Business modelling of IPTV operators

Ernst Nordström
Ernst Consulting & Education
ernstn@ieee.org

1. Introduction

1.1 Value of ICT services

Traditional ICT systems provide basic value for most people, such as radio, TV, telephony, and Internet data. ICT systems introduced the last 20 years provide extra value beyond the basic value. A service with **extra value** is often referred to as value-added service. The extra value spurs the subscriber to use their system more and allows the operator to drive up their average revenue per user (ARPU). ICT systems with a more pronounced extra value automatically gets a larger customer base. In some case (Irridium satellite mobile) the extra value is not large enough to support a positive business case, and these services will disappear from the market. Experts in the field tend to believe that to become successful, IPTV operators must offer significant extra value compared to other DTV options such as DVB-T, DVB-S and DVB-C.

1.2 IPTV players

IPTV players include telecommunication operators (telcos), equipment providers, and content providers. Telco operators are expected to directly provide IPTV service to subscribers, in which the operator takes the role of a service provider. In addition, operators may indirectly support IPTV services by through the provision of network services over common data networks, in which case the operator takes the role of a network provider. Equipment providers include manufactures of IPTV network devices, and IPTV terminal devices. Content providers include both major media producers, such as motion picture studios, as well as other professional and amateur content originators, such as participants in peer-to-peer content sharing.

2. Business planning

2.1 Definition

A **business plan** is a formal statement of a set of business goals, the reasons why they are believed attainable, and the plan for reaching those goals. It may also contain background information about the organization or team attempting to reach those goals. A business plan presents the calculation of the financial indicators that enable the managers to evaluate the financial performances of an enterprise in order to take best decisions for the overall operation. Due to the high number of alternatives today and the need to find economical feasibility in competition, the business evaluations are being used not only for the business plan itself but as an iterative evaluation of those techno-economical alternatives to select the ones that perform better in the competitive market.

A business plan summarises the results of the planning process:

- the objectives to reach (subscribers demand, sales)
- the future revenues expected from the plan and per service class;
- the planned expenses (investment and operations) as overall and per service class;
- the accounting statements and the financial indicators characterising the profitability of the project.

Different types of business plans are possible:

- strategic business plans for evaluating a strategy:
  - aid for making internal decisions for the whole company (strategic guidelines at the national level, all markets)
- tactical business plans for specific projects:
  - aid for making internal decisions for a particular area, or a market segment
- short term business plans for management control:
  - aid for monitoring the implementation of projects
  - preparation and follow-up of budgets

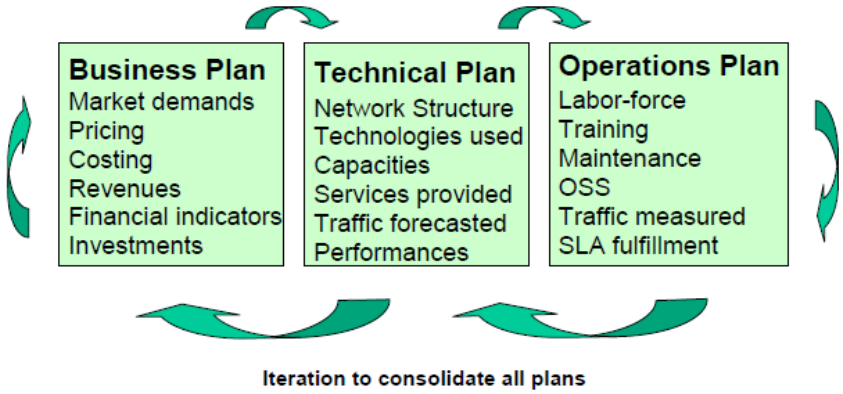

Figure 1. Relation between technical, business and operational plans (ITU-T,2008).

3. Business models

3.1 Definition

A **business model** is a framework for creating economic, social, and/or other forms of value. The term business model is thus used for a broad range of informal and formal descriptions to represent core aspects of a business, including purpose, offerings, strategies, infrastructure, organizational structures, trading practices, and operational processes and policies.

(Chesbrough, 2002) states “a successful business model creates a heuristic logic that connects technical potential with the realization of economic value”.

(Timmers, 1998) defines “a business model is architecture for the product, service, information flows, including a description of various business actors and their roles, a description of potential benefits for various actors, and a description of the sources of revenue”

(ECOSYS, 2004) proposes “Business model consist of service and information flows, including a description of various business players, their roles and relationships, their relative position within a value network and description of their cost structure and sources of

revenue." This definition does not specify company internal value chains and competitive strategies involved.

(Bouwman, 2008) states that "The business model concept in the STOF framework is defined as a blueprint of how a network of cooperating organizations can create and capture value from new innovative services". The STOF model consists of four domains, namely the service domain, the technology domain, the organisation domain, and the financial domain, each of which interacts with the others and is affected by market dynamics, technological developments and regulation.

The following set of parameters can act as a preliminary list for comparing two or more business models aiming to provide similar value to a customer.

- Value to the end-user: quality, quantity, pricing and ease of access
- Complexity and coordination level: number of players and associated roles
- Power dynamics: players have different bargaining power
- Choice of technologies: architectural complexity, evolution path, scalability, substitutes
- Regulation: check relationships in business models with regulatory rules

In order to assess the relative bargaining power of a player in a relationship, the following parameters should be considered. Here, the unit of analysis is a player.

- Nature of roles taken by player: a key role gives greater ability to control the value network
- Number of roles: a larger number of roles gives greater control over the value network
- Number of customers: a larger number gives greater power
- Number of suppliers: a larger number gives greater power
- Number of substitutes: a larger number gives greater competition and weaker bargaining power

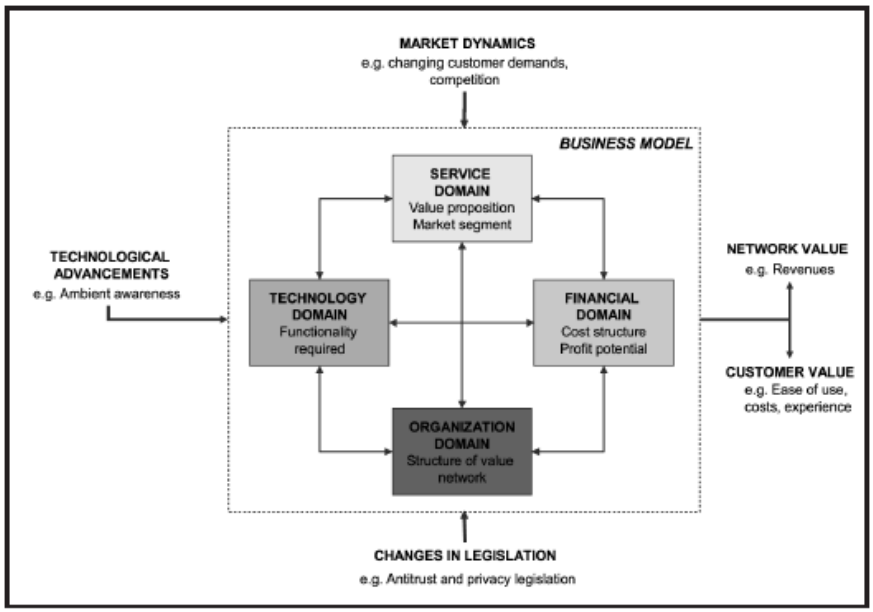

Figure 2: STOF model (Bouwman, 2008).

3.1 Value models

In order to generate revenue the company needs to offer some benefit (value) to the customers. Such value is derived from the operations, collaboration, or cooperation between the actors involved in its creation, distribution and consumption. Both customer's and provider's perspective are taken into account (consumer's value and company's value). From the company's perspective, defining a customer's value is an intrinsic component of a business model.

An important ingredient when designing a business model is to create a value model. The value model consists of:

- **Value proposition** includes identification of the key value drivers and elements, which enable the company to differentiate itself from the competitors, and
- **Value configurations** includes network of partners, which describe how the value is created, who contribute to it (i.e. relationships), and how it is distributed and finally, consumed. Value configurations reflect different value creation logics.

Each value configuration creates value by combining value elements and is enabled by value drivers. The selection of relevant value elements depends on the given business

Probably the most used value configuration is a **value chain**; it originates in the manufacturing economy (supply chain theory) and essentially encapsulates a set of interconnected activities that bring a value/product/service to the market. Initially introduced by Porter, it was used within a company to analyse the production, identify the activities and linkages between the activities, and determine the transaction cost. The idea is further generalised and applied to the complete industry, where a linear combination of several values chains is observed—not only company's value chain, but also value chains for suppliers and customers. Such a combination of value chains constitutes a **value system**.

Value network configuration was proposed to depict a value configuration suitable for the "mediator" industries. Examples of companies running such business include telecom operators, banks, insurance companies, travel brokers. These industries are operating so that single companies configure themselves (and its infrastructure) to mediate interactions and exchanges across a network of their customers. The value network configuration helps tracing the value flows relevant for the telecom industry (both tangible and intangible value elements).

