Business Model for IPTV Service: a dynamic framework

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1 Introduction

Today, the multicast digital television using IP network is technically and commercially applicable. Facing the fierce competition from cable companies offering triple play bundling package, about 80% of large European telecom operators are investigating the opportunities for the deployment of IPTV (www. Alcatel.com/tripleplay/graphics/19320_iptvworld_600.jpg, retrieved March 17, 2007). Telecom operators are entering the digital TV market. However it is still not clear, if new IPTV business models will be viable. Many analysts believe that the huge potential of the IPTV market will offer telecom operator opportunities to develop this new market. On the other hand, some other experts doubt about telecom operator's capability to compete with cable companies, which in many countries have significant market power in the TV market. Meanwhile, after the deregulation of telecommunication market, cable companies started entering into the data service and recently the voice service market, bringing new complexities and dynamics into the communication industry landscape. In this context, a clear and comprehensive business model for IPTV is critical for telecom operators. However, there is no template in defining IPTV business model. Different players in the market emphasize different elements. For example, Doherty et al (2004) focus on the right IPTV architecture and quality of services, while Liu (2006) is more interested in financial prospect of the new IPTV model. A common conception of business models is lacking.

We define IPTV as a broadcast or on-demand video service using the Internet Protocol (IP), which is streamed to a set-top box that can be connected to a pc or a TV-set. This implies the use of point-to-point networking infrastructure and the supports of broadcast video using multicasting techniques. Cable and satellite companies' TV services are not covered by this definition, as they are not using an IP based network and not based on a point-to-point architecture. We also exclude web-based television. This is also delivered over IP, but due to its different nature in terms of services, organization, service platform and revenue models, we decided to focus on telecom operators (see for an over view of business models for digital television, Limonard & Tee, 2007). Among the actors in the value chain of IPTV, telecom operators have particular interests in developing digital television service over IP, in order to compensate for the decreasing revenues in their traditional markets. By leveraging their brand equity they might be able to offer attractive bundled products and create a renewed consumer loyalty not solely based on a subscription. Also, their assets can be leveraged to transform the multiple specialized networks into a cost efficient network, as a step in the upgrading of their networks to next generation networks. Telecom operators are the new entrants in the digital TV market and are aiming to capture a fair amount of market share. We start from the pivot role of telecom companies in IPTV.

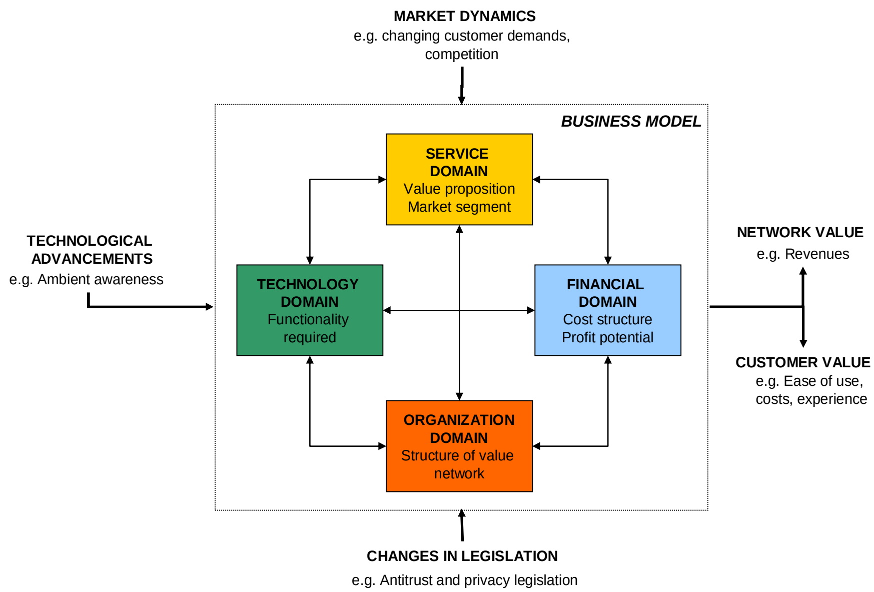

Figure 1 STOF Model

The STOF business model framework developed in 2003 (Faber et al 2003), proved to be successful in terms of designing the business model for mobile services (Haaker et al, 2006), insurance Intermediaries (Bouwman et al, 2005), the analysis of e-commerce business models (Bouwman et al, 2006) and description of critical design issues and success factors (De Reuver et al, 2006, Ballon, 2006). The business model concept in the STOF framework is defined as a blueprint of how a network of cooperating organizations intends to create and capture value from new, innovative services. The STOF-model consists of four domains, namely service domain, technology domain, financial domain and organization domain, each of whom interacts with the others and is affected by market dynamics, technological advancements and regulation (see figure 1). Based on this general model, this research will discuss whether and how the IPTV service and business model can be structured.

The four domains of the business model interact with each other and with external factors during the exploration and exploitation phases (He & Wong, 2004). Exploration implies firm behaviors characterized by search, discovery, experimentation, risk taking and innovation, while exploitation implies firm behaviors characterized by refinement, implementation, efficiency, production and selection (Cheng and Van de Ven 1996; March 1991). In this paper, we use the exploration and exploitation phase to describe IPTV business model development. In the first part we will discuss design issues in the exploration phase: currently IPTV developers are carrying out experimental projects and exploring the new market. In a next step we will use scenario analysis to discuss issues that might be relevant in future exploration phases: the priority of IPTV developers will be on the issues like service (bundles) and more efficient marketing strategies.

The objective of this paper is to identify the critical design issues that are critical to develop viable and feasible IPTV business models for telecom operators, that deliver customer and network value, and to test the robustness of these choices in the exploration and exploitation phase using scenario analysis.

