle to entertain kids during the winter days if cable or Internet connections are down. Connectivity has become a critical component in family activities and disrupting it can affect households' functioning habits.

6.3.3 To reduce the skills or time required

Often, specialist skills are needed to select, install and/or integrate a specific home technology. For instance, configuring a WiFi router requires basic routing knowledge, and connecting an Xbox with a Windows Media Center requires some medium knowledge about Microsoft's Windows operating system. Knowledge is widely available though forums and tutorials, but accessing it requires spending time and energy.

Some users just don't have the time, don't feel capable or simply don't want to go through the long and confusing learning process. As digital home technologies become widely available the need to shortcut the learning process will increase.

6.3.4 To reduce the gap between existing support services

Currently, each company, vendor or service provider defines very clear service boundaries. However, as home devices become networked devices, the device-centric approach becomes very confusing.

Common examples are Internet connections and software vendors. When there is a problem, the ISP may blame the software, while the software company may blame the ISP, leaving the customer in a middle zone that nobody addresses.

Convergent technologies will make this problem even worse. Imagine an Internet-connected TV with both linear programming and over-the-top content. Now, an unskilled user might not know where to start: Is it a cable operator problem?, or a OTT provider problem?, or a wireless network problem?, or an Internet connection problem?, or a TV software update problem?, etc. Even if he asks, each will probably blame others and ask to unplug everything to isolate the problem.

There is a clear need for a "system-level" help service that looks how all devices and services interact. Similarly to large contracts in the corporate IT market, it isn't unreasonable to imagine one company assuming full responsibility for every services, contacting third-party companies depending on the type of problem. Only one company would be the front-face for any help or support needed. It may be financially unsustainable, but users would definitely like it.

6.4 Market Segmentation

Not every household suffers the pain-points in the same way. Clearly, the need for help to select, install and use new convergent technologies is not spread evenly. This section presents a market segmentation based on some specific customer characteristics.

Digital help services' potential customers can be characterized by four simple parameters to understand its key drivers.

1. **Aware of value**: Are customers aware of the benefits and opportunities new home technologies can enable?
2. **Appetite for benefits**: Assuming a customer understands how new home convergent technologies can provide new opportunities for media and content sharing, does he/she feel an appetite for those possibilities?
3. **Has available time**. Does the potential customer have time to learn how to use new devices or services and/or solve any technological problem?
4. **Skilled/able**. Is the customer technologically skilled in new digital technologies in order to easily understand how new devices and services operate?
5. **Confident in skills**. Is the customer confident in his own abilities to use and rely on technology products? Regardless of his knowledge and skills, does he/she feel intimidated by technology?
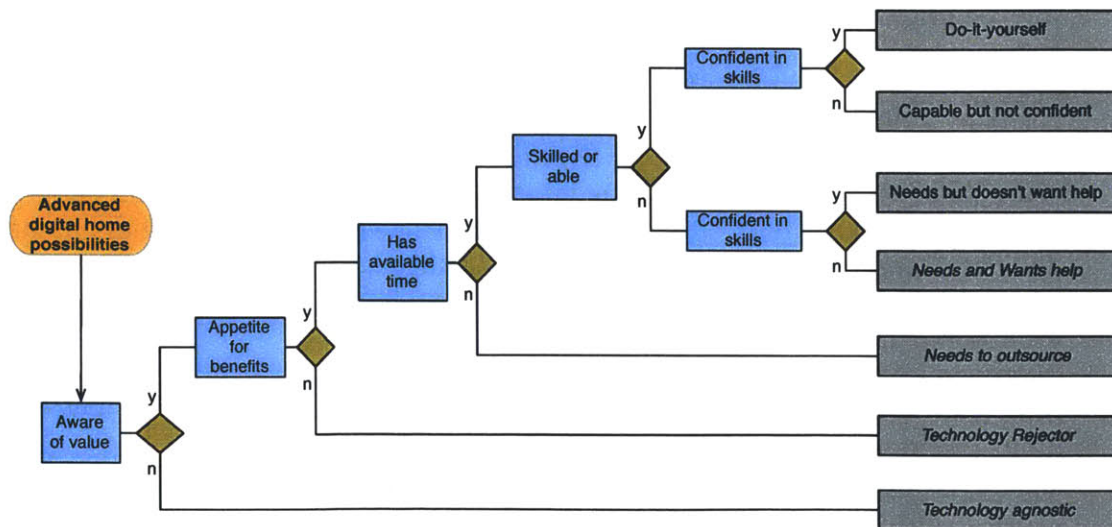
Figure 27: Market segmentation based on potential customer characteristics.

Based on theses five attributes, customers can be classified into seven groups.

Customer Group	Needs Help	Wants Help	Description	Technology adoption
1) Do-it-yourself	No	No	Geek or digital-natives	1st
2) Capable but not confident	No	Yes	Skeptical digital user	2nd
3) Need but doesn't want help	Yes	No	Time-rich independent user	3rd
4) Wants and needs help	Yes	Yes	Technology dependents	4th
5) Needs to outsource	Yes	Maybe	Busy family man	5th
6) Technology agnostic	Maybe	No	Average tech user. Follower.	6th
7) Technology rejectors	No	No	Anti-technology	7th

Table 2: Market segmentation for digital help services.

1. **Do-it-yourself.** Often referred to as 'geeks', they appreciate new technologies and are knowledgeable about them. They don't need or want help since they are capable of installing, using and troubleshooting by themselves. They feel very confident about their skills and are willing to spend time. Although they can be found in all age groups, younger digital-natives tend to dominate for new technologies.
2. **Capable but not confident.** Some people have the necessary skills and time, but just lack the confidence in their ability to properly user technology. Often, they don't know how simple and intuitive it really is. Initially, they tend to be fearful and skeptical about their skills, but after some little help they can operate independently.
3. **Need but doesn't want help.** Some people, even though they lack the required technical skills or knowledge, enjoy challenges and feel very confident in their ability to learn by themselves. Usually they are willing to spend a lot of time learning how to use technology (get into forums, read, reports, manuals, etc.).
4. **Wants and Needs Help.** They understand the value of new technologies but lack the necessary skills and confidence to do it by themselves. They depend on technology and often experience intense frustration-episodes. They rely on help from some third party.
5. **Needs to outsource.** Some people, regardless of their skills and confidence level, simply do not have the time to deal with technology issues. Even if they have the time, they don't want to spend it dealing with home technical issues. For instance, a stereotype would be a professional family man who, once back from work, needs to solve many technology issues for the kids. They typically prefer to outsource some activities (pay for services) to have more time for other activities.
6. **Technology agnostic.** They have an average interest in technology and do not fully understand the opportunities new convergent technologies can enable. Typically they follow others before adopting new technologies.
7. **Technology rejectors.** Even though they could understand the value of new technologies, they prefer to live without them. They consciously prefer not to rely on technology product and devices.

From these seven customer categories, three would be the best candidates for digital help services.

Priority	Customer group	Pros	Cons
1st	4) Wants and needs help	– Depends on help. Strongest needs. – Needs help to reduce frustration.	– Hard to define willingness to pay.
2nd	5) Needs to outsource	– Enjoys support services. Doesn't want to be bothered. – Loyal.	– Price vs time saved valuation. – Might be more price sensitive.
3rd	2) Capable but not confident	– Early adopter. – Requires advanced services.	– Short-term customer; only needs help once. – Low Loyalty. – Very demanding.

Table 3: Pros and Cons of three customer segments.

This simple market segmentation analysis suggests companies should focus on user groups that lack both the skills and confidence to use technology independently, but appreciate and understand the benefits the new digital home enable (wants and needs help).

Companies should stay away from *self-fixers* and *capable but not confidence* groups given their expected low loyalty and demanding requirements. More importantly, digital help services should be focused on users that understand and appreciate the possibilities enabled by convergent technologies. If people simply do not want to use technology at home, digital help services would hardly help.

6.5 Demand Size

How many households would demand digital help services and at which price? Estimating the size of the demand opportunity is not straightforward and requires detailed field market research. However, some rough estimates can estimate an order of magnitude.