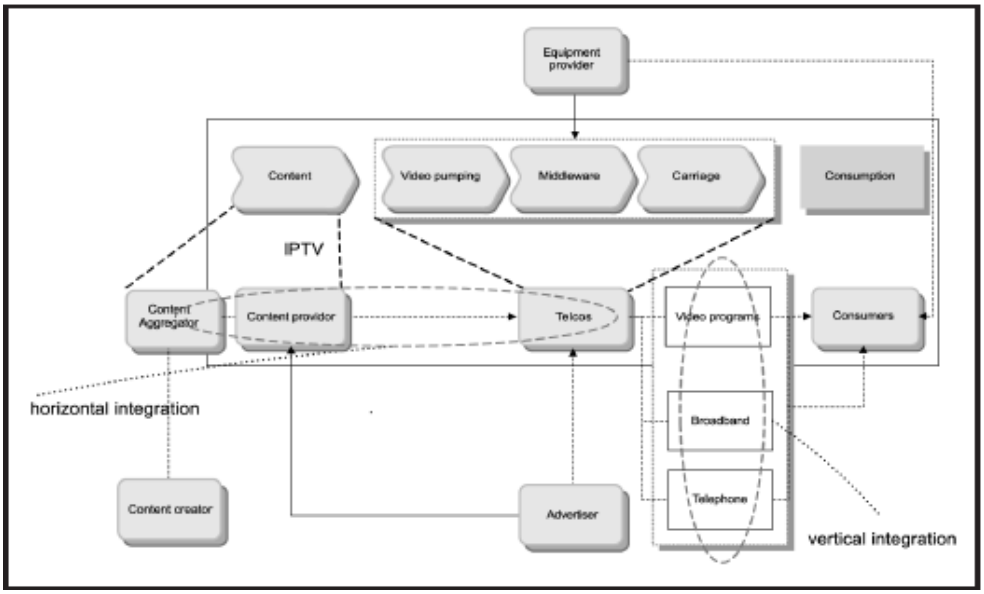

Figure 3. Value network of IPTV (Bouwman, 2008).

3.2 Portfolio models

The set of products/services offered by a company is called **portfolio**. The portfolio conveys the value proposition of the company. In order to design a successful portfolio, the value drivers of the business sector needs to be identified. To maintain its market position over time, every company needs continuous research & development to evaluate prospects for new products/services that can replace or extend the current portfolio.

Some companies, e.g. AT&T, ask user groups for suggestions of features of new services and applications. Apple (S. Jobs) tend to rely more on experts for innovation of successful services and applications.

Careful R&D on new technology, customer behaviour, market trends, etc. is necessary but not sufficient for the portfolio to become successful. A second major requirement is an accurate economic model of the prospects of the portfolio. Before any new item is launched its expected impact on the profitability needs to be assessed. The demand from customers is critically dependent on the functionality, quality and price of the portfolio. Advanced functionality and high quality is not a guarantee for a large demand. If the long-term profit gain is not large enough the profit expansion should be avoided.

Different customers segments have different needs and may respond to the offered portfolio differently. Services that are classified as must-have services by some segments may generate little demand from other segments. To sustain a positive business case, the portfolio content needs to be differentiated, meaning that some of the offered value should be relatively unique on the market. Some customers needs to explore a new service several times, to become motivated users. The willingness to pay for technology and services normally decays with the age of the customer.

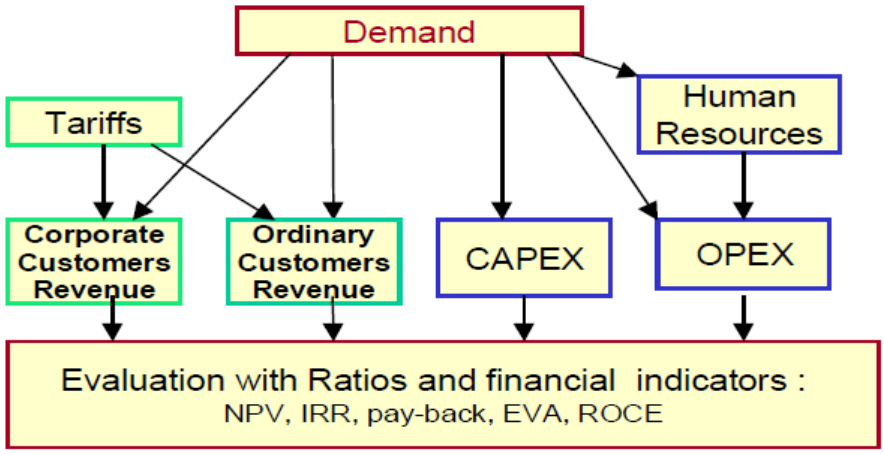

Figure 4. Business model structure for planning (ITU-T, 2008).

3.3 Pricing models

We can identify three types of price discrimination. With **first degree price discrimination** (also called personalized pricing), the supplier charges each user a different price for each unit of the service and obtains the maximum profit what it would be possible for him to extract. The consumers of his services are forced to pay right up to the level at which their consumer

surpluses are zero. In **second degree price discrimination**, the monopolist is not allowed to tailor his offer to each customer separately. Instead he posts a set of offers and then each customers can choose the offer he likes best. Prices are nonlinear, being defined for different quantities. A supplier who offers 'quantity discounts' is employing this type of price discrimination. Of course his profit is clearly less than he can obtain with first degree price discrimination. The idea of **third degree price discrimination** is market segmentation. By market segment we mean a class of customers. Customers in the same class pay the same price, but customers in different classes are charges differently. This is perhaps the most common form of price discrimination.

Service bundling is an example of second degree price discrimination that is popular among IPTV operators. Service bundling is believed to have a positive impact on ARPU and customer churn. The triple play service package includes telephony, Internet data, and IPTV. The price for the triple play package is lower than the price for the sum of individual services.

Factors to consider the design of pricing scheme include technology risks, availability of resources, competition, supplier and consumer behaviour, and political factors.

Any new technology has risks associated with unexpected costs, compatibility problems, immature standards, arrival of new and better solutions, etc. Risk of system failure may be estimated by reliability theory.

Resource consumption in a telecom network may be evaluated by mathematical modelling followed by analysis and/or simulation. The network capacity (transmission speeds, buffer memory) needed to provide a desired QoS for a given traffic demand may be calculated from probability models of network traffic. The behaviour of the network can be described by a continuous-time, discrete-state Markov process. It is shown in (Paschalidis, 2002) that although dynamic (state-dependent) pricing policy is optimal, static pricing can come very close to optimality and that a single price parameter (volume charge) may suffice, especially when typical calls are relatively small. This leads to the familiar **time-of-day pricing policies**. We also saw that a revenue-maximizing provider may set substantially different prices for two services even if they have very similar resource requirements. This is consistent to what is happening in other industries (e.g., in air travel all passengers receive essentially the same service but can pay very different prices).

The market dynamics under monopoly, perfect competition and oligopoly may be modelled and analysed with various mathematical tools. An excellent example is game theory which was first studied in the context of oligopoly markets by Cournot, and Bertrand in the 19th century. The work by Neumann and Nash laid the foundation of the field of game theory in the mid 20th century. Game theory is today an established part of econometrics.

The choices made by suppliers and consumers dictates the supply and demand on the market.

Both suppliers and consumers aim at maximising the benefit or surplus they receive. The suppliers aim at maximising the profit, which is the difference between revenue and cost. The consumers aim at maximising the consumer surplus, which is the difference between consumer utility (or willingness to pay) and price.

The regulators monitor the market and may take actions against unfair pricing, barriers against fair competition, cartel formation, etc. Regulators implement the political policies chosen by the government. Regulators normally attempt to maximise the welfare of the market players, i.e. total benefit (surplus) of all suppliers and consumers.

3.4 Demand models

New customers arrive to the DTV market at a characteristic rate Λ [customers/day]. The customers choose among the available operator firms with the objective of maximizing their own net benefit or consumer surplus, defined as the difference between the maximum willingness to pay (or utility) and the price for the service. The customers are shared among the available DTV operators according to customers' perception of offered functionality, quality, and price.

A rich body of experimental research in mathematical psychology says that consumers choose brands in an inherently probabilistic way. Random-utility models (RUMs) are based on a probabilistic model of individual customer utility. They are useful for several reasons. First, probabilistic models can be used to represent heterogeneity of preference among a population of customers. Second, can also model uncertainty in choice outcomes due to the inability of the firm to observe all the relevant variables affecting a given customer's choice including intrinsic and extrinsic factors. Finally, the econometrician typically does not the true functional form for the utility function.

3.5 Revenue models

The revenue model states how to generate revenue from customers. On Internet, business models are often based on advertising and free usage, possibly extended with a premium model that gives extra content at some minor fee. Future advertising systems will be directed, interactive and personalized. Subscribers will have possibility to respond the commercials presented at the TV screen. They can ask for information that are relevant to their specific interests. The DTV system can learn the preferences of each subscriber and present personalized commercials. Intelligent advertising may be implemented by a learning system based on AI techniques (Aghasaryan, 2008). The next generation advertising systems have great promise to change peoples' behaviour and attitudes towards TV commercials.