In this paper we will discuss the IPTV market, and touch upon the conception of business model and the STOF framework, we will discuss critical design issues and tradeoffs between design choices in the IPTV domain (section 2). Scenarios analyses are used in order to describe future development in the field of digital television (section 3), and to test the robustness of the business models with high uncertainty when entering the exploitation phase in the future (section 4).

2 IPTV business models

Starting from the STOF model we will first discuss the external forces that influence the business model choices. These include the technology drivers for IPTV, market dynamics, and regulatory conditions, before we will address the elements of the business model in more detail.

2.1. Technology drivers

Katz (2002) described four technological developments in shaping the new television industry, i.e. increase in effective distribution capacity, increased ability to process user feedback, increase in storage and processing power controlled by views and separation of applications from transport.

Increase in effective distribution capacity: the last mile is one of the main obstacles for telecom operators to develop video services. The capacity of ADSL is not sufficient to deliver streaming video service with certain quality. Unlike using small band service (email, web-browsing, file sharing, VPN), TV end-users are sensitive to the quality of video service (Wang, 2001, Cisco, 2005). Recently, the capacity of the local loop increases dramatically ADSL2, VDSL and VDSL2 make the best use of the twisted line (Fijnvandraat & Bouwman, 2006), and the maturity of fiber cable technology increases the backbone capacity tremendously. Nowadays, the network using at least ADSL2 can deliver IPTV service with certain guaranteed quality to residential areas.

Increased ability to process user feedback: watching television program used to be a predominantly passive activity. Recent technology developments make interaction more feasible in the digital home environment. The return channels, carrying messages form viewers to service providers, create possibilities to develop new, tailored and personal services for end-users and new revenue models like interactive advertisements.

Increase in storage and processing power controlled by viewers. In the traditional networks,

most of the “intelligence” is located in the center of the network. Today the intelligence of network is increasingly transferred to the edge of the network. The equipments installed in the end-users living room have increasing processing power and storage capacity. The appearance of PVR (Personal Video Recorder) is a vivid example.
The separation of application from transport: the layer model of the Internet allows for the development of applications that are oblivious to the underlying transport infrastructure. This architecture allows innovation to occur at the application layer and the transport layers separately. This ensures quicker technological innovations on the application layer regardless of transmission bottlenecks. The development of IPTV gives telecom operators opportunities to consolidate multiple specialized networks into a cost efficient network.

2.2 Market drivers and conditions

Demand and supply factors such as competition and industry structure, define the design space for IPTV services and business models.
Market demand. Western Europe is one of the world’s most vibrant markets of IPTV so far. France (MaIlgne TV, Free and Neuf Cegetel), Italy (FASTWEB) and Spain (Telefonica’s Imagenio, Jazztel and Grupalia) are leading the way each with a considerable subscriber base that passed the 200,000 subscribers. IPTV is less visible in the remaining two big markets in Western Europe, the U.K. and Germany. Although there are many initiatives, the impression remains that most initiatives are still small scale. Other market forces include the rising popularity of on-line webTV. Time spent watching video on-line seems to cannibalize on time spent in frot of the television in broadband forerunner countries such as the Netherlands (SCP, 2007)
Converging of information, telecommunication and TV industry. The television market is still being dominated by traditional broadcasters and cable, although the telecommunication and TV industry are converging. IPTV “borrows” the IP based transmission technology from information industry and use it to broadcast television content. Operators of IPTV are neither a traditional television provider nor an IP technology provider, but a telecom operator. The telecom operators decision to provide video service is related to the stagnated revenue of the traditional business, i.e. telephony. Video program offerings are expected to generate new revenue sources, even more than the revenue loss from voice.
Competition. Provision of IPTV service is also an important way to match the “triple play” capability of cable companies and retain traditional customers that might want to switch. It might be an effective business strategy, which is positively correlated with customer loyalty (McAfee et al. 1989, Ahn et al. 2004). Wirtz et al (2006) confirms the importance of providing triple play based on an expert and consumer survey. Most experts estimated that the penetration rate of triple play would reach more than 50% in 2010 and more than 70% in 2015. According to the same survey bundling video, voice and broadband service benefits consumers in terms of reasonable price, convenient configuration and easy invoice.

2.3 Regulation

The regulatory climate in the telecommunication sector has changed from old rules to new policy. Technology development gradually transformed a world of spectrum scarcity, dumb terminals and natural monopoly to a world of abundant channels, intelligent terminals and unnatural monopoly (Galperin, 2004). Digitalization makes the spectrum scarcity not an issue in the television industry. Instead, due to the inefficient spectrum use of analog TV (Peha, 2006), many regulators choose to rule out analog TV. The distinctions between different services platforms are largely blurred due to digitization, and therefore the distinctive regulations for different sectors, telecommunications, cable and television are gradually being removed. Already, the EU made a distinction between regulation covering the distribution and audiovisual content in the recently approved directive on audiovisual media. What impact this directive will have once implemented in each of the individual member states remains to be seen.

2.4. The IPTV business model

Technology, market and regulatory developments set the conditions under which business models for IPTV has to be developed. Based on the STOF model, this section is going to discuss the business model of IPTV in the exploration phase. The critical design choices in each of the four STOF domains will be analyzed, and especially the tradeoffs and relationships between relevant design options.

Service domain

Service domain design is defined in as a description of a firm's service offering to specific customers in particular market segment. A service design should at least matches the requirement of the market segment without exceeding the firm's capability in technology and finance domain. The interest of the IPTV potential for users is framed as expected value for customers. Telecom operators are not always capable to deliver the expected value due to technical and financial restriction, and a lack of market information.