It is important to keep in mind that the importance of digital help services could significantly increase with the adoption of new devices and technologies, and at the same time, the adoption of new technologies could increase if technology solutions are simplified to mainstream customers.

6.5.1 Market sizing

Four methods are used to estimate the market size in the US based on information provided by *2009 State of Consumers and Technology Forrester* report [2].

- Extrapolating attitudes towards technology from a different market

Through private correspondence, a company provided some private information about people's attitude towards technology on the UK.

Attitude group	Description	% market
Geeks	Self-confident technology users	17%
Digital Metropolitans	Digital lifestyle but not technology experts	14%
Time-Rich Self-Fixers	Can use technology confidently but not reliant on it	13%
Technology Dependents	Need technology but not confident users	16%
Technology Agnostic	Average engagement and reliance on technology	24%
Technology Rejectors	Use less technology and less reliant on it	15%
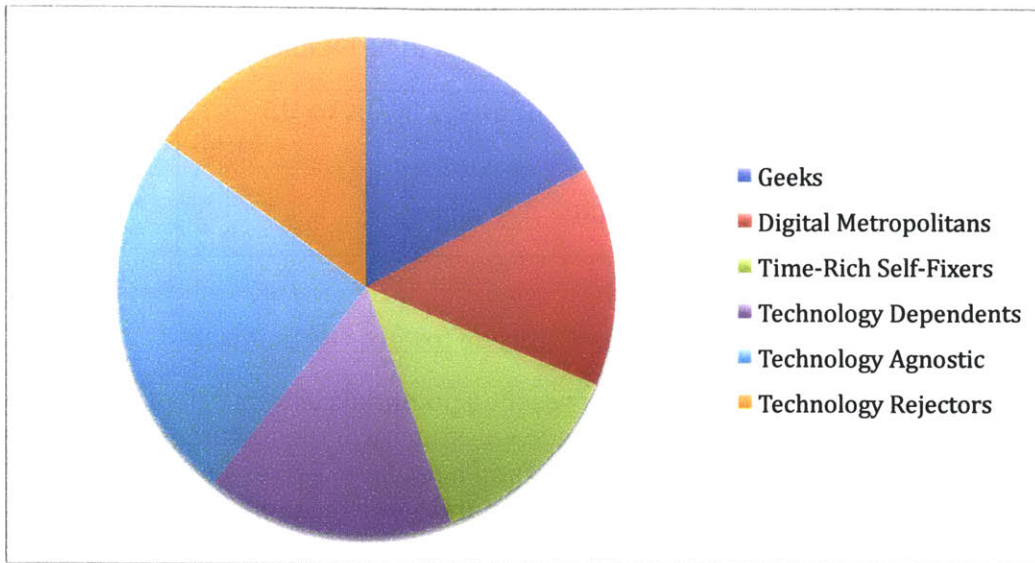
These groups can be mapped to the attribute-based groups described in the previous section.

Customer Segmentation based on attributes			Technology Attitudes – Company's private market research	
Customer type	Description		Attitude	% market
Do-it-yourself	Geek	<-->	Geeks	17%
Capable but not confident	Skeptical digital user	<-->	Digital Metropolitans	14%
Need but doesn't want help	Time-rich independent user	<-->	Time-rich self fixer	13%
Wants and needs help	Technology dependents	<-->	Technology Dependents	16%
Needs to outsource	Busy family man			
Technology agnostic	Average tech user. Follower.	<-->	Technology agnostic	24%
Technology rejectors	Anti-technology	<-->	Technology rejector	15%

Table 4: Attitude groups mapped to Attribute groups

Then, assuming digital help services customers would come from the technology dependents group, the estimate market size would be 16% of households. It should

be noted, however, that this report was made for one particular geographic market and that extending it to a different market needs to be handled with caution.

Extrapolating attitudes towards technology in UK to US		
US 2010 Households		119.8
Technology Dependents in UK	16%	
Technology Dependents in US (rough extrapolation) – Households	16%	**19.2**

- Based on technology adoption and attitude towards technology

Households with home networks represent a potential customer pool. Additionally, attitude towards technology can provide an estimate of the number of households that have adopted complex technologies and need help. Forrester 2009 report includes information about home networks and some technology attitudes, including "*I rely a lot on recommendations from friends or family when making purchase*". Assuming independence (big assumption, best case scenario), the estimate market size becomes 11% of households.

Based in adoption of convergent technologies and attitudes towards technology		
US 2010 Households		119.8 MM
Households with home network	39%	46.2
Households with DVR	28%	33.6
Attitude: "I rely a lot on recommendations from friends or family when making purchases"	30%	35.9
Estimate – Households (best case – assuming indep.)	**11%**	**13.0**

- Based on families older than 40 as an estimate of attitude towards technology

A different approach would be to use the number of families older than 40, not including older singles and couples, as an estimate of a user group that could benefit from digital convergent technology but lack the necessary skills and confidence. This is clearly a very rough estimate as there are many reasons why others groups would also benefit from digital help services. However, it may provide a conservative estimate of 4.1% of households.

Based families older than 40 as an estimate of skills and confidence		
US 2010 Households		119.8
Families older than 40 in US	14%	16.8
Families older than 40 with home network (estimate)	29%	4.9
Estimate (worst case) – Households	**4.1%**	**4.9**

- Based on current third party local tech-support

The *Combating Computer Stress Syndrome* report [45] asked people in the US How they typically solve computer problems.

Q.05 How have you typically solved computer problems?

	37%	Tried to fix it myself
	18%	Asked a friend or family member
	8%	Contacted my Internet service provider
	7%	Relied on third-party local tech support service
	7%	Called my computer manufacturer
	3%	Signed up for online subscription support service
	3%	Referred to IT support at work
	2%	Called or visited the store where I bought the computer
	1%	Talked with my software vendors
	5%	Other

Figure 29: How to solve computer problems – CMO survey results.

The number of households that would adopt digital help services can be estimates adding the percentage that relies on third-party local technicians with the percentage that already signed for an online computer support service.

Based on PC support survey			
			MM households
US 2010 Households		119.8	
Answered "relied on third party local tech"	7%		
Answered "signed for an online subscription support service"	3%	3.6	
Households Estimate	10%	11.9	

Overall, the potential market for digital help services is in the 10 million households order of magnitude, but it could grow exponentially if technology complexity increases and help services value proposition becomes clear to a larger group.

6.5.2 Willingnesss-to pay

Monetizing digital help services is probably the biggest challenge. The pain-points addressed by digital help services are clear; even though users might not be aware of their technology-help needs, there is a clear latent need for them. However, it is useless unless it leads to willingness-to-pay.

Historically, it has been hard to monetize services around consumer electronics, communications and related technologies. Users tend to link the value of hardware with the value of services related with that hardware. For instance, customers tend to think that if they spent $x in a certain HDTV system, the installation or support services have to be significantly below $x. Probably users associate those intangible goods to the tangible devices value.

The clearest example is backup services. Even though most people consciously understand the value of their documents, photos and music; online backup services haven't been widely adopted. It seems as if people think of the value of backups services in relation with the hard-drive's price. People is willing to spend something significantly below the value of a hard drive even though the value of information significantly is larger. Backup services are seen as insurance contracts that could be postponed until it is too late.

Transforming the latent need for digital help services into willingness to pay will take time and a sustained marketing effort. Several industry experts, both from service providers and PC support companies, have indicated that users are willing to pay if services are targeted to the right customers. As help services become more widely available, monetizing frustration and the need for help will require strategic thinking and lots of experimentation.