Revenue sources for DTV players include payment for services, content, rental of customer premise equipment, and advertising. The demand from customers and the pricing of services determine the amount of revenue. DTV players may implement revenue sharing with some other player(s), in order to establish stable revenue streams and reduce the risk taking. For example, the operator may share the revenue with content providers including major media producers, and other professional and amateur content originators.

3.6 Cost models

Cost modelling provides input information for several kinds of decisions. Knowing the cost per service is very important for pricing decisions, benchmarking, profitability analysis,

simulation for possible introductions of new technology or services etc. It is necessary that the cost modelling and allocation process is performed as correct and fair as possible.

Economies of scale are defined as a reduction in the cost per unit resulting from increased production, realized through operational efficiencies. The average cost per unit will decline when more service units are offered. The cost of providing bandwidth for all services over one network will be less than the sum of the costs of providing bandwidth for each service over a separate network.

Economies of scope are when the cost of performing multiple business functions simultaneously proves more efficient than performing each business function independently.

They have a positive effect on service costs as a result of usage of same technology. Due to the reduced number of network-technologies used in the converged network, cost of installation, reparation and maintenance will be smaller than in a not-converged network. This effect, however, is more difficult to measure.

Costs are divided into **capital expenditures** (**CapEx**) and **operating expenditures** (**OpEx**). CapEx costs contribute to the fixed infrastructure of the company and they are depreciated over time. They are needed to expand the services to the customers. OpEx costs do not contribute to the infrastructure itself and consequently are not subject to deprecation.

Variable costs are expenses that change in proportion to the activity of a business. In other words, variable cost is the sum of marginal costs. It can also be considered normal costs. Along with fixed costs, variable costs make up the two components of total cost. Not all variable costs are direct costs, however; for example, variable manufacturing overhead costs are variable costs that are not a direct costs, but indirect costs.Variable costs are sometimes called unit-level costs as they vary with the number of units produced. **Fixed costs** are business expenses that are not dependent on the activities of the business. They tend to be time-related, such as salaries or rents being paid *per month*. This is in contrast to variable costs, which are volume-related (and are paid *per quantity*.)

The **direct costs** are expenses that would not have been made if the product/service where not produced. **Shared costs** are defined as cost of the usage of resources which are shared amongst several processes/services. They can be divided in a fair way, e.g. according to bandwidth usage. **Joint costs** refer to costs of resources which are inherent to each other whereby providing the first resource will also provide the second resource and vice versa. **Common costs** are defined a joint costs for which the resources are not directly associated to the product or services sold. They are mainly seen as overhead.

Two approaches can be followed for allocating costs to the different services, dependent on the considered starting point of the network modelling process. The first approach, **top-down method**, an attempt is done to reduce the unaccounted-for common cost. One way to do this is to refine accounting records, keeping more information on how the common cost is generated. The cost of existing equipment is allocated to the elements needed to deliver the service, through the use of cost drivers. Depending on the different cost bases, different costs per service can be revealed. The second approach, the **bottom-up method**, each stand-alone cost is computed from a model of the most efficient facility that specializes in the production of that one product, using current technology.

A bottom-up method is, due to its characteristics particularly recommendable for regulatory studies, because it is independent of the operator's information, and it is also of interested for operators to study and decide upon networks deployment.

Once all the processes have been described and costs have been categorized and assigned, different types of costs per service can be calculated through different methodologies. The first method is the **Stand Alone Cost** (**SAC**). It considers the cost per service as if there was only one service offered. All shared/joint costs and common costs are added to the direct costs of the considered service and are allocated to that service. The SAC is the highest cost level the service can reach. This method is only used in a top-down approach to determine an upper bound for the cost of a service. The **Fully Allocated Cost** (**FAC**) method allocates all costs to all services. Direct costs are directly attributed to each cost consuming service, shared/joint costs and common costs through cost drivers. This method can be used for top-down as well as bottom-up approach. The hardest part when using this cost base is to find the right driver for all costs. The **Incremental Cost** (**IC**) method only measures the change in total costs when a substantial and discrete increment or decrement on output is generated. This

increment can be a newly offered service, but also an increase in output of one service. A well known methodology to measure increment costs is through **Long Run Incremental Costing** (**LRIC**). Long run implies that when a large increment occurs, capacity can be expanded. Economies of scale will be playing an important role in the allocation of shared/joint cost, resulting in a smaller part of the attributed costs than in FAC. The LRIC method is mainly used with the bottom-up approach.

4. Revenue management of DTV operators

The fundamental question for the DTV industry is how to make DTV systems attractive for the subscribers and profitable for operators. Revenue management aims at increasing the revenue and thereby the profit via adjustments of the offered portfolio and service pricing strategy.

The first question is **how to make the DTV offer attractive to subscribers.** The Technology Acceptance Model (TAM) is intended to explain and predict the acceptance and use of information technology (Kuo, 2009). Customers select operators based on comparison of perceived usefulness, perceived ease of use, and perceived cost. The perceived usefulness and the perceived ease of use are functions of the functionality (service, application and content portfolio) and its quality (QoE). The perceived cost is a function of the price of the service. The acceptance of IPTV is motivated by both intrinsic and extrinsic TAM factors (Shin, 2007). Intrinsic factors include control and interactivity and extrinsic factors include special individualized service and interoperability with other services.

Perceived QoS, known as **Quality of Experience** (**QoE**) in IPTV terminology, reflects the customer's experience of equipment quality, human factors, environment factors, and

transport quality. In the context of telecommunications networks is a purely subjective measure from the user's perspective of the overall value of the service provided.

The second question is **how to make the DTV business case profitable for operators**. Experts in the field tend to believe that to become successful, IPTV operators must offer significant extra value compared to other DTV alternatives. From a customer point of view, the meaningful differences between alternative DTV offerings are functionality, quality and price. The cost for expansion of the portfolio includes direct and shared costs for upgrading head ends, middleware and subscriber equipment.

Services such as VoD, NVoD, tsTV and HDTV will become basic DTV functionality in the future. Pioneering applications and a large mix of BTV and VoD content may be needed to differentiate a IPTV operator on the market. Demand for portfolio components is likely to be long-tailed (Andersson, 2006). Popular components can subsidise less popular components. Today the largest IPTV operators offer 300 BTV channels and 10,000 VoD titles.

IPTV operators today tend to use simple pricing models for BTV and VoD services. For example, TeliaSonera use a flat rate pricing scheme for the BTV service and a popularity-based pricing scheme for the VoD service. In the future IPTV operators may use more advanced pricing schemes, including time-of-day, congestion- or auction-based pricing schemes. Factors to consider in the design of pricing scheme include technology risks, availability of resources, competition, supplier and consumer behaviour, and political factors. Knowledge of the price-demand function is a essential when formulating efficient pricing schemes.

5. Competition models

5.1 Roles of incumbents and new operators

An incumbent will most often seek to introduce innovations which complement its existing portfolio of services. This applies in a monopoly situation as well as in a situation where competitors have entered the market. New operators, on the other hand, will have a bigger incentive to introduce technologies potentially substituting for existing solutions. This is a theme lately popularized in the discussions on sustaining vs. disruptive innovations, where the new wireless technologies have been a case in point as presumably disruptive technologies. New wireless technologies will be introduced in the markets as means to compete with the incumbent operators. However, it also turns out that incumbents are often able to adopt new technologies even if they potentially substitute for some of the products in their existing portfolio. This happens, for instance, when under pressure from new operators offering new technology solutions.

However, as a starting point there is no doubt that incumbents will have a tendency to implement new technology solutions which complement their product portfolios, while new operators will have a greater incentive to market new technologies that will substitute for the existing offers on the market. This also means that not only will competition enhance innovative market offerings; innovations will also increase competition. There is thus a two-way interrelationship between competition and innovation.

5.2 Bertrand model

The competition can be described as a multi-product oligopoly with probabilistic choices between operators that are controlled by consumer surplus functions, defined as the difference between the maximum willingness to pay (or utility) and the price for the service

To describe the optimal pricing problem faced by each operator we employ the following notation. Let N_f denote the number of operators, and let N_s denote the number of DTV services provided by all operators together. For each $f \in J_f = \{1,\ldots, N_f\}$, there exists a set $I_f \subset J_s = \{1,\ldots, N_s\}$, that corresponds to the services i offered by operator f. The collection of all these sets, $\{I_f\}_{f=1}^{N_f}$, forms a partition of J_s. The vector $\boldsymbol{p}_f$ refers to the vector of prices of the services offered by operator f.