Telecom operators have to make their value proposition clear and their technical and financial capability to realize it. A market analysis is desired to gather enough information about the market segment the firm opts for and the requirement and preferences expressed by consumers. The firm should also leverage the design choices and resources to minimize the mismatch between the intended value and the value that will be delivered. Based on a match found in this process, the service components can be designed in great detail, e.g. adding more channels, adjusting tariffs, redesigning service quality level and improving user friendliness. Many telecom operators position IPTV as a service that directly compete on the mass-market with cable and satellite companies. Telecom operators are expecting to take advantage of their expertise and consumer loyalty in the telephone and broadband market, which hopefully will bring them competitive edge. Telecom operators have to leverage their resources i.e. deep pockets, to increase the competitiveness of IPTV. Three possible ways for leverages are recognized, i.e. bundling video service with broadband and telephone service, offering more value-added services (e.g. interactive services, Video on Demand – VoD, and Personal Video Recorder - PVR) or an attractive service portfolio, either by focusing on exclusivity or a wide range of probably ‘long tail’ niche channels.

Technical domain

The technical domain is concerned with choices on three different layers, i.e. transport, middleware and content. Transport layer design has to safeguard that the infrastructures fulfill transmission requirements for the video services. The infrastructures refer not only to backbone or local loop network, but also the sophisticated network equipment. Besides transport layer design, the middleware and content design issue have to be given careful consideration because the service design requirement are vital in deciding the capability to offer specific service types (e.g. VoD) and value-added interactive services. The middleware and conditional access component manage the CRM (Customer Relation Management), encrypt the video program and control the access authorization. The set-top box is used to decode the program at the end-user side. Different IPTV providers choose different video application components, based on the demand of service design and financial consideration.

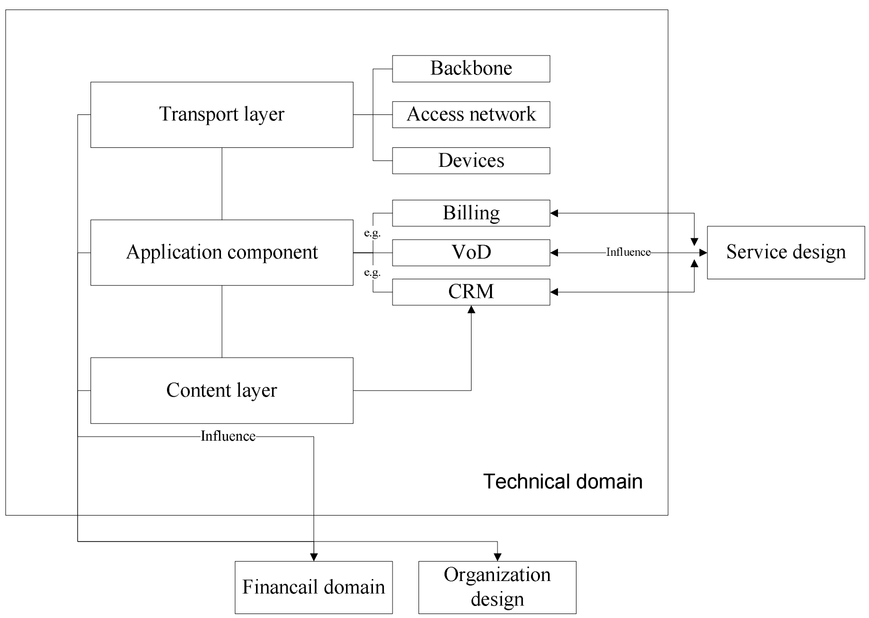

Figure 2 Technical domain designs

Technical issues are less critical since the transport, middleware and content layer solutions are well developed by many equipment providers and software companies. The real issue is how technical design is related to the other domains. Technology put certain constraints on service design, vice versa.

The main issues are bandwidth limit, quality of service and level of middleware capability. Bandwidth is still the major obstacles for IPTV development in the short term. Most local loop can’t provide for IPTV, which required about 3.5 Mbps, without upgrading. Even the ADSL2+ equipped local loop, which is sufficient for current video stream demand compressed under MPEG 2, is far from the capacity needed for HDTV (High Definition TV) video stream (16-18 Mbps). The telecom operators can choose different design approach, either by adding large capacity immediately before launching IPTV or gradually doing so. The former approach usually leads to upgrade of large portion of the infrastructure into fiber optic cables while the later one adopt the plan to first update most of the distribution network into ADSL2+ standard. The tradeoffs telecom operators have to make are between the more advanced technology platforms and larger investment, and a more evolutionary approach (Fijnvandraat & Bouwman, 2006). Quality of service is the second issue at stake since video contents is sensitive to the signal quality. Several package losses in the audio transmission do not make difference to people’s ears, but several package losses might matter a lot for video contents. To ensure that any degradation in video quality resulting from the IP transport network is negligible from a subscriber’s point of view, IPTV providers allow only on visible degradation roughly every two hours (Cisco whitepaper, 2005). The ways to increase the quality of service include better transmission infrastructure and encoding/decoding equipment, all of which requires higher investment. An alternative design choice is to offer different service levels to different customers. For example, the packages delivered to golden members have the privilege to be in the front of the queue, which can partly satisfy some consumers’ demand for high QoS. Middleware capabilities is the third issue, particularly for those telecom operators offering broadcasting , VOD (Video-on-Demand) and value added services. Middleware is crucial in integrating platforms, enabling interactivity, conditional access and customer relationship management. Especially Future interaction modes are very uncertain, and telecom operators have to strike a balance between advanced STBs and middleware enabling a wide range of interaction and cost effective technology which is more stable and easy to interact with by consumers. Advanced middleware would also open the door to more revenue models, but if the consumer is ready for this kind of lean-forward behaviour and new revenue models is uncertain. This choice is also highly dependant on the Qos, as the risks of dissatisfaction increases with a higher level of interactivity. Subscribers who experience an outage cannot come back and continue watching at the same point when the outage is over. It is the case today that part of the consumers’ request for video contents in peak time would be rejected without spare video servers. Such experiences are certainly not attractive for most consumers.