Positive Differential Value

Intangibles:
- Avoid frustration
- Do critical tasks
- Simplicity
- Confidence

Reference Value: cost of best alternative

Tangibles:
- Occasionally, pay for tech support

Intangibles:
- Do it yourself
- Rely on techy friend
- Don't use technologies
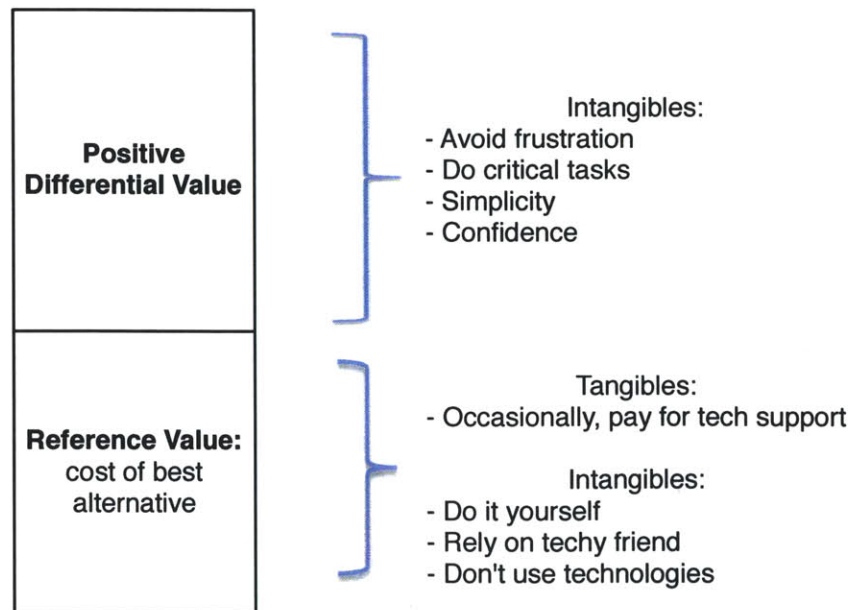
Figure 30: Economic Value Estimation diagram [47].

However, desktop support services are currently being offered and their pricing suggest a lower bound for willingness to pay.

Company	Service name	Description (from web site)	Price/month
Virgin Digital Help – UK	Digital stuff plan	"Covers things like computers, laptops, wireless networks, printers and smart-phones"	$15.58
iYogi	Unlimited desktop support	"..support for your PC, connected devices, peripherals and over 100 software"	$14.17
Firedog	Premium user support	"..help for all your PC problems including performance, networking, security, troubleshooting, data backup & more"	$24.95
Hiwired	Premium support help desk"	"..technology devices including PCs, wireless networks, printers, MP3 players, digital cameras and more"	$14.17

On the other hand, single-event services such as home-theater installation or wireless configuration services are usually below $100 for remote services and above $150 for services that require onsite visits.

Additionally, *Combating Computer Stress Syndrome* report [45] indicates that at least 15% of users indicated they were willing to pay more that $100/year for unlimited desktop support service (out of the total of the survey responses). However, limitations of surveys about willingness-to-pay information are well known.

Q.13 What would you be willing to pay per year for a service that is always available and solves computer problems remotely and automatically?

31%	0
15%	$10
19%	$25
18%	$50
14%	$100
1%	$500
0%	$1,000
1%	More than $1,000
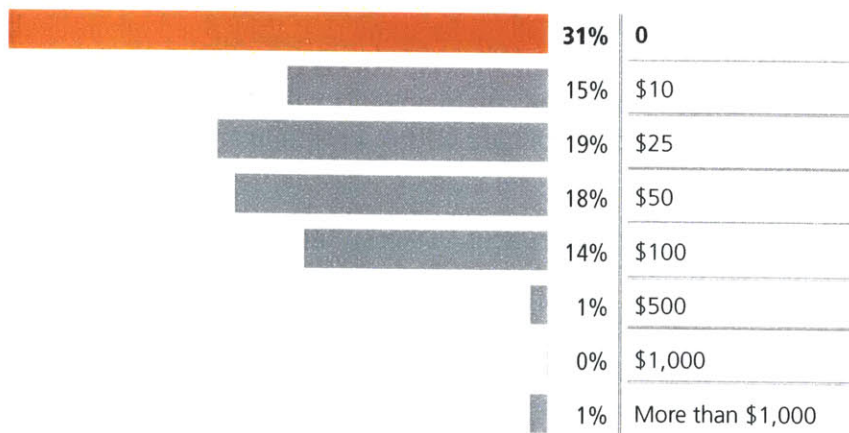
Figure 31: Willingness-to-pay for computer support – CMO survey results

Overall, customers' willingness to pay for digital help services is in the $10/month order of magnitude. One key question is what are the optimal prices for a massive adoption of digital help services? A company executive indicated that price experimentation has indicated the demand is quite inelastic and prices could go up; only price experimentation will tell.

Using a $10/month price estimate, and a potential market of 10 million households, the market opportunity results in $1.2 billion in annual revenues for the US (order of magnitude).

6.6   Analogy with automotive industry

Looking at a different industry and its evolution path can offer an interesting perspective of the digital help services opportunity. In particular, the automotive industry evolution and how car owners deal with the need for assistance can be insightful.

Decades ago most car owners could repair their cars by themselves. Cars were based on simpler mechanics allowing people to solve some simple issues. If someone wasn't skilled enough, he or she could rely on a better skilled friend. If not, car owners could use a fragmented market of small auto repair shops.

However, as car technology became more complex with many electronic components, the old support model changed. Nowadays, most car owners don't even attempt to fix any technical problem with their car. They simply take their car directly to a service center. Often, service center are associated with car dealerships that can solve any technical issue.

The home technology space could follow a similar path. As the automotive industry went from a support model based on mechie-friends and fragmented repair shops, the home technology industry could go from a techie-friend support model to robust integral digital help services. If home technology becomes as complicated as automotive technology did, users will understand that they need formal help services to properly operate. But, will digital help services increase technology adoption? If the automotive industry analogy holds valid, probably yes. It is hard to imagine the widespread adoption of cars without reliable and professionalized technical support services.

However, there are some key differences between the automotive industry and the household technology industry that may influence the evolution path:

- In the automotive industry the car company usually controls car services. Car owners go to a service center that often specializes in one brand. On the other hand, home technology devices and services come from several different companies, making the "service integration" effort much harder.
- Car owners often see their car as an investment and are willing to spend some money to protect their value. On the other hand, technology devices become obsolete very fast and rarely have any salvage value.

- Most car owners know they are completely unable to solve a car technical problem. On the other hand, home technologies are complex to some, but not to everyone. Many want to at least try solving a problem by themselves.

The challenge for digital help services is to transform the latent need for technology help into services widely adopted, despite some challenges not even the automotive industry had.

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7 Opportunity for communications service providers

7.1 Introduction

Previous chapters described the need for simplicity, the value proposition for digital help services, business ecosystem and the demand opportunity. This chapter describes the specific opportunity for communication service providers (CSPs) and the potential benefits to them – direct and indirect – of offering extensive digital help services to their customers.

This chapter refers to digital help services that would simplify convergent technologies to mainstream users, without defining the specific product details since the help needed in each geographic market varies. For instance, the US market tends to be more technologically advanced than, for instance, some southern Europe markets. In some market there is still a huge need for simple desktop support services while in others there is a growing need for help around the Internet-connected TV subsystem.

The chapter is organized in three sections. First, the general benefits for communication service providers. Second, some risks or potential disadvantages these services could carry. Third, a simple economic model.