The probability that a new customer selects operator $f \in S = \{1,\ldots, N_f\}$ is given by

$$P_f(\mathbf{Y},\mathbf{p}) = P\left(CS_f(\mathbf{y}_f,\mathbf{p}_f) \geq \max\left\{CS_g(\mathbf{y}_g,\mathbf{p}_g) : g \in S\right\}\right)$$

where $\boldsymbol{y}_f$ denotes a vector of service attributes related to the functionality and quality of the DTV offering, and $\boldsymbol{p}_f$ denotes a vector of expected prices for the offered DTV services (BTV, tsTV, VoD, etc). The stochastic Logit model gives the following operator selection probabilities:

$$P_f(\mathbf{Y},\mathbf{p}) = \frac{\exp\left[-CS_f(\mathbf{y}_f,\mathbf{p}_f)\right]}{\sum_{g\in S}\exp\left[-CS_g(\mathbf{y}_g,\mathbf{p}_g)\right]}$$

In the Bertrand competition game, the operators should select pricing strategies in a rational and selfish manner, with the objective to maximize its own profit:

$$\max_{\mathbf{p}} \ \pi_f(\mathbf{Y},\mathbf{p}) = \Lambda P_f(\mathbf{Y},\mathbf{p})(\mathbf{p}_f - \mathbf{c}_f^U) + \mathbf{c}_f^F$$

where $\mathbf{c}_f^U$ denotes the cost for one unit of demand, and $\mathbf{c}_f^F$ denotes the fixed costs. Note that neither the operator fixed costs $\mathbf{c}_f^F$ nor the overall customer arrival rate Λ play a role in determining the prices that maximize expected profits. Therefore we only consider "demand-normalized gross expected profits", $\hat{\pi}_f(\mathbf{Y},\mathbf{p})$, referred to below as simply "profits". We also consider $\mathbf{Y}$ fixed, and cease to include this characteristic matrix as an argument. Finally, we write $\mathbf{c}_f = \mathbf{c}_f^U$ as these are the only relevant costs for the price equilibrium.

Conceptually, a fixed number of operators decide on prices for a fixed set of services prior to some time period in which these prices must remain fixed. During this purchasing period, a fixed number of customers independently choose to purchase any of these services, following a given RUM. This framework can be described as a two stage stochastic game, where in the first stage the operators choose prices and in the second stage customers choose services to maximize their own consumer surplus after sampling, or "drawing," from the distribution of random utilities.

(Morrow, 2009) shows that (i) there exists simultaneously stationary prices and (ii) simultaneously stationary prices are in fact equilibrium. The results assume the consumer surplus function is concave in the price parameter. The equilibrium in expected prices for Logit stochastic demand is obtained by solving a system on nonlinear equations:

$$\tilde{D}\mathbf{P}(\mathbf{p})(\mathbf{p}-\mathbf{c}) + \mathbf{P}(\mathbf{p}) = 0$$

where $\tilde{D}\mathbf{P}(\mathbf{p})$ denotes the derivative matrix w.r.t. prices, (***p-c***) denotes a vector of margins, and $\mathbf{P}(\mathbf{p})$ denotes a vector of choice probabilities as function of prices.

The costs are sensitive competitive information that are not likely to be made public.

6. Adoption of digital TV

6.1 Technology adoption

Different models can be used for modelling the adoption of a new technology or service. These models typically resemble an S-shaped curve for presenting the adoption as a function of the time. Different mathematical formulations can be used for these S-curves, leading to slight variations in the adoption models. Often used models within literature, both in telecom and more in general, are Rogers, Bass, Fisher-Pry, and Gompertz. Roughly speaking, information used for properly estimating the parameter values of these models can be gained from two sources:

1. Fitting of the mathematical adoption models to existing adoption data available. This requires sufficient data to be available and thus requires an existing customer base. For IPTV this might not always be the case.

2. Extrapolation from existing comparable technologies. In the case of IPTV we could make an extrapolation based on telecom broadband adoption on one hand and broadcast television (color or black and white) on the other. For television as well as broadband adoption, there is a lot of information available.

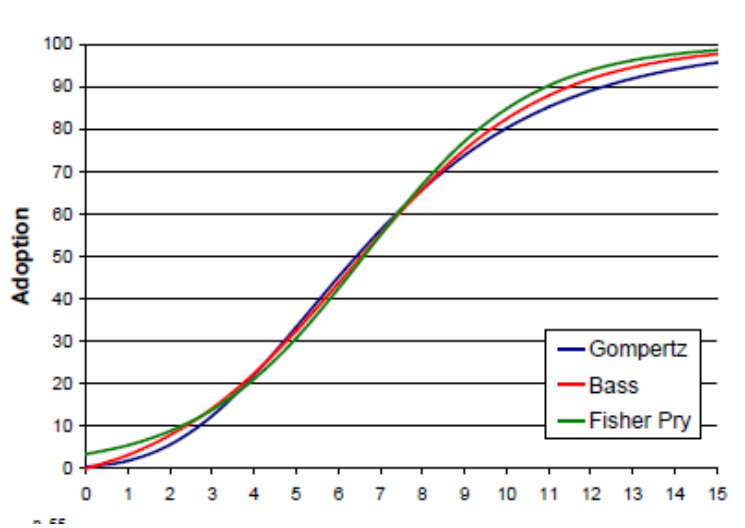

Figure 5. Cumulative market share as function of time (Verbrugge, 2008).

(Soto,2007) propose the following techniques for market and demand forecasting:

- Historical projection: ARMA, ARIMA, etc.
- Analogy with other demands
- Evolutionary (grow lifecycle)
- Causal on orginating factors
- Scenarios (alternatives and feasibility)
- Visionary (imagination)

6.2 Customers' choice of DTV operator

Operators around the world are preparing for the transition from analog TV to digital TV. In Europe, some countries have already made the transition (e.g. Sweden and Finland in 2007) and the remaining European countries will do so by 2012. In countries with high coverage of broadband access networks, this could lead the high adoption of IPTV. It could also lead to more intense competition with other DTV offerings.

From a customer point of view, the meaningful differences between alternative DTV offerings are functionality, quality and price. The **functionality** offered by the IPTV operator is given by the system portfolio, which includes the services, applications and content. Note that a service is an application that can serve other applications. IPTV offers both regular TV broadcast services (BTV), video-on-demand (VoD), near video-on-demand (NVoD), and even time-shifted TV (tsTV). Standard Definition TV (SDTV) and High Definition TV (HDTV) formats are available for IPTV. A variety of applications already exists, or is under development, including viewer-to-viewer communication, camera angle selection, intelligent/associative search, feedback/voting in TV shows, betting, and karaoke on demand. Leading IPTV operators offers a large content mix in terms of BTV channels and VoD titles. Future IPTV networks will also provide contents originating from the users themselves as

done on Internet by YouTube. The **quality** perceived by the users is expressed by Quality of Experience (QoE) metrics. The **price** for using the IPTV service is given by the subscription and transaction tariffs, and rental charges for subscriber equipment.

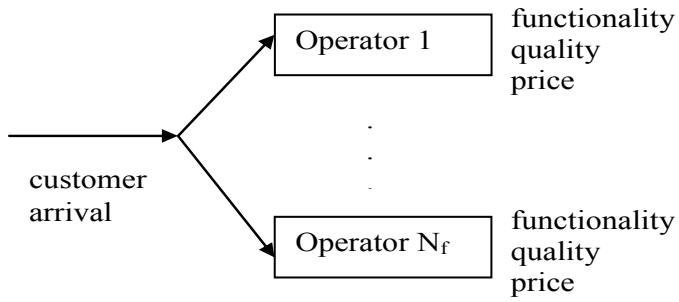

Figure 6. Customers' choice of DTV operator.

6.3 Usage of IPTV services

Once an operator have been selected the new subscriber can start using the broadcast and on-demand services offered by the IPTV system. The usage can be modelled by a frequency of service requests, and a probabilistic Logit model for selection of broadcast channel package and on-demand services. The arrival rates of decision requests for broadcast and on-demand services are denoted by λ_f^b and λ_f^s [requests/day]. No pricing game is associated with the IPTV usage level.

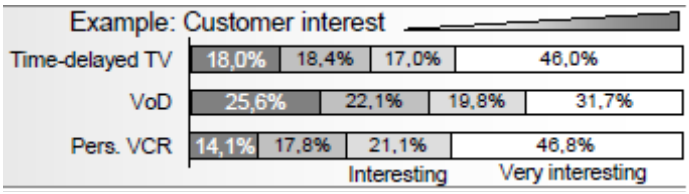

Figure 7. Customers' interest in IPTV services (Goetzpartners, 2009).

Studies show that 57 % of UK residents time-shift their TV viewing using VoD or PVR. This gives an hint of the expected popularity of the time-shifted IPTV service (tsTV).

7. Analysis of IPTV business models

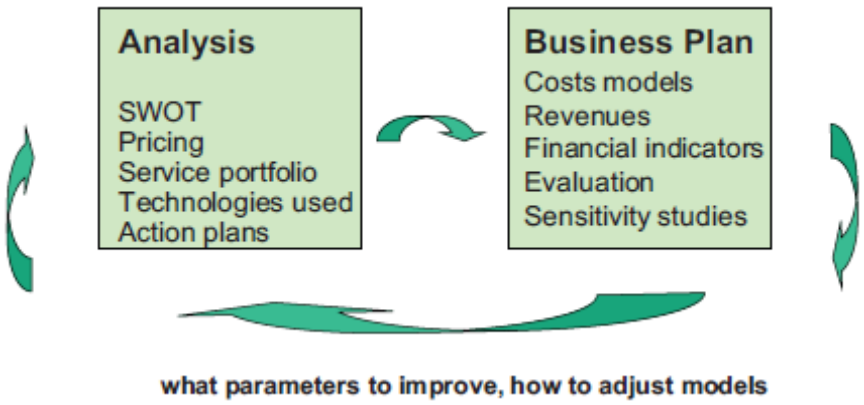

Figure 8. Interaction between analysis and business plan (ITU-T,2008).