Organization domain

The organization domain essentially describes the value network that is needed to realize the IPTV service offering. A value network consists of actors possessing certain resources and capabilities, which interact and together perform value activities, to create value for customers and to realize their own goals (Faber et al, 2003). Typical actors in the value network of IPTV are telecom operators, content providers, telecom equipment providers, middleware providers, advertisers and consumers. Telecom operators take part in the whole stream of the value delivery process. First, they choose to produce or purchase the video contents and have to maintain the physical network as well as hardware and software components of video application together with equipment manufacturers. The core responsibility of telecom operators is to distribute the video contents to customers. The middleware is key to telecom operators, which determines if they can provide seamless service to the end-customers. Telecom operators might seek partnership with system integrators for a more efficient middleware solution. Furthermore telecom operators can be involved in negotiation with advertisers to extract revenuer from advertising. Content creators and providers are located in the upper side of IPTV value network (see figure 3). The content aggregator plays the role in combining information such as news, sports, weather forecasts and reference materials from smaller content creators and sells them to content providers. Big content providers often cover content production and content aggregation. The advertising revenue in the IPTV value network is relatively small compared to cable and Internet advertising. However, telecom operators can choose to add advertisement into their services and by doing so, advertisement revenue can become a revenue source

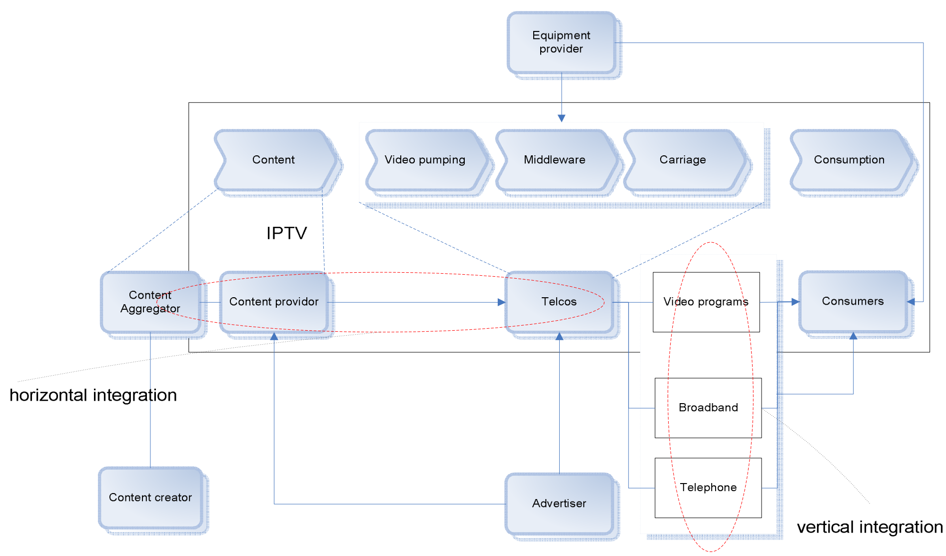

Figure 3 Value network of IPTV

An important issue in the organization domain, is the level of vertical integration, referring to the level of ownership and control over successive stages of the value 'chain'. The telecom operators, developing IPTV usually face the choice to what level integration with content production is appropriate. They might want to control or own the production and rights to content or produce content themselves. The benefits of vertical integration for telecom operators are reduced transaction cost, gaining the capability to broadcast their own contents, externalities and possibilities to raise the cost for competitors. The cons to enter into content production are also clear, mainly the likelihood of failure due to a lack of resources, knowledge and expertise in the new market. A careful cost-benefit analysis is necessary before making the decision.

Finance domain

Cost and revenue combined, determine financial performance. Technical and service design choices explain the fixed cost level of IPTV projects. For example, high availability service requires large investment in setting up redundant servers to secure abundant video sources at peak times. Interactive services need financial support to upgrade network equipment and to solve technical problems. The revenue models are dependent on revenue source, for instance advertisement or flat rate models, and accompanying pricing model. The revenue can than be calculated by the size of market and the expected market share.