7.2 Benefits

Figure 32 shows the benefits that would motivate communication service providers to offer digital help services, going from the end-user experience (why do it?), to the operational benefits and their impact in the final corporate results (Benefits to CEO/Board). Each logical connection represents a certain hypothesis with uncertainty about its validity (represented by a color code).
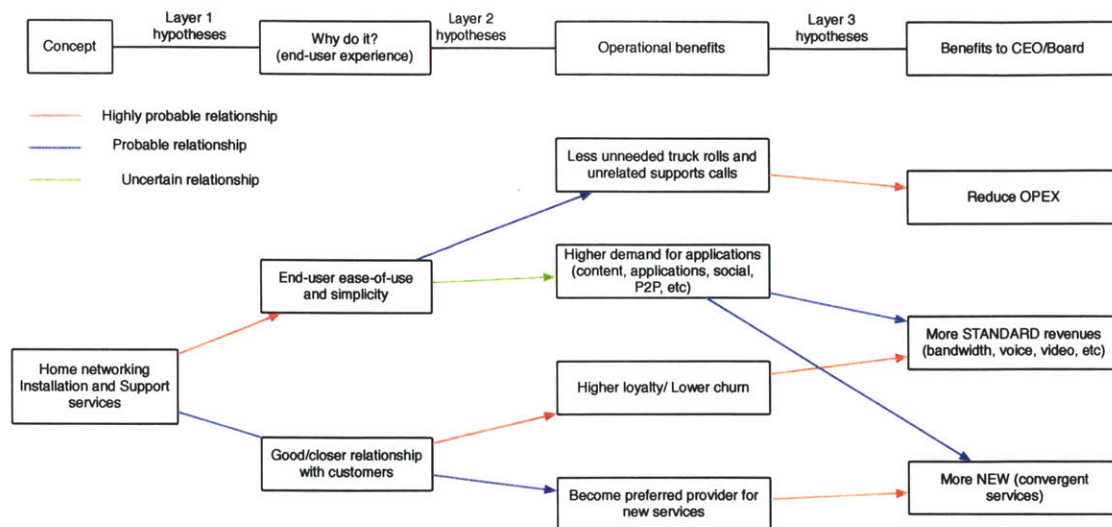
Figure 32: Benefits of offering digital help services

From an end-customer experience perspective, there are two main motivations for digital help services. First, digital help services would simplify end-users interaction with technology products, reducing frustration and increasing their ability to obtain value from technological products or services. Second, through digital help services customers would establish a closer relationship with communication service providers.

Operational benefits and their impact in the bottom line:

- <u>Less unneeded truck-rolls and unrelated support calls</u>.
  A significant proportion of the support calls received by CSPs are not directly related with their services (for instance, customer's hardware/software problems). Often, that leads to additional costs and expensive truck-rolls (visit to customer home). Efficient digital help services could monetize some of these calls and reduce customer support costs, leading to lower operational expenses (opex).

- <u>Higher demand for connectivity and applications (content, applications, social, P2P, etc)</u>
  Simplicity and ease-of-use could lead to a higher demand for content and online applications. Most industry experts have indicated they strongly believe help services could increase the adoption of new technologies and services, leading to bandwidth consumption and –potentially – higher Internet ARPU. Additionally, communication service providers could capture new value-added services (VoD, cloud services, fixed-mobile convergence, etc.) and increase new convergent revenues.

- <u>Higher loyalty/ lower churn.</u>

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A closer relationship with customer could lead to an increase in customer loyalty and lower churn rates. Lower churn leads to more traditional revenues.

- Product differentiation.
  In highly competitive markets, communications service providers tend to add additional features to differentiate their Internet and TV services during the sales process. Bundling digital help services with, for instance, broadband services could become an important differentiation element. Product differentiation leads to more effective sales and more traditional revenues.

- Become a preferred service provider for new services
  A closer relationship with customer could position CSPs in an excellent position to capture new sources of revenues.

7.3 Risks

However, there are some risks associated with digital help services, as shown in **Figure 33**.
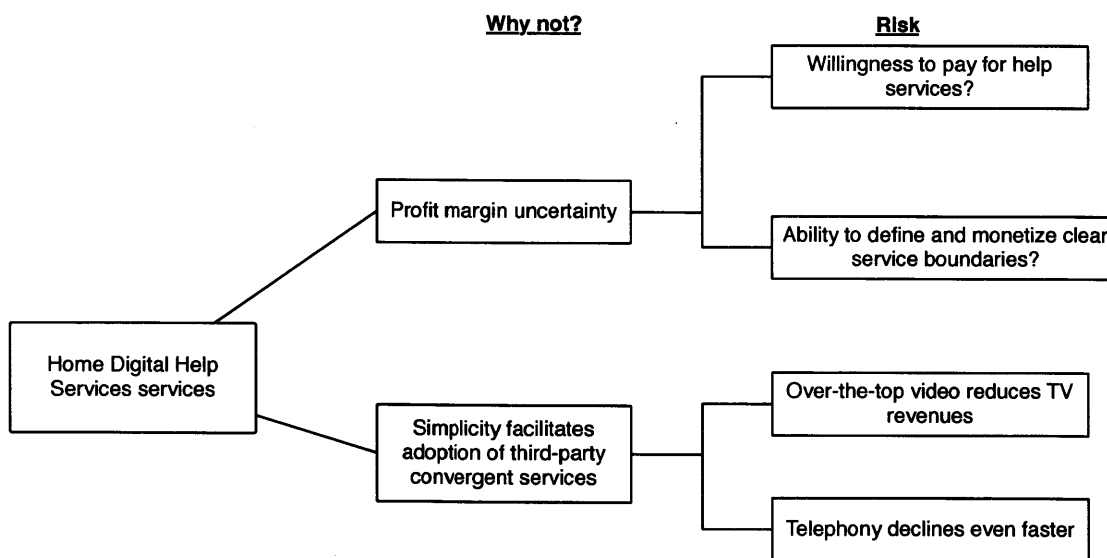
Figure 33: Digital Help Services risks for communication service providers.

First, the ability to profit from widely available digital helps services needs to be validated. It is not clear if willingness to pay would become the major bottleneck for massive adoption. Additionally, CSPs with a long history of customer support services have some concerns about their ability to define clear service boundaries and monetize the additional services. They are afraid customers would end-up forcing them to give any additional help service for free. For instance, one service provider mentioned that, even though they could charge thousands of truck rolls, usually they don't in order to keep churn rate under control.

Second, and probably strategically relevant, digital help services could facilitate the adoption of third-party convergent services. As explained in previous chapters, current OTT television solutions are complex and require some specific skills. Simplifying them could increase the rate at which users transition from traditional cable-TV services to OTT models; potentially reducing subscription-TV revenues.

7.4 Economics

The benefits and risks associated with digital help service opportunities can be modeled using a simple ARPU diagram (**Figure 34**).
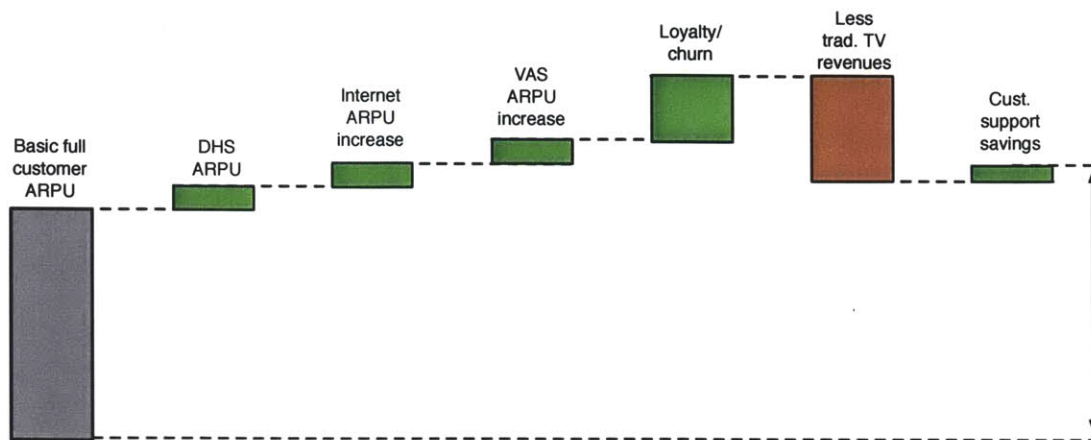
Figure 34: Digital Help Service ARPU implications

Digital help services will have a positive financial impact if:

+   Digital Help Services ARPU
+   Internet ARPU (increase)
+   Value-Added-service ARPU (increase)
+   Loyalty additional revenues (increase)
+   Customer support savings
−   Loss revenue from TV (users switch to OTT given simplicity)
> 0.

In the following sections some of these components are estimated for the US market.