7.1 Qualitative analysis

The star model is loosely based on Porter's Five Forces. Developed in 1979 by Michael Porter, the Five Forces group microeconomic forces within the marketplace into the following five categories: bargaining power of customers, the bargaining power of suppliers, the threat of substitute products, the threat of new entrants, and industry rivalry (Porter, 1998). This idea provided companies with a method of analyzing a market in order to predict what forces affect a product offering, resulting in an analysis on how the microeconomic influences work. Since Porter's model debut, other theories have been presented that also attempt to understand market forces and apply knowledge gained from such analysis to improve business models. In modifying Porter's work, scholars have proposed further categorization of the forces within a market to anywhere from six (Carr, 2005) to eight forces (Downes, 1997). Each of these models provides significant qualitative information to companies requiring snapshots of the marketplace in which a product is expected to launch.

As with other scholars, these authors found value in using Porter's forces to analyze the IPTV market by categorizing the microeconomic forces acting within a marketplace to allow examination of potential market opportunities. In prior research, it had been difficult to understand the strengths and weaknesses of an IPTV product offering beyond claims made by companies. With IPTV in a major cycle of development, the marketplace reflected a rapidly changing pricing of products and the lack in standards created to define what IPTV is. Not only does the standard consumer want to know how they can benefit from IPTV, but, more importantly, telecom providers need to know how they can profit from this growing technology. Companies expecting to have successful launches of IPTV need a quantitative way to gauge how all of the forces acting within a market could affect the success or failure of an IPTV launch (Landow, 2008).

Major metrics of the star model:

1. **Power Against Suppliers**: This metric will allow each company to be rated at its current level of bargaining power with respect to the suppliers of the end products. The power of supply affects the costs of producing a product and will be reflected in the value chain.

2. **Power Against Customer Bargaining:** This metric evaluates the customer's bargaining power with an IPTV service provider. The questions for this parameter also discover costs the company passes on to consumers and if the company's service to customers is unique.
3. **Power Against New Entrants:** As part of this metric, companies are evaluated based on their vulnerability to new entrant competition. Questions will also help evaluate the evel of resistance the company poses to new entrants.
4. **Power Against Substitution:** This metric will help evaluate companies based on the ease of customers substituting a product offering with another competing product. The parameter evaluates the market power of the company with respect to the product being offered. Specific questions target if there are high start-up costs for entrants, whether nor not there are exit barriers for companies divesting from the market and if the product can be replicated by others.
5. **Power Against Competition:** This metric will be used to evaluate the level of competition that the company faces in the overall market, otherwise known as *rivalry* within the market. This metric evaluates whether the company is operating under healthy competitive environment. Questions relate whether the company holds the patents and intellectual property rights for goods and services.

Minor metrics of the star model:

A. **Customer Loyalty: Stable Customer Base.** This metric evaluates steps taken by a company to influence and encourage customer loyalty. A higher rating will indicate the company's ability to retain its existing customer base. Additionally, the parameter is also indicative of the company's ability to utilize existing customers while adding new subscribers. Finally, the rating also has influence on the ability of the company to face competition from potential new entrants.
B. **Product Usability: Interactivity Between Product and Customer.** This parameter reflects a company's ability to envision requirements while providing user-friendly interactive features to its customers. The parameter also evaluates incremental ARPU generated from existing customers. Higher rating influences the company's bargaining power against customers. Additionally, differentiated services also result in higher bargaining power against suppliers.
C. **Secured Solution: Enabling Security within the Company and its Services**. The objective of secured services is not only to protect the legitimate users while accessing the network but also to keep the malicious users away from any potential disruption of the services. Content is one of the most important elements for IPTV services. Availability of secured infrastructure for delivery encourages access to premium contents and attracts incremental subscribers.
D. **Market Regulation: Business Operation within a Regulated Market.** This factor includes clarity of regulatory environment in the target country. An uncertain regulatory environment will have high impact on planning development of newer services. Additionally, increase in regulation of content will also result in increased cost to suppliers.
E. **Customer Satisfaction: Immediacy of Satisfaction.** This parameter reflects the operational efficacy of the company while handling problems reported by customers. A higher satisfaction index results in increased market share influencing the company's ability to attain higher bargaining power against suppliers. Additionally, the parameter also has influence on power against competing vendors.

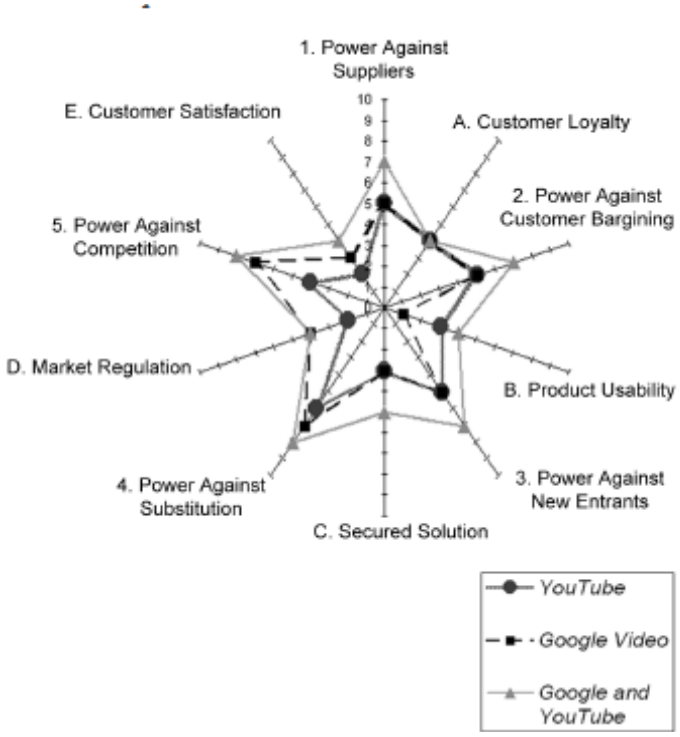

Figure 9. Google vs. YouTube star model (Landow, 2008)

7.2 Quantitative analysis

Techno-economic analysis is the process of analysing different business cases to find out adequate technological solution and/or the overall profitability of the case. The following financial indicators characterise the profitability of the business case:

- Payback period
- Net Present Value (NPV)
- Return on Investment (ROI)
- Internal Rate of Return (IRR)
- Net Cash Flow (NCF)
- Discounted Payback Period (DPP)
- Discounted Cash Flow (DCF)
- Operating income
- Revenue per service class

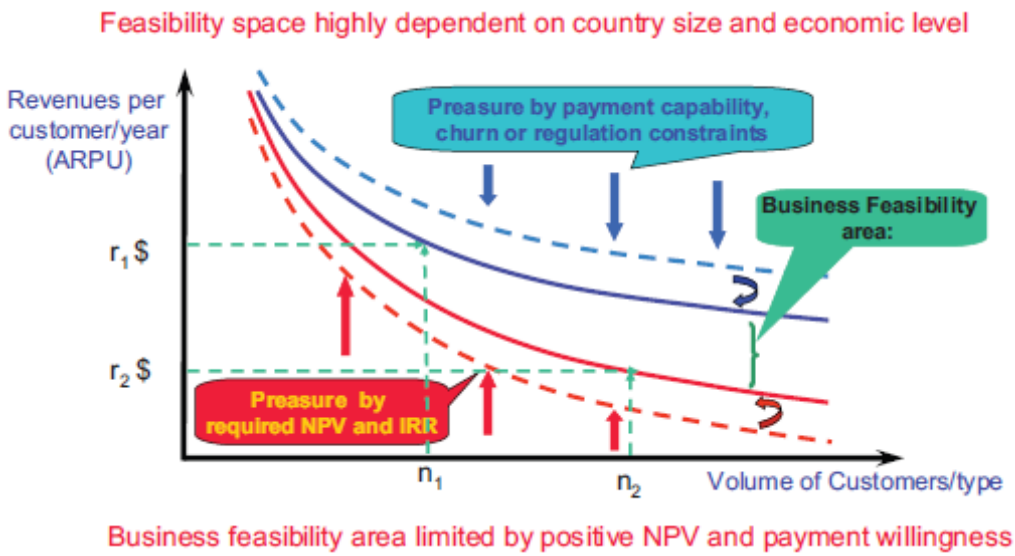

Figure 10. Key factors in competition: business feasibility.

8. IPTV business models

ICT players (service operator, network operator, content providers, content aggregators, third party service provider, billing service operator) may use one of several business models:

- basic service provisioning model
- vertical bundling model
- capacity reseller model for content
- bit-pipe model

In the **basic service provisioning model**, the user buys service from the service operator. The subsribers can either be an individual or business organisation. Service operator acts as the main responsible player against the subscriber. In order to carry out its business, the service operator needs to buy network access and transport services from the network operator. Network operator is a player who operate both access and core portions of a network infrastucture.