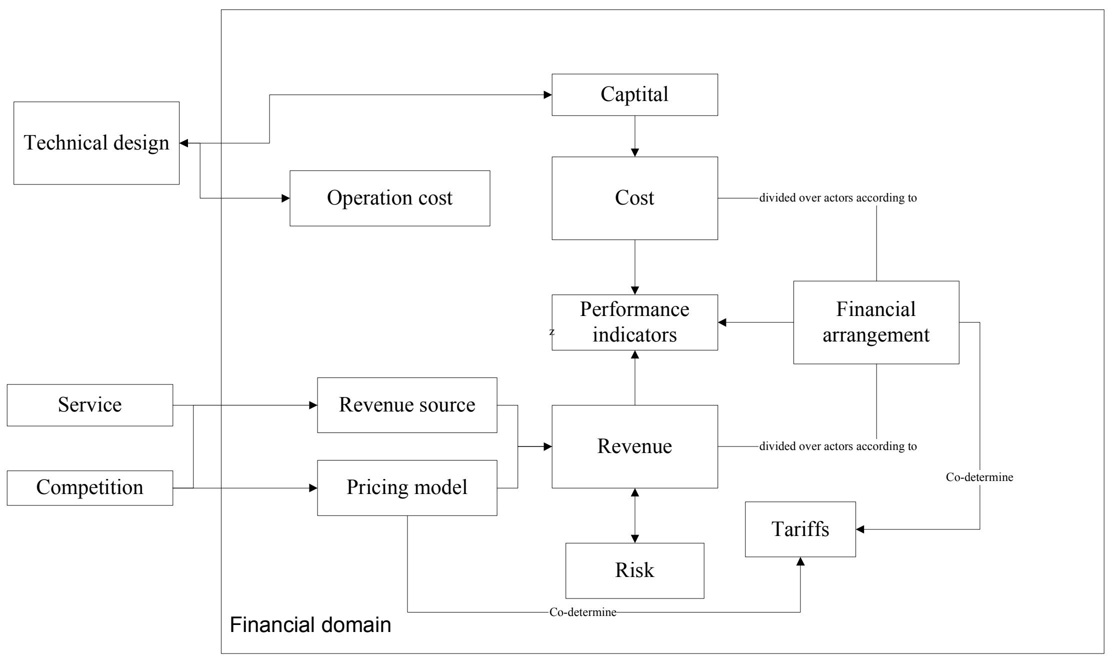

Figure 4 Finance domain design method template

In the current IPTV market, telecom operators mostly apply the subscription model (flat rate) and are slowly adopting pay-per-view models and advertising in provisioning VoD (Video on Demand). However, if more customized and personal services are available, a flexible pricing model would be more desirable and realistic in the future. Pricing is a result of evaluation of many factors including market competition, operational cost and company strategy. IPTV operators' pricing models and revenue are dependent on all kind of risks regarding technology, availability of resources, competition, supplier and consumer behavior, as well as political risks. The telecom operators must use some methods to reduce uncertainty and risks. The critical design issues in the financial domain are the revenue/cost sharing and revenue model. Revenue/cost sharing agreement can be reached on the basis of tangible value objects (e.g. money, contents and services) as well as intangible value objects (e.g. brand, scheduling and customers information rights). The advantages of revenue/cost sharing are reduced investments and reduced risk levels, while the disadvantages are coordination costs, abusing market power and the risk of damaging a carefully built brand.

As can be concluded from this analyses, designing business models for IPTV services is a complex undertaking because it is technically complicated and requires multiple actors to balance different design requirements. There are critical interdependencies between service design, technical architectures, organizational arrangement and financial performances. The critical design issues and the tradeoffs of choosing different design choices in the exploration phase of IPTV development are presented in table 1. Telecom operators have to balance the requirement in these domains and take into considerations the external factors and strategic interests to make the appropriate decision on IPTV business model design. However these decisions have to be sustainable when entering the exploration phase. In order to assess the sustainability of IPTV business models, we use scenario analysis to understand the trade-offs in the exploitation phase.

3 Scenario analysis

Scenario analysis is an effective method to reduce uncertainties and to help firms formulate flexible and sustainable strategies and policies. As a tool to hedge the future risk, scenario analysis is different from the more quantitative prediction methods. Instead of predicting, scenario analysis explores the future direction in a diverging perspective. Scenarios produce various possible developments and display a keener awareness of the uncertainty of trends (Bouwman, Van der Duin, 2003). The focus of scenario analysis is to understand, capture and describe possible future development rather than to predict the future based on a few selected variables. In the case of IPTV business model, scenario analysis will be used as a tool to catch the uncertainties with a potential high impact on the viability and feasibility of business models for IPTV during the exploitation phase (Limonard, 2006). Uncertainties often include elements which are hardly to be quantified and modeled (Fijnvandraat and Bouwman, 2006). The results of scenario analysis help IPTV operators to develop a clearer view towards the sustainability and feasibility of their business model. For constructing scenarios we made use of existing scenarios discussing future digital telecommunication and digital television. There are three reasons to select these scenarios as reference scenarios. First, the selected scenarios are created by institutes and experts specialized in future study. The quality of scenarios can be ensured by their expertise in scenario analysis and the consistent use of proven methodology in their research. Second, each of the three studies was conducted in the telecommunications and television industry. Third, the time horizon (2010) of each scenario is similar.

Table 1 Summary of critical design issues and tradeoffs

Service design issues	Tradeoffs		Critical Design choice
	Service domain	Other domains	
Service bundling	Triple play, quartet play	Complex organization arrangement	• Choice on the level of discount of bundling • Choice on different products portfolio
Value-added services (e.g. interactive)	New and unique service	Extra investment, Risk of failure	• EPG • PVR • Other interactive components
Content portfolio	Content only available through the platform	Requires cost effective network and advanced middleware Complex organization arrangement	• Platform exclusivity • Channel exclusivity and distributor customer ownership
Technical design issues	**Tradeoffs**		**Critical Design choices**
	Technical domain	Other domains	
Bandwidth	High bandwidth	Large investment on infrastructure	• Adding large capacity (FTTx) with high investment • Gradually expanding bandwidth capacity
Quality of service	High QoS	Large investment or extra customization	• Deploying FTTx and advanced quality guarantee equipment • Golden, silver membership
Middleware capability	Extensive capabilities for interacting, conditional access, security, CRM	Large investment or low revenue generation	• Prioritizing the preparation for advanced Electronic Program Guide functionality, revenue models based on customer information such as advertising • Prioritizing lower CAPEX and quick time to market in order to acquire installed base of customers
Organization design issues	**Tradeoffs**		**Critical Design choices**
	Organization domain	Other domains	
Vertical integration	Vertical integrated firm	Bundling service	• Whether or not to become content provider • In which way to enter into content production market
Horizontal integration	Horizontal integrated firm	Cost revenue sharing	• Choice on the level of discount of bundling • Choice on different products portfolio
Financial design issues	**Tradeoffs**		**Critical Design choices**
	Finance domain	Other domains	
Revenue/cost sharing		Horizontal integration Content portfolio Middleware capability	• How to arrange revenue/cost sharing with other players
Revenue model		Value added services Content portfolio Vertical/hor integration	• Flat rate or more flexible pricing model • Price the service in an appropriate rate level

The scenarios we used as a reference are.

