Tariff Models for Telecommunication Services in a Liberalised Market

by Katarina Stanojevska-Slabeva, mcm institute, University St. Gallen, Switzerland

I Introduction

The liberalisation of the telecommunication market in many countries has marked a fundamental change in business practices of telecommunication providers. We have witnessed a steady decline in telecommunication prices in countries with liberalised markets. The change is also marked by experiments with new tariff models.

Before deregulation, tariff models, i.e., calculation schemas and pricing for telecommunication services were influenced by national monopoly supply, social objectives, certain competitive and customers pressure, and they were rather less influenced by hardware and software progress and innovation or international consensus regarding cost allocation methodologies (Gupta et al., 1997). As a result, there was one tariff model for specific services (for example Ramsey pricing, i.e. differentiation pricing for telephone services based on time of usage and distance), which made telecommunication costs transparent and predictable.

The liberalisation of the telecommunication market in many countries, the convergence of infrastructure, the emergence of new services such as interactive TV and particularly the explosion of Internet usage has given rise to a broad discussion of possible new tariff models in a liberalised market. The pressure to introduce new tariffs for telecommunication services has also resulted from inefficient resource allocation on Internet based on the prevailing flat-rate based model (Walker et al., 1997), (Gupta et al. 1997). This trend is further encouraged by the growing possibility of sophisticated networks based on ATM technology to support variation of bandwidth and the measurement of the usage of network resources (Anania et al. 1995). Finally, in the new competitive environment, service providers are constantly under pressure to find new ways of positively differentiating themselves from their competitors. One competitive advantage could be the introduction of new tariff models.

As a result of the developments described above, the introduction of new tariff models might be considered as one possible future scenario for the development of the telecommunication market (Williams, 1997). This could affect all players in the market for telecommunication services – the consumers, service providers, network operators and producers of equipment, i.e. of hardware and software for network operation and management.

The aim of this paper is to provide an overview of existing tariff models, to describe experiments made during liberalisation, as well as to describe possible future scenarios for pricing strategies based on related research.

The content is structured as follows: First in section 2, tariffs are defined and the most important tariff models are explained. Section 3 provides an overview of existing and possible pricing strategies for the most important telecommunication services: voice communication over fixed networks, mobile communication and Internet communication. Section 4 provides a summary and an overview of possible future scenarios for pricing of telecommunication services.

2 Definition and Classification of Tariff Models for Telecommunication Services

In every day life we understand under the word “tariff” to be the price for telecommunication services. This word is furthermore used interchangeably with the words rate and price. In this paper we distinguish between tariff model and price. Thus, in order to prevent misunderstanding first the basic terms will be defined.

We define a tariff as a scheme of rates and regulations governing the charging of telecommunication services. A specific tariff model consists of two components:
- a monetary component called price
- a related tariff model, i.e. a calculation schema, which clearly delimits the unit for which the given price is valid and provides a charging function which governs the calculation of costs. For example prices for voice communication are defined per time unit of active usage of the network, whereby the time units are priced differently according to distance, time of the day and type of customer.

In theory numerous tariff models have been proposed for telecommunication services. Following, the most important categories of tariff models will be described in more detail in accordance with (Mitchell and Vogelsang, 1991).
2.1 Typology of Tariff Models

Tariff models are basically classified in three groups: linear tariff models, non-linear tariff models and discounts.

**Linear Tariffs** are based on an equal price per defined unit of usage and comprise usage based pricing and Ramsey pricing. In usage based pricing the revenue depends on the quantity, i.e. number of units sold. Total cost of a call or transmission is calculated by a multiplication of the unit price with the number of units used. Usage based tariff models differ with respect to what is defined as the basic unit of usage. For telecommunication services, the unit of usage might be: time of usage, volume transferred, and allocated bandwidth.

Ramsey pricing or differentiation pricing is a special linear tariff, where different prices are charged for essentially the same service, i.e. for a defined unit of usage. The prices can be differentiated according to customer type (for example private and business customer), time of the day, distance of the call, etc. For further examples of differential pricing and its economic aspects see (Varian, 1996).

**Non-Linear tariffs** result in different prices per used unit. The best known and simplest non-linear tariff is flat rate (McKnight et al. 1997). With this model, the customer pays a fixed price for a certain period of time, regardless of how much he uses the service. From the customer’s point of view, the ability to budget for that service may be an advantage. The service provider also saves costs, as no measurement related to charging is required.