In the **vertical bundling model**, the service providers takes on the additional roles as content aggregator. Service operator is the key player in this model having a direct relationship with the subscriber base, providing content through a portal and billing the subscriber for the services. By assuming the role of content aggregator, a service operator can gain greater control of the value network. This is also known as vertical bundling.

In the **capacity reseller model for content**, the third party such as content aggregator provides content top the subscribes using a service operator's network capacity. Here, the service operator resells a part of its capacity and also provides billing services on behalf on the content aggregator. The content aggregator in turn has to pay for the billing service and capacity usage to the service operator. A revenue sharing model can also exist between these players for content usage. These revenue models may differ depending on the type of content provided.

In the **bit-pipe model**, content provisioning is done by content aggregators. Here, the third party offers content to the subscribers over service operator's network capacity. A third party billing service operator (such as credit card agency or banks) will provide billing services on

behalf of the content aggregator. The service operator bills only its subscribers for the transport of data, hence the "bit-pipe" model. Content aggregator and third party billing service provider are the key players in this model.

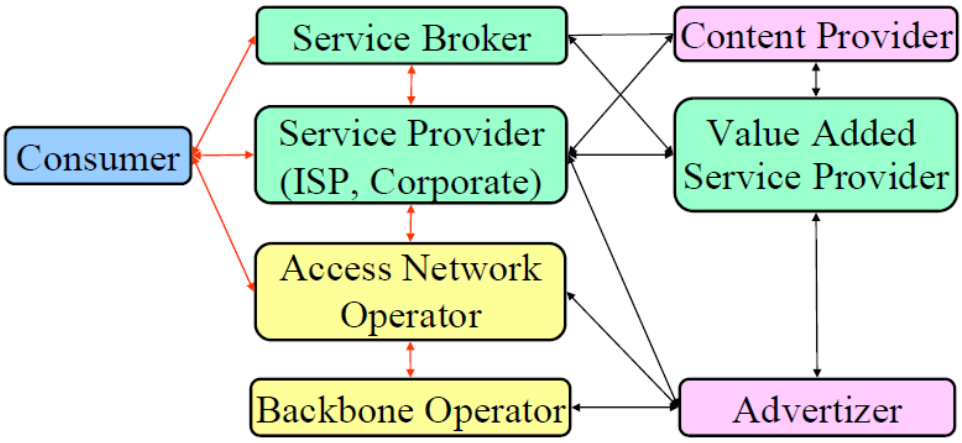

Figure 11. Reference business model

Top 10 operators in September 2008:

1. Iliad (Free) - France
2. France Telecom (Orange) - France
3. PCCW - Hong Kong
4. Nuef Cegetel - France
5. Telefonica - Spain
6. Chunghwa Telecom - Taiwan
7. China Telecom - China
8. Belgacom - Belgium
9. TeliaSonera - Sweden
10. Fastweb - Italy

PCCW has shown to develop a viable business model that includes a basic free service. On top of that, the operator has found that premium sports and HD offerings are important reasons for subsriber and ARPU increase.

9. Costs of IPTV networks

Classification of CapEx costs for telco:

- network infrastructure (shared; two-phased scheme)
  - e.g. equipment
- network software (shared; two-phased scheme)
  - e.g. network management system
- non-telco specific infrastructure (common; not straightforward)
  - e.g. land and buildings

Classification of OpEx costs for telco:

- OpEx for network in operation
  - telco-specific continuous cost of infrastructure (shared; two-phased scheme)

    - maintenance (shared; activity-based costing)
    - reparation (shared; activity-based costing)
    - service provisioning (direct; directly allocated)
    - pricing and billing (shared; directly allocated)
    - operational planning (shared; activity-based costing)
    - marketing (direct; directly allocated)
- OpEx associated with setting-up the network
    - up-front planning (shared; two-phased scheme)
    - first-time installation (shared; two-phased scheme)
- non-telco specific OpEx
    - non-telco continuous cost of infrastructure (common; not straightforward)
    - non-telco specific administration (common; not straightforward)

Telco-specific continuous cost of infrastructure includes costs for floor space, power and cooling energy, and leasing network equipment. **Maintenance cost** can be seen as the cost of preventative measures such as monitoring and maintaining the network against possible failures. Repair costs include diagnosis and analysis, travel by technicians to place the failure, fixing the failure, and testing to verify the repair. **Provisioning and service management cost** includes testing, service provisioning, service move or change, and service cessation. **Pricing and billing cost** includes sending bills to customers and ensuring payment. **Operational network planning cost** includes all planning performed in an existing network such as day-to-day planning, re-optimisation, and planning upgrades. **Marketing cost** includes promoting a new service, providing information concerning price, etc.

Up-front planning cost includes planning studies to evaluate the building of a new network, changing the network topology, introducing a new technology or new service platform, etc. **First-time installation cost** includes actual connecting and installation of the new component into the network, as well as the necessary testing of the component and its installation.

Non-telco continuous cost of infrastructure includes leasing infrastructure not related to the network itself such as buildings to house the personnel, energy for desktop PCs, heating, cleaning of buildings, etc. **Non-telco specific administration cost** includes employee payroll administration, office support staff, human resource department, etc. Non-telco-specific administration and non-telco-specific cost of infrastructure can jointly be seen as "overhead" costs.

See Section 3 for definitions of **direct costs**, **shared costs** and **common costs**. The two-phased cost allocation scheme and activity-based costing are described in (Casier, 2006a,b).

Calculation of overall cost for a network scenario involves several steps:

1. Collecting equipment information
2. Dimensioning the network
3. Calculating total CapEx cost
4. Calculating OpEx for equipment installation
5. Calculating OpEx for a network that is up and running
6. Calculating the cost distribution over time

Alcatel-Lucent divides the CapEx costs for IPTV network infrastructure and software into 3 categories:

- Home network
    - residential gateway

    - STB
- IPTV service network
    - security and monitoring
    - IPTV HW platform
    - IPTV SW platform
- Access network
    - optical network
    - access network
    - IP & Ethernet aggregation
    - data centre network
    - system integration

The overall CapEx cost per subscriber reduces with the increased subscriber base, but the cost of the home network component effectively remains constant.

Appendix A: Economic concepts and terms

The following terms and associated concepts are the most frequently used to analyze the Telecom business and decide on best project alternatives with its specific properties due to the multiplicity of diverse equipments, life cycles and operational practices. For a more detailed economic terms definition refer to classical books of Economy.

Amortisation refers to the paying off of a debt with regular payments and it also has the meaning of the accounting procedure that gradually reduces the cost value of an intangible asset, that is, depreciation. Amortization is the method of liquidating a debt on an installment basis; for example an amortized loan would be one where the principal amount of the loan would be paid back in installment over the life of the loan. Sometimes used as an alternative term for depreciation, in particular with regard to the process of writing off the cost of an intangible asset, such as a lease or patent, over its useful life.

Assets are resources owned by an enterprise. In the balance sheet assets are listed in rising order of liquidity. They include fixed assets (land and buildings, plant and machinery, etc), current assets (inventories, account payable, etc.) and liquid assets (cash in hand, cash in banks, cheques, etc).

Breakeven period is time required for project revenues (after deduction of operating expenses) to offset investment expenditure. This method of comparing project avoids the need for discounting calculations. It takes account, however, neither of the effects of the time factor of the different alternatives, nor of what happens after breakeven.

Business case is a special instances of the business model are analysed to figure out the quantitative foundation for the management decisions.

Business domain is an environment where the business is run including all relevant entities, regulation, standards, etc.

Business model (BM) that can be understood as a snapshot of reality that enables effective modelling and analysis of different aspects of the business.

Business modelling is the process of planning and designing business models—it is an important input to strategic management, usually by assuring the qualitative results.

Business plan is a document that collects information on all relevant aspects of the BM -- (1) industry and market models, (2) product, production and marketing process, and (3) financial data (cash flow analysis, income statement, balance sheet).

Business situation is a particular situation of interest for the focal entity; it is described by the market picture (customers, partners, competitors), technical solution (network, services, applications, terminals), environment structure (regulation form, politics) and organisation of the entity.

Cash flow consists of cash receipts and cash disbursements over a given period. Also funds generated internally by the activity of an enterprise or a project equivalent to the balance between the inflow of funds arising from revenues and the outflow of funds arising from expenditures. The following diagram illustrates the main generators for the inflows to the company classified in three categories: The first one at the left is the specific business operating income due to the selling of services to customers and the most interesting to analyze when comparing projects or evaluating strategies for the operator evolution. The other two consider the generic financing capital increases either due to the shareholders by a capital increase or to the external sources of capital by credits or loans.

Typical originators for the outflows in a company are also summarized in the diagram with the first three concepts due to the proper activities of the Telecom activity itself like labor force, network equipment investment and all technical, operation and administrative expenses. The other three concepts reflect the generic outflows due to taxes, debt payment and dividends for the shareholders that are needed to have an overall company running.