- The scenarios as published in 2005 by the European Monitoring Centre on Change (http://eurofound.europa.eu/emcc/publications/2005/ef0567en.pdf, retrieved in Aug.2006). This scenario analysis was aiming to "look at the future of the telecommunication services sector" and taking into account "the rapid evolution of telecommunications and the technologies involved five years from (2005)". The study first identified three key dimensions, i.e. demand and usage, regulation and public policy and technology and industrial strategy. Based on the dimensions, four scenarios were recognized..
- The scenarios created by the Bournemouth Media School and ITC (the former Independent Television Commission in UK), see (http://media.bournemouth.ac.uk/research/documents/fullreport.pdf, Here, scenario analysis was used to assist electronic communication industries, especially television, to define and deal with common future issues in 10 years from 2002. Three dimensions constituting the scenario are the way consumers make use of media, economical developments, and characteristics of the industry structure and competition. Based on these three dimensions four scenarios for British television industry in 2012 were presented.
- Drop et al. (2000) developed a set of scenarios in KPN research. It was aiming to answer the question that what the use of ICT in the Netherlands will look like in 2005. Although the scenarios originally had a time horizon up to 2005, experiences with other scenarios in all kinds of projects for KPN showed that the basic assumptions and scenario axis could be applied to 2010 (Bouwman & Van der Duin, 2003). The two axes (dimensions) of KPN scenarios are individual vs. collective (the degree to which consumers let their own interests prevail above those of the group they belong to), and active vs. passive (the degree to which consumers explore and change their environment rather than conform to external influences). Four scenarios were identified and validated.

Based on these scenarios, we identified consumers' attitude and regulation related to industry structure, as the most important uncertainties. As a consequence, we make a distinction between sophisticated and regular consumers. Sophisticated consumers are fully aware of the advantage of new media product and services, they want to pay a reasonable price for customized and personalized services. Regular consumers are conservative in choosing new products. They are satisfied with the conventional TV, they prefer easy configuration of services and are price sensitive. Therefore, bundling services with discount price is very popular to them. The regulator and industry structure dimension at one end discusses a hands-off approach of regulators and domination of the market by telecom operators in the voice and broadband market. At the other end of this dimension, regulators play the role of interventionist and restrict the dominant players in the market. As a result there are many players in the voice, broadband and television market. These two dimensions result in four scenarios, which will be presented in the next section (see figure 5).

4 The four IPTV business models scenarios

We will discuss the four scenarios in more detail and illustrate what kind of critical design issues become relevant in the exploitation phase of a IPTV business model.

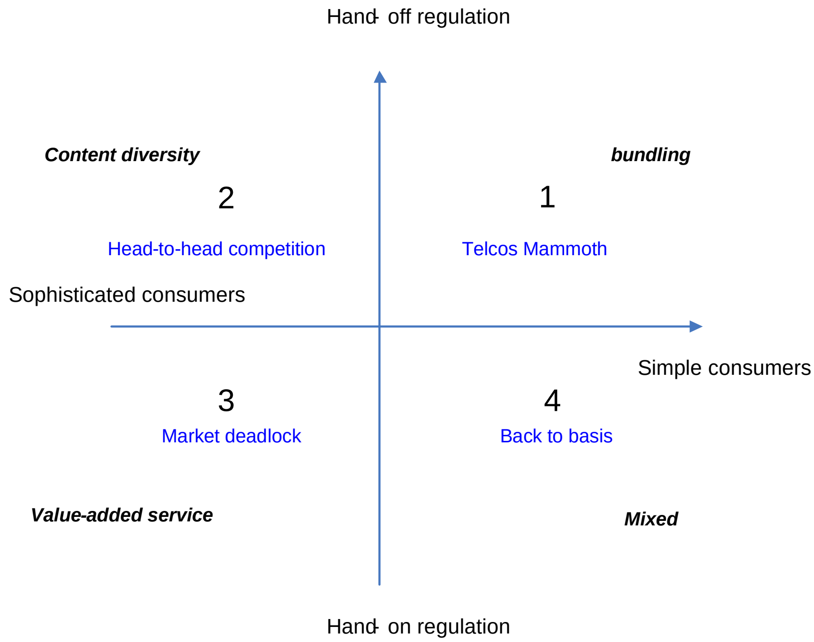

Figure 5 Scenario dimensions, scenarios and critical issues

Scenario 1: Telecom operators Mammoth.

Economic growth is modest. The market competition between incumbent telecom operators, new entrants and cable and satellite companies keeps growing. The regulator has little doubt about the market efficiency and adopts a light regulation regime. Telecom operators are not bounded by tariff regulation and have the freedom to ally with content providers. The younger generations of consumers accept in a fast pace the new services at an affordable price. Most of them like easy configurable digital TV, telephone and broadband services. Consumers show interest in bundling. The most popular packages are the discounted offers from the multi-services providers. Bundling complementary products is an attractive strategy given the fact that consumers will value bundling service more than the total separated value. Such bundles would even not require a discount. Telecom operators should avoid offering substitute bundling without justifiable economic return. Therefore bundling services becomes the priority for telecom operators. Telecom operators are the only player capable of providing quad-play. Cable companies are triple-play veterans, but have a hard time to catch up with telecom operators. However, market success is not simple in a market where several competitors (cable) are capable of offering similar service bundles. The success of triple play is determined by factors like the bundling type, pricing and content (Forrester Research, 2006). Telecom operators should make use of the “simple” users’ preference of easy and quick configuration and entice more consumers by introducing bundling products. Telecom operators can choose to bundle the IPTV and broadband services together. In most cases, these are independent products and can reduce cost by bundling, but in some cases they become complementary and thus add additional value for end-users.

Table 2 bundling option

	Nature of products	Bundling strategy	Synergy effect
IPTV and DVB-T	Substitute	No bundling	no
IPTV and telephone	Independent	Bundling	no
IPTV and broadband	Independent/complementary	Mix bundling	yes
IPTV/broadband/telephone/mobile	Impendent/complementary	Mix bundling	yes

The fact that service bundling is the key critical design issue in this scenario does not undermine the importance of other design issues. However, in the light of limited resources, when balancing the requirement of IPTV business model design, telecom operators have to focus on the service bundling and the critical issues related to this. In the technical domain, bandwidth is closely related to service bundles offering. The bundle between broadband and video service requires high bandwidth capacity (e.g. video service requires at least 2-3 Mbps and broadband requires around 1Mbps. The total is about minimum 3-4Mbps). This technical design issue of bandwidth will be the key enabler of bundling services. A network upgrading to fiber or hybrid type is therefore necessary. In the organization domain, horizontal integration is important in order to offer service bundles. It is a challenge for telecom operators to coordinate the newly established video business unit and the traditional broadband, voice business units in the back office, in order to be able to provide seamless bundles and efficient billing system for end users. In the financial domain, because of consumers' desire to have affordable services, it is critical to choose the right pricing and discount rate. Telecom operators have to balance the technical and financial design to control the cost level and be able to offer a modest monthly rate to most consumers. This pricing strategy can be modified to more aggressive approach by offering larger discount rate in comparison with cable operators' discount rates and by taking advantage of economies of scale and scope. This can create competitive advantage and entice more consumers to the convenient triple play configuration.