7.4.1 Full customer ARPU

Comcast, given its leading role in the US market and its focus on the fixed residential market (no wireless and little business services) can be used as an example for voice, video and telephony ARPU and the related cost structure. Data from 2009 Comcast Annual report, cable segment operations.

Revenues	$MM	Relevant Customer Base Type	MM	Average per customer $/month	
Video	$ 19,377	Video Customers	23.6	$ 68.42	47%
High Speed Internet	$ 7,757	Internet Customers	15.9	$ 40.66	28%
Voice	$ 3,262	Voice Customers	7.6	$ 35.77	25%
Advertisment	$ 1,444	*Not considered*			
Other	$ 1,069	*Not considered*			
Franchise Fees	$ 948	*Not considered*			
Subtotal	*$ 33,857*			*$ 144.84*	*100%*

Operating Expenses	$MM	Relevant Customer Base Type	MM	Average per customer $/month	
Video Programming	$ 7,046	Video Customers	23.6	$ 24.88	17%
Technical labor	$ 2,245	All	23.6	$ 7.93	5%
HighSpeed Internet	$ 519	Internet cust	15.9	$ 2.72	2%
Phone	$ 602	Phone customers	7.6	$ 6.60	5%
Other	$ 3,123	All	23.6	$ 11.03	8%
Subtotal	*$ 13,535*			*$ 53.16*	*37%*

SGA	$MM	Relevant Customer Base Type	MM	Average per customer $/month	
Customer service	$ 1,879	All	23.6	$ 6.63	5%
Marketing	$ 1,600	All	23.6	$ 5.65	4%
Administrative and other	$ 3,149	All	23.6	$ 11.12	8%
Subtotal	*$ 6,628*			*$ 23.40*	*16%*

CAPEX	$MM	Relevant Customer Base Type	MM	Average per customer $/month	
CPE	2934	All	23.6	$ 10.36	7%
Scalable infraestrcuture	855	All	23.6	$ 3.02	2%
Line extensions	120	All	23.6	$ 0.42	0%
Support capital	421	All	23.6	$ 1.49	1%
Upgrades	356	All	23.6	$ 1.26	1%
commercial services	351	0%	23.6	$ -	0%
				$ 16.55	11%

ARPU - OPEX - CAPEX		$ 51.74	36%

Figure 35: Comcast's revenue and cost-structure revenue.
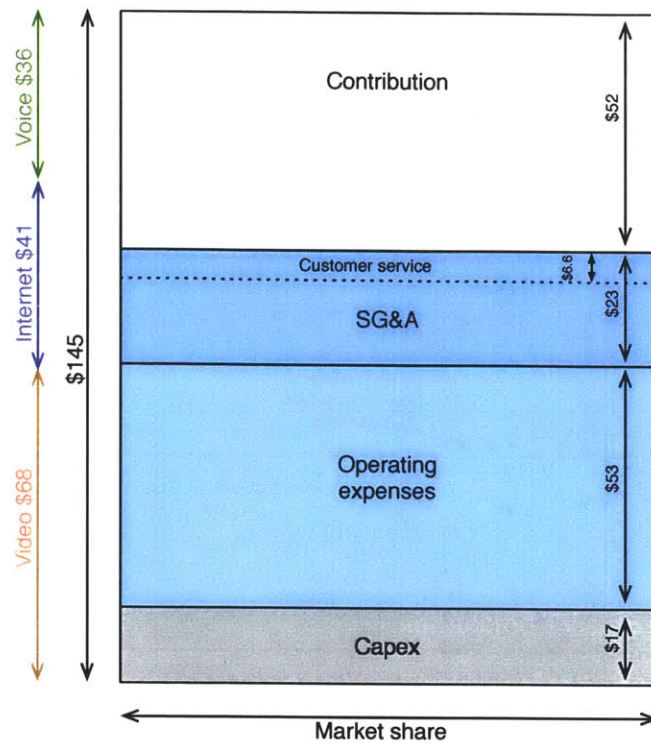
Figure 36: Comcast's "full customer" ARPU and cost structure.

7.4.2 Internet ARPU increase

Digital help services would increase the use of Internet services and then, in the long run, increase the ARPU per Internet customer. **Figure 37** shows Internet prices vs bandwidth for Comcast and Verizon. Since the average Internet ARPU is $41/month, it is reasonable to expect that users would move to more expensive plans as they use more bandwidth-intensive technologies.
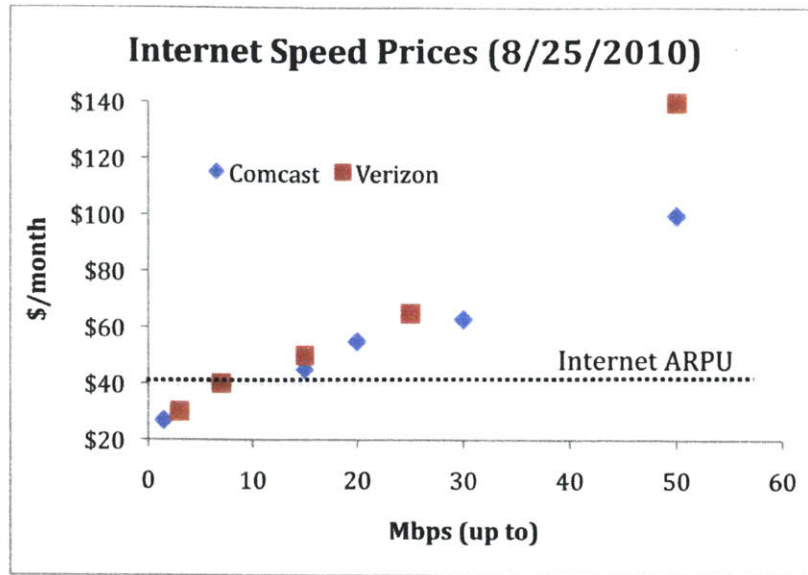
Figure 37: Price vs speed for Comcast and Verizon.

But, how much Internet ARPU would increase for digital help services customers? Based on price dispersion and bandwidth requirements of new technologies a long-term $10/month increase will be assumed.

7.4.3 Customer support savings

Digital help services effects in customer support costs are estimated based on information provided by service providers during interviews. A simple model based on calls statistics and truck roll costs suggests a customer-support costs of $7.2/month, particularly close to the $6/month estimated from Comcast's annual report.

Assuming that 35% of the customer support calls are related with problems outside the service scope, and that 50% of those can be monetized offering customers digital help services, the net customer support cost per customer goes from $7.2/month to $5.9/month (18% reduction).

Overall, customer support saving can appeal some CSPs looking for new ways to reduce costs, but its effect would probably be small and shouldn't be the major motivation for a digital help services strategy.

Calls per customer/month	0.2
Once every X months	5
Calls related with customer's HW or SW	35%
Calls resolved online	90%
Truck-roll required	10%
Customer support call cost	$25
Truck-roll cost	$110
Cost/customer/month	**$7.2**

DHS conttribution - Customer support savings	
Calls per customer/month	0.2
Calls related with customer's HW or SW	35%
Monetized (assuming no profit)	50%
New - calls/month not-monetized	*0.165*
Cost/customer/month	**$5.9**
Saving ($/month)	**$1.3**

Table 5: Customer service economics.

7.4.4 Churn/loyalty

Digital Help services should reduce churn rate and increase customer loyalty. Based on a Forrester report *The Science of Churn: when and why consumers switch service providers* [48], and assuming an increase of 3 months in average customer lifecycle, the equivalent additional monthly revenues increases in $12/month (9% increase).