Further tariff models can be defined by combining linear and non-linear tariff models to complex tariff-models. One such example is the Two-Part Tariff which consists of a fixed entrance fee for a certain period of time and Ramsey Pricing for used units.

The above mentioned tariff models can, furthermore, be combined with a fixed or changeable price per defined unit. In the first case we have static tariff models and in the second case we have dynamic tariff models (Morris and Verus, 1999). Static tariff models are all linear tariff models. Examples of dynamic tariff models are the block dynamic tariff and the discrete dynamic tariff, where the price per unit is increased or decreased during the transmission once a set amount of used units is reached.

**Discounts** are a special type of tariff model. While the above described tariff models are applied in order to calculate the cost of each call or transmission, discounts are applied to decrease the total cost for the customer. They are defined as a percentage of total costs, which is deducted at the end of the billing period. They can be defined over total costs incurred for a special type of transaction or on total costs incurred for a certain period of time. Discounts are applied in combination with tariff models and result in an additional reduction of prices.

2.2 Charging and Billing of Telecommunication Services

Tariffs are used in order to calculate the total cost for a telecommunication service used by the customer. Thus, they provide the base for charging and billing of telecommunication services. Charging is the process of determining the total cost for telecommunication services for a certain period of time. Billing is the process of notifying the customer about the charges and the legal require for payment.

Charging can take place in two ways 1) on a regular basis for an agreed upon period of time (for example monthly or quarterly) or 2) during the call. In the second case, we are talking about advice of charge (AOC). Advice of charge is a special network function, which allows notification of charges before, during and immediately after a call. AOC is the prerequisite for online and real-time charging. It is already applied in case of calls from public phone cabins or prepaid cards.

3 Prevailing Tariff-Models for Telecommunication Services

In this chapter the prevailing tariff models for the most important telecommunication services as voice communication, mobile communication and Internet will be described.

3.1 Prevailing Tariff Models and Pricing Strategies for Voice Communication over Fixed Phone Networks

Before liberalisation, voice communication was charged based on a two part tariff model consisting of:

- A fixed monthly access fee and
- Ramsey pricing for defined time units of network usage. Prices were differentiated according to type of customer, distance of the call, time of the day and day in the year (holidays and working days).

Against this background new providers of telecommunication services applied the following pricing strategies (Stanevksa-Slabeva, 2000): the Ramsey pricing part of the former monopolist’s two-part tariff model. The new entrants also tried to differentiate themselves and to attract customers by remarkably lowering prices when compared to the prices of the incumbent. Most entrants used the percentage of reduction against the price of the incumbent as a major marketing slogan.

Even though new entrants adopted Ramsey pricing, they tried to differentiate by changing some of the param-
etters of these calculation schema. In particular each entrant tried to define:

- different time units, for which prices were defined,
- different time intervals as peak and off-peak intervals with different prices. (see for example the strategies of two Swiss companies Sunrise and Swisscom provided in figure 1).

As a further differentiation strategy of new providers, numerous discount models have to be mentioned. Examples of discount models include:

- discounts on costs for calls to one or several predefined domestic and international telephone numbers or countries,
- discounts on costs for calls to certain telephone numbers with the highest monthly turnover,
- volume discounts on total costs occurred during a given period of time (for example monthly).

The discount rates and the strategies for which kind of calls discounts are offered differ from provider to provider. Private and business customers are treated differently as well.

Besides the above described European developments, the following pricing strategies and experiments have to be mentioned:

- Application of flat-rate for local calls in the USA. This pricing strategy led to higher communication traffic in the USA, when compared to Europe, and also fostered Internet adoption and usage.

- Free phone communication, which is financed with advertising. With this model, the customer does not pay for the services, but has to listen to advertisements during his call. This experiment was conducted in the German market. Even though there were a sufficient number of interested customers for the free service, it was not rolled out after the test phase because there were not enough interested parties, who wanted to advertise over the phone.

The above described developments resulted in significantly lower prices for telecommunication services, but also increased the opaqueness of the market. The providers with their numerous tariff times and time units cause confusion for the consumer.

3.2 Prevailing Tariff Models and Pricing Strategies for Mobile Communication

With respect to applied tariff models, the same observations can be made in mobile communication as with voice communication. Before liberalisation, mobile communication was priced with a two part tariff, consisting of a fixed monthly access fee and Ramsey pricing per time unit of usage. The same tariff model is also used after liberalisation, but again with a redefinition of basic parameters.