Key words in this scenario are bundling services, aggressive discount rate of bundles, horizontal organization integration, and sufficient bandwidth.

Scenario 2: Head to head competition.

Economic growth is high. The regulators relax constrains on telecom operators and succeed in removing the differences in regulation between telecom operators and cable companies. The regulatory framework leads to fair competition of equally strong players creating an expanding digital TV market. Different players compete on a national level and gain fair access to the content market. Competition facilitates innovation and strengthens the balance sheet of the digital TV industry, as a whole. Market values of digital TV companies keep increasing. A virtuous circle is created. Consumers grow to be more sophisticated, meaning more awareness of the benefits of digitalization and are experienced in selecting digital TV offers and programs. They prefer new services at an affordable price and have less interest in choosing from a whole range of options and like to create and share content. The champion digital TV provider is the ones that cater to the personal tastes of consumers and enables them to create, publish and share their personal stories. In this scenario, telecom operators have several strong competitors in the market including cable, satellite and content providers. End-users have at least one alternative to choose from. Most service providers offer mixed-bundling service with comparable prices. Bundling is hardly a winning strategy.

On the other hand, sophisticated consumers search for the programs they prefer. Because of consumers' personal choice, the content market becomes fragmented. In a fragmented market, the most popular programs do not attract much attention. Most consumers pick their own content regardless the preference of other viewers. This leads to a large number of programs with small audiences, emulating a ' long tail' for television (Limonard and Tee, 2007). The success of business model is dependent on the question if operators can satisfy individual's choice and capture the value located in the "long tail". In order to do so, television operators have to seek extensive cooperation with various content producers, including content generated by viewers, and aggregators to obtain as many and as diverse programs as possible, as well as to pursue their own capabilities to produce exclusive content. The key critical design issue in this scenario is the ability to create content diversity.

In the technical domain, IP-based distribution technology provides a competitive advantage in as this meets the requirements bof the the long tail to become economically interesting (Brynjoffson, 2006). As the IP infrastructure is enables interaction and capturing detailed information on user behaviour, a powerful asset is created, giving telecom operators the chance to grow into an indispensable interface between the customer and content producers and advertisers To enable this, telecom operators should make full use of the advantages of IP based transmission. Delivering customized service requires extra investment in content production and distribution. According to Noam (2002), cable and Internet TV operator have similar cost of content production but distribution cost through IP platform is much more expensive. Individualization requires significantly larger transmission resources, and therefore investments.

Business model key word in this scenario are content diversity, wide cooperation with various content producers, balance cost issue, full use of IP-based transmission, user-generated contents

Scenario 3 Market deadlock

Several large merger deals create natural monopolies. Regulators propose to bring back strict anti-trust policy. Telecom operators challenge the harsh regulation in court. Judges agree with regulators and rule pro cable and satellite company judgment. Consequently, telecom operators have to pass numerous procedures to receive TV franchise permits and are actually blocked from content integration. Cable and satellite companies take advantage of the regulatory environment. They consolidate their business and become dominant and vertically integrated national players Consumers in this scenario are already have quite some experience with digital TV They are interested in new services.

It is hard to generate profit for telecom operators in a stagnating market. The key critical design issue is about providing new value added services. In order to achieve satisfying penetration rates for IPTV service, telecom operators need to create competitive edge by differentiating their services. Not by disclosing the long tail for content, but by disclosing the long tail of value added services, independent of content producers and aggregatorsmaking use of for instance PVR (Personal Video Recorder) and interactive services (TV email, TV internet and games). However, simply offering PVR or interactivity will not safeguard market success. Choosing this strategy inevitably implies conflicts with content centric firms. Service providers might decide to implement various forms of copy protection. However, history suggests that these measures will be defeated and consumers will have the capabilities to copy the program (Katz, 2002). Some value-added services provide the possibility for consumers to schedule and edit the programs. This ability can threatens content packagers ability to rely on the sale of advertising (Loebbecke and Radtke, 2006). A notable example is consumers' choice to push the "forward" button to skip the advertisement when watching the recorded programs.

The relation to content packagers and advertisements are the key resources for television distributor's revenues. The implication for value added service is certainly not trivial. Understating the attractiveness of value-added service and also the possible revenue loss helps telecom operators to choose some measures to reduce the disadvantages of value-added service offering. One measure is to create advertisement embedded in other programs that consumers are willing to watch. The second strategy is to provide entertaining or informative advertisement, which consumers do not want to skip. Another strategy is to give extra reward to consumers watching advertisement. In an IP-based network, monitor consumers' commercial watching time is possible. Telecom operators can use the monitor result to give monitory payment or conditional access to premier contents (Katz, 2002). Telecom operators can also choose to tolerate consumers' copying contents and skipping advertisement if the value added services can attract enough new subscribers. Actually, according to Myers (2002) and Mogg (2004), these two features are the biggest selling points for PVR. Telecom operators should make the decision based on the balance between customer value and economic benefits. If the value added service can attract big enough number of new customers to offset the loss from advertisement and program reproduction and redistribution.

Business model key word in this scenario are provisioning of value-added services, balance between service attractiveness and potential revenue loss, flexible pricing.