		How long have you had service with your current provider?		
Range	Estimate	triple play	Internet	TV
<6	3	19%	10%	10%
7-12	9	16%	9%	6%
12-18	15	18%	9%	8%
18-24	21	14%	9%	6%
24-36	30	13%	12%	11%
36-48	42	6%	10%	8%
>48	48	13%	39%	50%
		99%	98%	99%
Average (weighted)		**21**	**32**	**34**
Churners reasons include "I want a better customer service"		27%	32%	32%
Digital Help Contribution Estimate - extra months		**3**	**3**	**3**
Increase in revenue/customer		15%	10%	9%
Estimate	9%			
ARPU	145			
Revenue increase/month (equivalent)	**$ 12.68**			

Table 6: Churn economics

7.4.5 Disrupting TV services

Potentially, digital support services could increase the speed at which users transition from tradition cable or satellite TV services to third-party OTT television services. In case that occurs, the economic impact would be significant ($68/month for Comcast). However, how much of the disruption of traditional TV services can be attributed to digital help services remains to be determined.

7.4.6 Overall economic value

Overall, based on this simple economic exercise, the ARPU could go from $145 to $169/month with digital help services, without considering the disruption of subscription-TV services. This simple estimate present a simple baseline case for further analysis using real data from companies
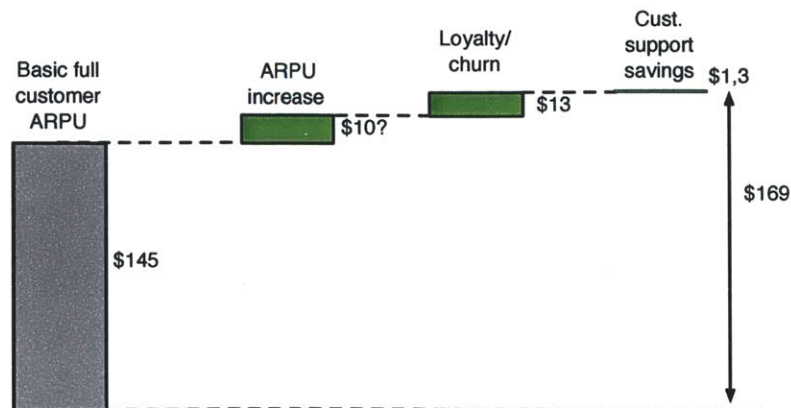
Overall, there are three strategies in which digital help services benefits are maximized.

Strategy	Condition		
Internet Services strategy	(Internet ARPU increase) x (market share)+ (ARPU) x (market share increase)	>>	Expected reduction in TV revenues + digital help costs
Loyalty strategy	(Average customer lifecycle increase) x (ARPU) x (market share)	>>	Expected reduction in TV revenues + digital help costs
Independent business opportunity	Digital help services revenues	>>	Digital help services costs

8 Value-Captured

8.1 Introduction

Previous chapters described home technologies, its main stakeholders, digital help services' value proposition, the demand opportunity, and benefits for communication service providers.

Regardless of digital help services direct revenues; their value proposition can have a huge effect in the overall ecosystem. If help services simplify technology adoption for mainstream users, the transition to convergent services could speed to reshape how value is captured among the different stakeholders.

This chapter briefly describes how stakeholders capture value. First, a simple value-captured diagram shows how revenues are distributed. Second, help services value-captured implications are discussed. Third, implications for the different types of communications service providers are discussed.

8.2 Value Capture

A detailed value-captured analysis is beyond the scope of this thesis project. However, using IbisWorld industry reports, a general US revenues flow diagram can be constructed.

A revenue-flow diagram shows how money flows between different stakeholders and, based on that, suggest how transitions third party services can modify the value-captured distribution. **Figure 38** presents a revenue-flow diagram based on IbisWorld Industry reports [35][36][39][40][41][42].

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Figure 38: US value captured diagram (revenues flow).

HOUSEHOLD SERVICES

| Voip (non cable) $3B Vonage, etc. | Residential Wireline $68B AT&T, Verizon, Qwest, etc. | Internet Service Providers $30B AT&T, Comcast, Verizon,etc | Subscription-TV $87B Comcast, Liberty Meda, Dish, etc | OTT-TV ? Hulu, Netflix, Boxee, ESPN3, etc | Tech-support ? iYogi, Firedog, etc etc |

HOUSEHOLD DEVICES

| CE Stores $84B BestBuy, RadioShack | E-comm: CE + computer $23B Amazon, Dell, etc | Computer stores ? Apple etc |

programming

Advertisement

51%

Cable Networks $44B Time Warner, Disney, News Corp, etc

45%

?

Advertisement

TV Broadcast $30B CBS, News Corp, NBC, etc.

Consumer electronics + computer hardware companies

Retail

48%

Cinema

13%

Movie Production $27B Touchstone, Warner, Universal, etc.

?

Services:

- **Wireline** revenues are declining rapidly, but they still represent a major portion of communication revenues with around $68B for residential services. Voice over IP (Voip) only represents $3B in revenues, without considering cable operators telephony.
- **Internet** services annual revenues are around $30B, with AT&T, Comcast and Verizon as the major players (without considering mobile Internet).
- **Subscription-TV** aggregate household revenues are aprox. $87B, notably larger than wireline and Internet revenues. Subscription-TV services are part of the media industry:
  - **Cable Networks** revenues are $44B with 51% them coming from programming fees paid by subscription-TV operators (cable, satellite, IPTV, etc). Some cable network content is being offered as OTT TV.
  - **Movie/Video Production** revenues are aprox. $27B. Most of those revenues come from retail products (DVDs, Blue Ray, etc). Only 13% comes from cinemas. Some content is now being offered directly by OTT services such as Netflix.
  - **TV Broadcasting** generates most of its revenues ($30B) from advertisement. Currently, they are trying to obtain some programming fees from cable networks. Even though some content is moving to OTT TV, their local and live content is still very popular.

Devices

Consumer Electronic stores such as BestBuy and RadioShack sell $86B to households annually, while **E-commerce stores** such as Amazon and Dell sell about $23B in consumer electronic and computer devices. Additionally, reports indicate that computer store revenues sum $14B, but its unclear how much of those are already part of the consumer electronic industry. Additionally, other companies such as department stores and supercenters sell technology devices.

8.3 Digital Help services effects

Even though customer relationship, product differentiation and bandwidth consumption would probably dominate digital help short-term effects, long-term widespread adoption of help services could have significant strategic implications. Help services can increase the rate at which users transition form traditional voice, video and Internet services to next-generation convergent services, particularly OTT television. If the "T-Anywhere approach" (operator's controlled OTT services) doesn't become the dominant model, digital help services could open the door for third-party providers, assuming complexity and confusion remains an adoption barrier.

Industry	Long-term strategic effect of widespread digital help services	Effect
Internet Service Providers	New services depend on Internet bandwidth	Positive
Cable/Satellite Providers	Traditional subscription TV get disrupted by OTT	Negative
Wireline Telco	Telephony decline increases with faster adoption of convergent technologies	Negative
OTT TV companies	Users transition to online content becomes much faster	Positive
VOIP Providers	Users transition to convergent telephony services becomes faster	Positive
Cable networks	Need to revamp business model to substitute programming fees from cable/satellite operators	Unclear
TV Broadcasting	Revenue stream moves to online advertisement	Indifferent
TV/Movie production	Demand for TV content unaffected	Indifferent
Movie Theaters	Demand for cinema unaffected	Indifferent
Consumer Electronics Stores	Consumers increase technology adoption rates	Positive
Computer Hardware stores	Consumers increase technology adoption rates	Positive
Consumer hardware manufacturers	Consumers increase technology adoption rates	Positive
Set-top-box manufacturers	OTT streaming replaces operator-controlled STB	Negative
Home Automation	Facilitates adoption of additional technology products/services	Positive
Smart Meter, Tele-heath, etc	Facilitates adoption of additional technology products/services	Positive
Indep. Digital Help Service companies	Strong industry growth. Increased competition. Multiple M&A options.	Positive

Table 7: Stakeholders and long-term effects of widespread adoption of digital help services.

Service providers that focus on traditional operator-controlled services, such as wireline telephony or subscription-TV services, face the strongest strategic challenges in face of convergent technologies. Massive adoption of OTT television services would completely reshape the industry and cable networks would need to redefine their business models in order to replace the programming-fees revenues that currently come from cable and satellite operators. Regardless of which OTT business model prevails, cable networks would need to adjust their strategies and business models.