A detailed analysis of the specific Telecom associated inflows and outflows is the nucleus of the operational business analysis when a decision has to be taken in a modernization of the network, migration to NGN, introduction of new services, etc. Yearly cash flows are taken as the main base for the evaluation of a company value, capability to generate business and calculation of the NPV when transforming into present values and decide which evolution alternative is recommended.

Main sources of inflows are due to the revenues of the different operation services and at the end of evaluation period also the terminal value of those network elements that did not reached the end of life cycle have to be taken into account as they have a positive value.

As main components of the outflows we have the major CapEx equipment investment at the project start with the corresponding equipment extensions or upgrades for capacity increase in subsequent years as well as equipment substitution when some of the elements reached their end of life cycle. OpEx increases as a function of the cumulative invested CapEx through time and is the main outflow component at the medium long term.

Net cash flow is derived from the difference of the inflows and outflows and provides the main input for a more detailed dynamic evaluation of the project added value to a company. Higher cash flows at the end of the evaluation period and a prompt turn into positive values are good indicators for a better project.

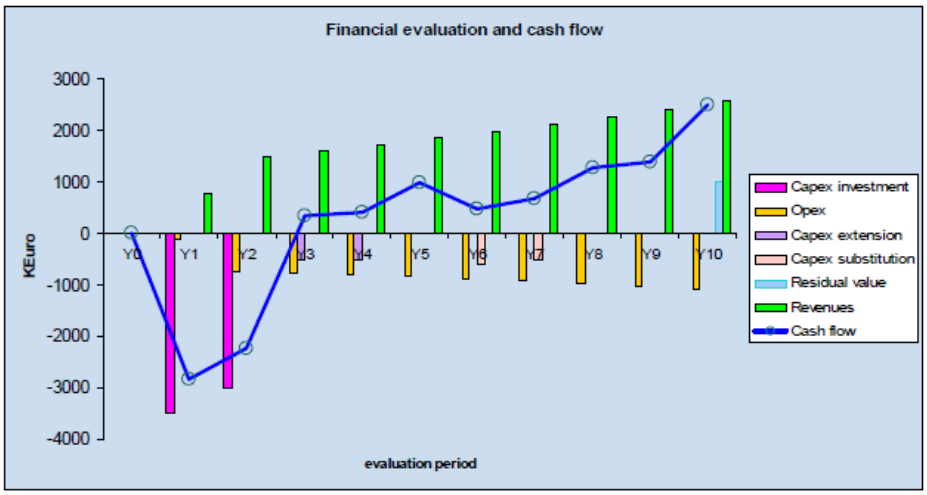

Figure A1. Typical components as a basis for evaluation of a company (ITU-T,2008).

Churn is an annual rate at which the own customers or subscribers leave the service either to move to a competitor, to migrate to other service or leave the market.

Depreciation represents loss of value of an asset over time, as a result of wear, aging or obsolescence. With the method of linear (or straight-line) depreciation, the loss of value of an asset is spread uniformly over the number of years of its useful life. Depreciation charges do not give rise to an actual outflow of funds and the sums remain available to the enterprise.

Discounted cash flow (DCF) approach describes a method of valuing a project, company, or asset using the concepts of the time value of money. All future cash flows are estimated and discounted to give their present values. The discount rate used is generally the appropriate cost of capital and may incorporate judgments of the uncertainty (riskiness) of the future cash flows. Discounted cash flow analysis is widely used in investment finance, real estate development, and corporate financial management.Very similar to NPV.

Discounted payback period (DPP) is an investment decision rule in which cash flows are discounted at an interest rate and then one determines how long it takes for the sum of the discounted cash flows to equal the initial investment.

Discount factor is the discount rate used to calculate the net present value of a company or project. This rate has to consider the cost factors for the capital of the company such as interest rate, and expected inflation in a strict sense. In a wider sense has to consider also the risk rate for long term evaluation in large projects and new scenarios with uncertainty.

Earnings before interest and taxes (**EBIT**) is a measure of a firm's profitability that excludes interest and income tax expenses.

EBIT = Operating Income + Non-operating Income

Operating Income = Operating Revenue – Operating Expenses

Operating income is the difference between operating revenues and operating expenses (OpEx), but it is also sometimes used as a synonym for EBIT and operating profit. A professional investor contemplating a change to the capital structure of a firm (e.g., through a leveraged buyout) first evaluates a firm's fundamental earnings potential (reflected by Earnings Before Interest, Taxes, Depreciation and Amortization EBITDA and EBIT), and then determines the optimal use of debt vs. equity. To calculate EBIT, expenses (e.g., the cost

of goods sold, selling and administrative expenses) are subtracted from revenues. Profit is later obtained by subtracting interest and taxes from the result.

Earnings before interest, tax, depreciation and amortization (EBITDA) means all the (annual) revenues minus operating costs that is the basic information for the evaluation of a business from its own specific factors and the first indicator to be calculated and analysed. The following diagram illustrates a simplified interrelation among main generators for the EBITDA and the sequence to proceed in the obtention of the Net Income.

Economical value added (EVA) or net operating profit (after tax) minus the cost of the capital used to generate that profit either in debt or in equity. It is a good indicator for the point of view of the investors.

Future value (FV) is the value of a present amount at a future date. It is found by applying compound interest *r* over a specified period of time.

$$FV = PV(1+r)^n$$

Internal rate of return (IRR) is a capital budgeting metric used by firms to decide whether they should make investments. It is an indicator of the efficiency or quality of an investment, as opposed to NPV, which indicates value or magnitude.

The IRR is the annualized effective compounded return rate which can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero.

Definition:

IRR is the value of *r* that satifies:

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+r)^t} = 0$$

Objective is to have IRR ≥ required minimum IRR.

Advantages of IRR:

- Takes into account all CFs
- Takes into account timing of CFs (time value)

Disadvantages of IRR:

- Does not take into account size of project

Life cycle costing is the full cost of an asset over its life. This includes all costs associated with acquiring, controlling, operating and disposing of the asset.

Net present value (**NPV**) is defined as the total present value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting, and widely throughout economics, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met.

Definition:

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+r)^t}$$

where

t - the time of the cash flow

r - the discount rate (minimum required return on investment)

CF_t - the net cash flow (the amount of cash, inflow minus outflow) at time t

Projects with NPV<0 should be rejected. Projects with NPV>0 may be accepted. This does not necessarily mean that they should be undertaken since NPV at the cost of capital may not account for opportunity cost, i.e. comparison with other available investments. Projects with NPV=0 adds no monetary value and the accept/reject decision should be based on other criteria, e.g. strategic positioning or other factors not explicitly included in the calculation.

Advantages of NPV:

- Takes into accound all CFs
- Takes into account timing
- Takes into account size of the project (size of cash flows)

Disadvantages of NPV:

- Dependent on considered lifetime (t)
- Does not penalize huge intermediate losses

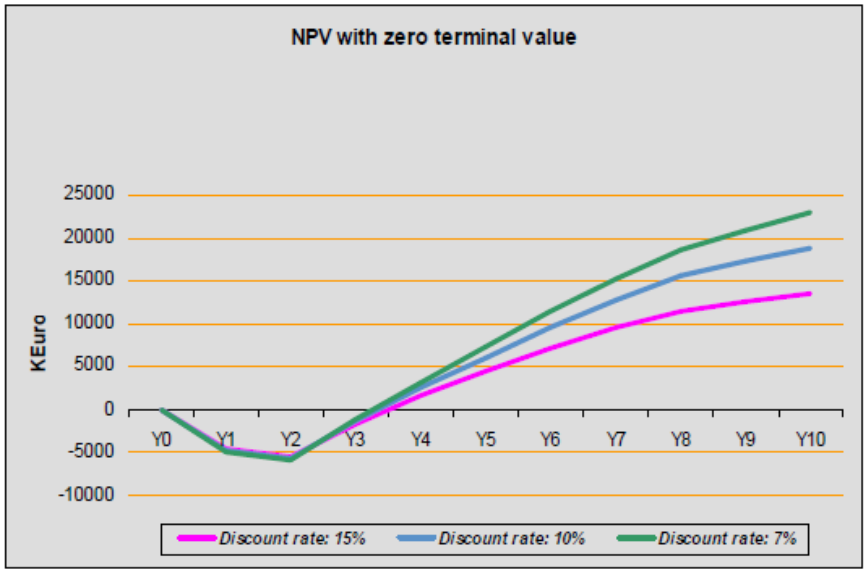

Figure A2. Typical NPV evolution for a new project as a function of the discount rate (ITU-T,2008).

Payback period is the number of years required for a firm to recover the initial investment required by a project from the cash inflows it generates. Short payback periods are preferred.

Like internal rate of return, the payback period metric takes essentially an "Investment" view of the action, plan, or scenario, and its estimated cash flow stream. Payback period is the length of time required to recover the cost of an investment (e.g. purchase of computer software or hardware), usually measured in years. Other things being equal, the better investment is the one with the shorter payback period. Also, payback periods are sometimes

used as a way of comparing alternative investments with respect to risk: other things being equal, the investment with the shorter payback period is considered less risky.