Scenario 4 Back to basis.

In this scenario, regulators adopt strict anti-trust policy toward the big telecom operators in the market. Cable and satellite companies take advantage of the regulatory environment and consolidate their business. Several vertically integrated and global companies dominate the television market. Most consumers are satisfied with their current television services provided by cable and satellite companies. They are extremely hesitant to adopt new services. A "wait-and-see" attitude is often observed. There is little market demand for interactive service and Internet TV. Consumers decided to use bundling services for convenience reasons and easier configuration.

In the back to basis scenario, regulatory barrier and consumer indifference make it hard for telecom operators to offer IPTV service. There are not many new opportunities for telecom operators to develop the IPTV as defined in the exploration phase to a successful service in the exploitation phase. Bundling might still be an effective strategy. However, it will be difficult to convince the consumers to switch from cable companies to the telecom operator. The potential market is limited. The content supply side is dominated by several vertically integrated global companies. It is difficult for telecom operators to enter the content market and to compete with content providers.

The more realistic options for telecom operators are to make better use of the existing technologies, services and resources to support IPTV development. First, telecom operators can create a fresh image as a new entrant, which provides high level of QoS and service availability and excellent customer service. Better program quality and customer service are compelling reasons for consumers' to switch from cable and satellite offers. Second, telecom operators should take leverage their customer base in the broadband and telephony market. Third, telecom operators can create complementary programs and contents on the television and broadband platforms. However, there is no dominant strategy telecom operators can make use of in this scenario.

Business model key word in this scenario are QoS, leverage experiences and expertise from broadband to television, synergy effect.

5 Conclusion

IPTV business model always has to adjust to the change of external factors and uncertainties, in the exploration and the exploitation phase. The four scenario presented explicitly addresses the demand, regulatory and competition related uncertainties. The scenarios represent the different future possibilities in terms of regulation environment, industry structure and consumers' attitude towards (IP)TV service. By choosing the right business model, telecom operators can sustain the market competition and deliver customer value and economic benefit. In the light of limited resources, when balancing the requirement of IPTV business model design, telecom operators have to put their efforts to focus on the critical design issue in each of the scenarios. The critical design issues are of eminent importance to the viability and sustainability of the studied business model (Faber, et al., 2002).

The analysis shows critical design issues telecom operators have to focus facing the changing external factors. In the “*telecom operators mammoth*” scenario, telecom operators should take advantage of the economies of scale and scope and offer more competitive bundling offers. The critical design choice to offer bundling is the key to satisfy “simple” consumers demand on convenient configuration and help telecom operators to establish leading positions in the television market. In the *head-to-head competition* scenario, telecom operators’ capability to offer content diversity is important to match the increasing fragmented consumer demand. Besides possible integration into content production and signing deals with multiple content providers, providing a platform for users generated contents is also an effective way to create diverse content with low cost. In the *market deadlock* scenario, the critical design choice of provision value added services should be the focus of telecom operators. The interactive and versatile nature of IP-based network to carry multimedia and interactive service should be fully explored. By doing so, telecom operators can differentiate their IPTV from cable and satellites companies and gain the competitive edge. In the *back to basis* scenario, it is relatively difficult to implement the IPTV business model due to indifferent consumers and the existence of dominant cable companies in the market. The analysis emphasizes the synergy effect between the telecom operators’ broadband and television service. Telecom operators can leverage their advantage in the broadband market (e.g. brand, large customer base and sufficient cash flow) to the television market in order to increase the value for both.

Table 3 Summary of critical design choices in different scenarios

Scenario’s Domains	Telecom operators mammoth	Head-to-head competition	Market deadlock	Back to basis
Service	bundling	Content diversity	Value-added service	bundling
Technical	Sufficient bandwidth	Middleware capability	Middleware capability	QoS;
Organization	Horizontal integration	Partial vertical integration to enable cooperation with content producers (professionals and amateurs)	Partnering/partial integration with ASPs and OEMs	Consolidate
Finance	Aggressive discount rate	Balance increased costs (CAPEX and OPEX) with increased revenues	Balance content related loss in revenues and extra revenue from advertisers and	Consolidate, focus on internal Synergy effect in network

			price differentiation	

The critical design issues we identified as critical in each scenario do not necessarily undermine the importance of other design issues. The fact is that telecom operators always have to balance design choices to deliver both customer value and economic benefit to shareholders. For example, the content diversity design is closely related to the finance domain, because the cost of producing tailored personal services is not trivial. It is important to find ways to control the cost in certain level (e.g. broadcasting user generated content is one way to reduce cost). Providing value-added services takes the risks of losing subscribers and advertisement revenue, and is therefore making the business model vulnerable if it is not attracting enough new customers. Telecom operators have to take the decision on to what extent they want to offer the new services based on the measurement of market demand and costs.

The existing IPTV business model literature is limited. There is a large volume of literatures about IPTV technological development (Pfeffer, 2006 and Cisco whitepaper, 2005) and lots of discussions on the revenue/profit generation capabilities (e.g. Liu, 2005). However, a systematic and balanced perspective about different components of IPTV business is missing. Exception is a working paper from Carney et al (2006) using Porter's five forces to assess the IPTV business models, and Limonard and Tee (2007), focusing on long tail business models using the STOF model.

The STOF model, and especially the critical design issues, appears to be suitable for IPTV business model analysis. This confirms the initial findings of Limonard and Tee (2007) that the result is useful for decision making process in designing IPTV business model. This research does not stop after analyzing critical design issues, but takes these a step further in order to cast light on the viability of the business model in an exploration phase. This is done on the basis by integrating the business model framework analysis with scenario analysis. As a well recognized method, scenario analysis pinpoints different future possibilities and provide a platform to analyze the decisions with regard to critical design issues to be taken in an uncertain future environment. The competing views on future developments are useful to reduce the future uncertainties with regard to viability and feasibility of business models for IPTV.

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