On the other hand, Internet Service Providers would benefit the most from massive adoption of convergent technologies. As users rely more on Internet bandwidth, service providers would have a better opportunity to increase the ARPU (average-revenue-per-unit) and sustain a close relationship with the end-customers.

Now, which Internet service providers should deploy Digital Help Services first? Services providers that don't have a strong presence in TV services have stronger incentives to innovate around digital help services, while the ones with a dominant position in TV services should probably wait-and-see, at least regarding help services around online streaming technologies. In the US, Verizon is well positioned to take a lead in digital help services since it doesn't have a dominant position in TV services. On the other and, Comcast should think strategically and focus on help services that won't lead to a fast decline of its current television business.

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9 Conclusions and Recommendations

9.1 Introduction

Overall, previous chapters have described digital help services as a business opportunity for service providers, presenting the underlying motivation, the potential benefits and the economics. This final chapter presents the main conclusions and some recommendations for service providers.

Given the available time and evidence, there are some areas where there is a high degree of confidence, while other areas that remain uncertain. The conclusions need to take into account these uncertainties.

To facilitate the discussion, the trends and developments for which there is a high degree of confidence have been explicitly separated from the ones where the is uncertainty in terms of possible outcomes. Conclusions and recommendations depend on beliefs about those possible outcomes and, as new evidence becomes available, decision-makers will need to adjust their strategies for digital help services.

Three cases for which service providers would mostly benefit from digital help services are presented to suggest to right audience for the recommendations, which are divided into short-term recommendations that could be easily deployed and strategic recommendations that would probably require higher budgets and approvals.

9.2 Digital Help Services conclusions

9.2.1 The digital home will remain complex

Overall, technology is evolving rapidly, enabling great opportunities for those who are able to learn how to use them. However, mainstream users skills are evolving slower than technology, increasing the gap between the ones who know how to install and use them from the rest of the population.

Households are becoming increasingly digitalized, but its technologies remain complex and confusing for non-digital natives or unskilled users. In the future digital home, many Internet-connected devices (HDTVs, laptops, media centers, smartphones, etc) will share media and content through a reliable network. Even though standards as DLNA promise interoperability across devices, complexity will probably remain. The lack of a dominant digital home architecture, common DRM standards and system-wide interfaces will push the "plug&play" vision even further into the future for mainstream users.

Additionally, given the ecosystem structure, it is very hard to innovate around simplicity and better user interfaces. The multiplicity of vendors competing without a dominant system-level architecture leads to proprietary solutions and adds confusion to user's decision-making process.

9.2.2 Frustration and confusion are clear pain-points

Non-digital natives, unskilled or fearful technology users experience real frustration and confusion when they use technology. Their interactions are dominated by deeply emotional frustration episodes that reinforce the fearful attitude towards technology.

Frustration and confusion experiences suggest a clear need for help and guidance services, especially for those people that understand new technologies benefits but see themselves as unskilled (lack confidence and skills).

9.2.3 Help needed is market-specific and opportunities are company-specific

Different help services can be offered according to the product lifecycle: (1) help users select the proper device according to their legacy infrastructure, (2) installation and/or integration services, (3) mentoring services to help users learn how to use new devices or software, (4) help to use devices or services, either solving a technical problem or outsourcing a complex task, and finally (5) recommend upgrade or growth options. For each stage there are multiple help possibilities, including remote access, self-configuration tools, home visits and counseling services. Additionally, each service, software or devices enables different service options, including software assistance for PCs, HDTV–Internet integration, Smartphone mentoring services, etc.

The *low-hanging fruits,* in terms of help services that address the strongest frustration and confusion, depend on specific market conditions. For instance, in some markets the elderly still needs a lot of help with basic computer tasks while online streaming it still limited to a small technology-savvy group. Meanwhile, in other markets –like most of the US – online streaming and DVRs are becoming very popular and there is a greater need for help around the HDTV systems. Regardless of the technologies, help services should address the stronger pain points to help markets move forward in their technology adoption curve.

Additionally, each stakeholder is better positioned to offer specific types of services. Retail players can naturally add technology counseling and installation services, but would find it more challenging to move further from their core and to offer monthly services. On the other hand, service providers are better position for mentoring, troubleshooting and monitoring services offered as a monthly contract; even though they would still need to build (or outsource) new capabilities around home technologies and devices.

9.2.4 Digital Help services could increase technology use and adoption

New services or devices are adopted first by lead users, then early adopters, early majority, later majority and so on. Rather than changing this general pattern, help

services would increase the adoption speed. The net effect would be a shorter adoption process.

Digital help services value proposition is to simplify the use and adoption of home technologies in the digital home, especially around new convergent services. Even though there is not hard evidence (only expert opinions), it is reasonable to expect that simplicity can increase adoption of new technologies. Households' technology infrastructure usually grows organically, adding one device after another. Simplicity is typically not a major concern during the purchase-decision process, but frustration and confusion limits the desire to continue with the technology adoption process.

9.2.5 Service providers can benefit from some digital help services

So, who should go after the digital help service opportunities: retail players, service providers or independent technology support startups? There are probably opportunities for all of them; especially retail companies and services providers that already have the ability to acquire new customers. However, the question may be misleading since the opportunities need to be build with a consistent strategy. This thesis tries to address a different question: is there an opportunity for communication service providers?

Putting the risks discussed in the next section aside, communication service providers can benefit from the closer relationship with customers and from the end-user simplicity enabled by digital help services.

Simplicity and ease-of-use can lead to operational savings through less truck rolls and support calls not directly related with their services. Additionally, as explained above, simplicity can increase technology adoption, which can then lead to higher demand for bandwidth, content and applications. Depending on market conditions, higher bandwidth demand can lead to higher Internet ARPU; and higher demand for content and applications can lead to new convergent services revenues (VoD, cloud-services, Apps, etc.).

On the other hand, a closer relationship with end-customers can have several strategic advantages. First, customers that trust and rely on help services would be more loyal, reducing the churn rate. Second, help services, bundled with traditional Internet services, can become an effective differentiation strategy in highly competitive broadband markets. Finally, a closer relationship with customers usually leads to become the preferred option for additional services, increasing new value-added services revenues.

9.3 Digital Help Services uncertainties

Digital help services opportunity also depends on some elements that are less clear.

9.3.1 Dominant architecture.

The previous section indicated that, based on reasonable evidence, home technologies will remain complex to mainstream users, partially due to the lack of a dominant home architecture. Even though current trends suggest there are too many competing players and interests to agree on a common architecture or standards, predicting the future always involves uncertainty. For instance, a few years ago nobody suspected the leading role that Apple's closed-architecture would have, and its resulting influence in the ecosystem.

There is the possibility that a company like Apple (or someone else) comes ups with such good products and services that it dominates the complete digital home ecosystem, establishing a dominant closed-system architecture that simplifies technologies for everybody. Some technologists believe in this scenario, suggesting innovation by itself will make things simple enough for mainstream users. In this scenario, a closed system would be adopted by the majority, as opposed to a small group of early adopters willing to pay a premium price (e.g., expensive Apple products). The author doesn't believe a dominant digital architecture will emerge in mainstream homes, but acknowledges it as a possible outcome in an uncertain future.

9.3.2 Willingness to pay for help

Will a large portion of customers be willing to pay for help services in order to avoid frustration and confusion? At which price? Willingness to pay for help is probably the biggest unknown. Interviews with companies in the US, UK, Spain and Chile indicate that customers that understand the value of new technologies are willing to pay for services. However, help services still have a very low market penetration and it's unclear if willingness to pay would become a bottleneck for massive adoption.

One service provider indicated that a prior experience with desktop support services failed precisely because customers didn't want to pay for help. But new remote support technologies enable pricing structures that were previously not feasible. Additionally, as customers depend more on technology for critical tasks, the willingness to pay should increase.

Only a strong push for digital help services by a leading communication service provider would clarify these risks. In any case, digital help services will need to go together with efficient marketing strategies to explain the value proposition.