Present value (PV) is the current monetary value of a future amount. The amount of money that would have to be invested today at a given interest rate *r* over a specified period to equal the future amount.

$$PV = FV/(1+r)^n$$

PV is the currency value today of some future inflow, outflow, or balance of funds. In essence, it is the discounting of future funds to their present value by taking into account the time value of money. It is useful in providing a common basis for comparing investment alternatives. See also discounted cash flow, future value, and net present value.

Residual value is the value of an investment at the end of its economic or estimated life. At the end of the period, residual value may be treated as a positive cash flow, and discounted as such. The present value of the business attributable to the period beyond the forecast period.

Return on investment (**ROI**) is the ratio of money gained or lost (realized or unrealized) on an investment relative to the amount of money invested. The amount of money gained or lost may be referred to as interest, profit/loss, gain/loss, or net income/loss. The money invested may be referred to as the asset, capital, principal, or the cost basis of the investment. ROI is usually expressed as a percentage rather than a fraction. ROI does not indicate how long an investment is held. However, ROI is most often stated as an annual or annualized rate of return, and it is most often stated for a calendar or fiscal year.

Definition:

$$ROI = \frac{V_f - V_i}{V_i}$$

where

V_i - initial value of an investment
V_f - final value of an investment

The objective is to have ROI ≥ minimum required ROI.

Advantages of ROI:

- Takes into account CFs after payback time
- Takes into account size of project (size of cash flows)

Disadvantages of ROI:

- Does not take into account timing of CFs

Return on capital employed (ROCE) is net income divided by the sum of fixed assets and working capital. Shows the company profitability from the point of view of the owners.

Techno-economic analysis is the process of analysing different business cases to find out adequate technological solution and/or the overall profitability of the case—its input to the strategic management includes the quantitative results.

Appendix B: Business modelling concepts and terms

B.1 Service domain terms

Value as the intrinsic property of the product that a customer is willing to pay for, is described in a value proposal which together with value creation logic is combined into a value model.

Value proposition includes identification of the key value drivers and elements, which enable the company to differentiate itself from the competitors.

B.2 Technical domain terms

Capacity is capability of an equipment, network or sub network to handle the traffic flows with an

associated grade of service.

Head end is central or regional communication end system that transmits video information stored on VoD and broadcast servers.

Middleware implements IPTV by providing TV-Portal/EPG, user management, interactive service, channel/package and program together with pay TV solutions.

Network infrastructure consists of core network, metro network, access network and home network.

Set-top box (STB) is a communication end system at the customer premise that receives video information and supports user interactivity.

Security means service protection, content protection, consumer privacy, device protection and network protection.

Traffic Engineering (TE) involves both capacity management and traffic management and involves a trade off between effectiveness and simplicity.

B.3 Organisation domain terms

Roles are functions that the business entity playing this roles takes in order to realise the product/deliver the service.

Relationships are the information flows between two roles; can be business related (e.g. billing method, tariffing schemes, SLA negotiation, etc) or technical (e.g. signalling, management, payment method, etc).

Value configurations includes network of partners, which describes how the value is created, who contribute to it (i.e. relationships), and how it is distributed and finally, consumed. Value configurations reflect value creation logics. The value chain and the value network are examples of value configurations.

Value chain encapsulates a set of interconnected activities that bring a value/product/service to the market.

Value network is a network of relationships that generates economic and other types of value through dynamic exchanges between two or more participating players. The exchanges may be tangible and intangible in nature.

Vertical integration refers to the extent to which a player controls the production and distribution of services in a value chain.

Horizontal integration occurs when a firm in the same industry and in the same stage of production is being taken-over or merged with/by another firm which is in the same industry and in the same stage of production as of with the merged firm.

B.4 Financial domain terms

Operational Expenditure (OpEx) is all non-capitalised costs of operating the network either associated to each network element, to running the services or generic company activities.

Typical operation cost associated to the network elements are:

- Maintenance
- Connection
- Rental
- Technical operation
- Decommissioning

Services associated operations include:

- Service activation
- Commercial operation
- Service marketing campaigns
- Balance of international traffic (if negative)
- Compensation to content providers, etc.

Generic operation costs consider:

- Labor costs
- Social charges

Training

- Company marketing
- Administrative expenses
- Bad debt

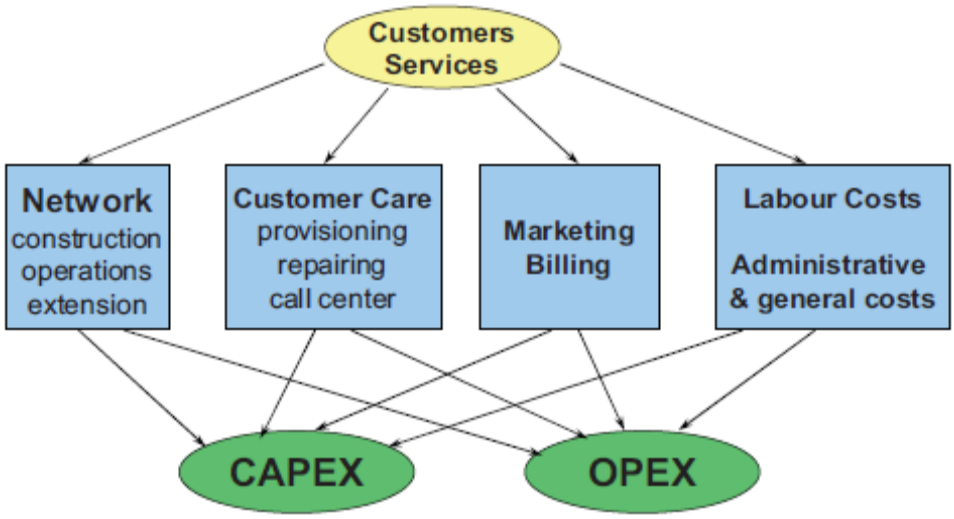

Figure B1. Expenses calculation (ITU-T,2008).

Capital Expenditures (CapEx) are due to the purchase of a fixed asset to be installed at the different

network segments and layers:

- Typically: land, building, exchange, cabinet, duct, fiber, cable, transmission system, tower, BTS, computer, IT platform, car, etc.
- Costing more than a threshold defined internally in any company and following current financial best practices in order to allow consideration as an asset and not as a consumable or operation expense.
- Having an expected life of more than one year (value subject to specific parameters of industry sectors and companies)

Revenues is an income statement term, referring to the sum of money owed the company for sales of goods and services. Revenues (or "Sales") are ordinarily the top line in the income

statement, against which most other costs and expenses are subtracted to calculate income. In Britain, the term turnover is often used in place of revenues. The term revenues generally mean "gross revenues," that is, revenues before adjustments for customer discounts and allowances.

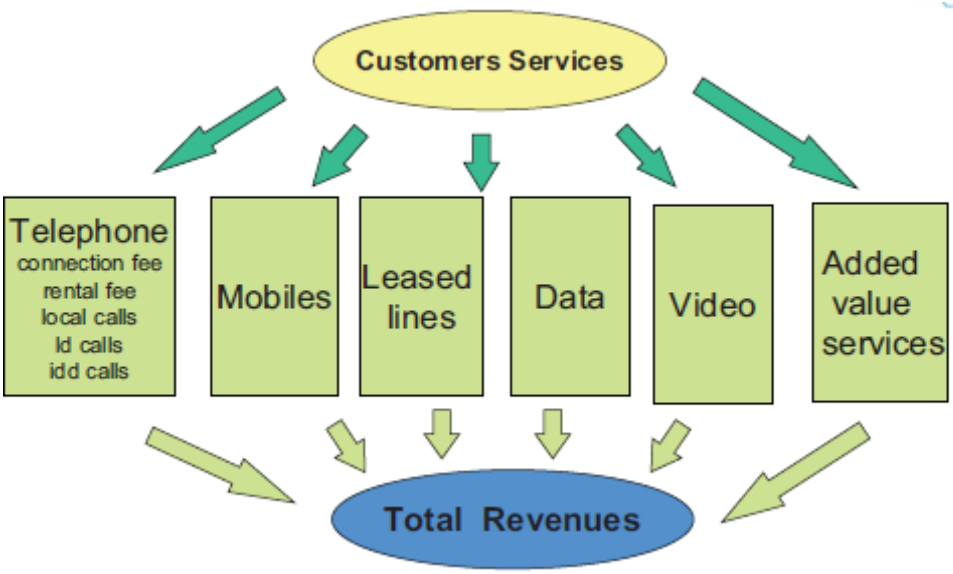

Figure B2. Services revenues calculation (ITU-T,2008).

Profit is another term for Net Income or Earnings. Surplus of sales revenues over costs or expenditure during an accounting period or operating cycle. Leads to an increase in owners' equity, though not necessarily to an increase in cash. It may be reflected in increased assets or decreased liabilities. Net profit may refer to profits after tax (on profits) or to profits less financial costs, depending on the purpose of the analysis.

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