9.3.3 Ability to offer good and reliable help services

Service providers know that offering good and reliable support services sounds easier than it really is. Simplifying the adoption and use of new convergent technologies, reducing frustration and confusion episodes to mainstream customers will require excellent service capabilities. Companies will need to use state-of-the art technologies and business practices to facilitate the communication with customers though voice, chat or video platforms. Additionally, remote access technologies need to be reliable and protect customer's private information.

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Moreover, offering good digital help services will require new capabilities for service providers. There are hundreds of different devices and services leading to a vast knowledge base. Building the human resources to support home technologies through innovate services will be very complex, especially for large companies with cultural inertia.

Probably, building digital help services capabilities digital will require smart outsourcing strategies and, probably, some startup acquisitions. However, it is possible to start with some pilot projects that address the strongest pain points and, then, plan expansion phases.

Risks around the ability to offer good and reliable services, together with risks around customer willingness to pay for services leads to uncertainties around the ability to profit with digital help services. However, currently, there are several technology support companies and service providers that offer some digital help services with, according to them, good margins.

9.3.4 Direct Payoff to Communication Service Providers

Will a faster adoption of new home technologies increase the ARPU (average-revenue-per-unit) for service providers? It is reasonable to expect that as users rely more on their connectivity services, opportunities to differentiate and increase revenues would exist. Additionally, Digital Help Service should strengthen the relationship with end-customers, increasing the chances for new value-added services and reduce churn rates.

However, prices are the result of supply and demand. Competitive markets can maintain prices down, regardless of the position communication service providers have with respect to other stakeholders in the value chain. For instance, Internet ARPU has maintained relatively stable despite the exponential bandwidth growth.

There are basically there possible scenarios, assuming that a wide adoption of Digital Help Services effectively leads to a faster technology adoption. (1) In a protected (regulated) market, or in a market characterized by low levels of competition, ARPUs would probably increase. (2) Digital help services lead to differentiation strategies hard to replicate that, together with faster technology adoption, lead to higher ARPUs. (3) Competitive forces move the economic surplus to the end-customers, and a stronger relationship with the customers is not able to sustain prices, leading to stable or lower ARPUs. Competitive forces are hard to predict, adding uncertainty to the ability of service providers to obtain direct payoffs from Digital Help Services.

9.4 Cases for Digital Help Services

Based on the conclusions and risk described above, there are basically three cases under which digital help services are a good opportunity.

- **Differentiation in a competitive broadband market**

Some broadband markets have become very competitive, with several service providers offering similar products at declining prices. In countries with last-mile unbundling regulations, competition for Internet services has been particularly strong since market entrance costs have been reduced.

Digital Help service offer a very good differentiation element and a good strategy to avoid being perceived as a dumb-pipe only characterized by bandwidth and price. Broadband services bundled with digital help services can help service providers willing to increase their customer base through a differentiation element hard to replicate.

- **Increase loyalty**

Some service providers need to increase the customer average duration given larger customer acquisition costs. For instance, fiber-to-the-home networks require an investment per customer significantly higher, and a longer period is needed to become cash-flow-positive for each customer. Digital Help services would strengthen the relationship with customers, probably increasing loyalty and reducing churn rates.

Certainly, any customer service improvement would probably lead to an increase in loyalty. However, digital help services stand out as an opportunity to take the service relationship to a completely different stage, where the service provider is involved in the way customers use the technology products and services.

- **Compete against cable operators**

Help service will probably increase the adoption of convergent technologies. Currently, cable operators are being threatened by Over-the-Top television services that rely on the Internet. Even though until now not many households are cutting the cable or satellite cords, complexity and confusion associated with connecting the TV to the Internet is limiting the adoption. Digital help services could, in the long run, reduce the transition period from tradition TV services to over-the-top services.

Often, Telco's need to compete with cable operators using ADSL or FTTH networks. Many of them have added IPTV services in order to compete with cable operator's bundled TV and Internet services. However, if over-the-top services become widespread adopted, the IPTV strategy might become obsolete soon.

An alternative –or complementary – approach would be to help customers transition to over-the-top television services in order to reduce the attractiveness of cable operators bundled services. Internet service providers can significantly increase their competitiveness, and therefore market share, if customers switch from subscription-TV services to Over-The-Top television services.

9.5 Recommendations

Based on the conclusions and risk described above, some recommendations can be made to communication service providers. First, a few simple short-term

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recommendations are presented. Second, more strategic recommendations are explained.

9.5.1 Short-tem recommendations
- **Stay close to digital home lead-users**

Even if a service provider are skeptical about digital help services as a strategic opportunity, they should stay close to digital home lead users to learn how are they adopting new technologies and – more importantly – how are they simplifying them.

As explained by MIT Professor Eric Von Hippel in *Democratizing Innovation* [50], lead users often anticipate the rest of the market and innovate to solve their most pressing needs. By learning how lead-users simplify home technologies, service providers can anticipate if complexity and frustration will continue to be an adoption bottleneck for mainstream users.

- **Explore next-generation Digital Help services**

Digital help services offer benefits and opportunities to communication service provider that are worth exploring, regardless of the risks. Through small pilot projects that address one precise help need, service providers can reduce uncertainties and start testing some of the assumptions.

To facilitate the interaction with customers, help services need to be based on remote access, chat, and online help tools. Simple "call-this-number" schemes will fail to capture the "impulsive need" for help.

With which technologies or services should they start as pilot projects? There are probably three stronger candidates: remote desktop help, remote wireless network assistance, and TV-computer integration assistance.

- **Don't ask the same technician to do more**

Service providers have a network of, typically outsourced, technicians that are sent to homes to diagnose or solve a technical problem (truck roll). Even though service provider could rely on them for help services to save costs, the knowledge and training needed in completely different.

Service providers should base their help services on a centralized knowledgeable team that can remotely assist customers. If needed, and based on the service definitions, a skilled technician can be sent home, but their capabilities are completely different from the traditional Telco – technician. Maybe Telco-technicians could contribute with some connectivity issues, but they cannot replace the team specialized in home technologies and devices.

9.5.2 Strategic recommendations
- **Explore acquiring a Digital Help Services startup**

Service providers will need to build new capabilities in order to provide effective and reliable digital help services in the coming years. Help services require a new and broad knowledge base, together with innovative processes and technologies to enable the best and most intuitive help services. However, most service providers

are very large companies that often get criticized for their inability to rapidly deploy new innovative products and services.

Meanwhile, during the last few years, several technology support startups have been founded, some of them based on innovative approaches and technologies. Companies such as iYogi and Firedog are trying to build a brand to capture new customers, establishing a direct relationship with end-customers.

Service providers interested in digital help opportunities should keep close attention to those companies. Acquiring some of them can become a good opportunity to rapidly get into the digital help industry without the need to build costly new capabilities.

- **Build technology services marketplace when there are market failures**
In a developed market, households have several options for technology installation and integration services. For instance, in the US, BestBuy dominates the technology stores industry and offers extensive installation services for HDTVs, home theaters, network devices, etc. Additionally, there are lots of small companies that can do wiring installations.

However, some technology services markets are less developed. Users can only hire WiFi installation services from small and unreliable companies. This market failure, in term of traditional corporate strategy, puts significant pressure on service providers to vertically integrate and offer installation services. Often, customers ask service provider for a full service.

The lack of clear installation and integration services can limit technology adoption, harming their ability to benefit from the adoption of bandwidth and content intensive devices. However, on the other hand, service providers have better opportunities around *use*, *learn* and *troubleshoot* help services than installation services.

If recommendation and installation services (devices, wiring, etc.) are limited or immature, service providers can contribute creating specialized marketplaces. Instead of controlling each service, they should build an online marketplace where independent companies can offer their technology services and users can rate them (maybe after some certification). A strong and effective technology services market will increase technology adoption with benefits far greater than the direct profits they can obtain. Meanwhile, service providers can focus on some strategic help services, leaving the rest to a large group of existing fragmented technology support companies.

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