Another important change is the growing importance of advice of charge and prepaid cards for mobile communications. Prepaid cards apply Ramsey pricing, i.e. a linear tariff for usage and advice of charge as the cost of each call is deducted from the amount on the card. Even though price per unit is higher as it includes a portion of the fixed fee, prepaid cards are popular as they enable an easy control of total costs for communication and do not require a check of the creditworthiness of the customer. Prepaid cards are especially interesting for young people with limited budgets for communication.

New tariff models will be necessary with the introduction of third generation (3G) digital packet-switched broadband mobile networks, such as Generalised Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS). GPRS is seen as the first step towards UMTS and is currently being established in several European countries. These technologies enable an always on connection to the Internet and hence one that will permit charges to be levied per packet sent, i.e. based on the volume of received or send data (Curwen, 2000). Given the different volume-based tariff models prevailing currently on the market for business customers of Internet described in more detail in the next section, scenarios for volume-based pricing of mobile services are expected.

With the introduction of 3G mobile networks, new pricing paradigms will be applied for mobile communication, which might pose a serious obstacle for
the adoption of the technology. Existing experiences in pricing of telecommunication services show that the customer is used to and prefers simple tariff models such as flat rate (Odlyzko, 2000) and that volume based tariff models can considerably influence usage (see also the volume-based tariffs for the Internet services in the next section).

3.3 Prevailing Tariff Models and Pricing Strategies for the Internet

Prevailing tariff models and pricing strategies for Internet differ for the end-consumer and business market. Before liberalisation, Internet access via telephone for private customers was charged according to a two part tariff model: a fixed monthly charge for a certain amount of hours of usage and a linear tariff for any additional hour exceeding the hours included in the fixed access fee. In addition, the telephone connection during the Internet sessions is charged at the lowest local tariff offered.

Due to the strong competition, providers were constantly increasing the number of hours included in the fixed monthly charge, which was a clear trend towards a flat rate. At present, there are many providers in Europe offering a flat-rate or free Internet, which is similar to the situation in the USA.

Compared to the end-customer market for Internet access, the market for business customers is basically priced by volume-based tariffs, in particular in countries, which have expensive lines to the USA. One example, which is documented in literature, are the university networks in Australia and New Zealand (Brownlee, 1995), (Carter and Guthrie, 1995). Other examples are the SWITCH network in Switzerland (for a detailed description see Stiller et al., 2000) and the JANET in Britain. The experiences with usage based pricing show, that these tariff model affects usage intensity (Odlyzko, 2000). (Stiller et al., 2000).

Another variant of volume-based charging, that seems to have become popular recently is a 'Bursty' rate, where the Internet Service Provider periodically, e.g. every hour, measures the volume of data transferred over the connection. For each charging interval, e.g. a month, all samples are sorted by volume. A fixed percentage of the highest samples are discarded to eliminate unusual peaks, and the highest remaining sample is used to define the bandwidth at which the connection is charged (Stiller et. al, 2000).

Due to congestion on the Internet in the late 1990s and equal quality of service for all users there has been great controversy in science concerning the right pricing model for Internet. A summary of tariff models proposed by different researchers is given below:

1. Quality of Service (QoS) based pricing.

One interesting example of QoS-based charging is the Paris Metro Pricing model proposed by (Odlyzko, 1999), (see also Fishburn and Odlyzko, 1998). Under this approach the network is divided into different logical subnetworks, each of them handling packets on the best-effort base, but charging different prices for them. This is an analogy to the price system used in the subway of Paris, and it is to be expected that a more expensive subnet will be frequented less often and is hence able to deliver high-quality service, but without giving formal guarantees for that. Descriptions of other QoS based models can be found in (Stiller et al. 2000).

2. Auction based allocation of Internet resources.

The idea of auction pricing was introduced by MacKie-Mason and Varian (1995) and is known under the name smart market approach. With auctions, the prices for services are determined based on consumer bids. The basic idea is, that each packet contains a bid, and if it is served, pays a clearing price given by the highest bid among packets which are denied service. Thus, each node in the network becomes an efficient market. Another approach is the ‘Progressive Second Price Auction for Network Bandwidth Sharing’ proposed by Lazar and Semet (1999). Compared to the previous approach, this approach proposes auctioning of bandwidth, rather than auctioning based on individual packets. Available bandwidth is split into small units, and users bid for the required bandwidth at each auction period. This approach generalises the idea of Vickrey auctions – the winner pays the price per unit which is calculated from all players’ bids, when each of them is weighted by how much the allocation of that player is decreased by the existence of their bid.

All auction based approaches for resource allocation and price determination show an often cited drawback of a lack of price transparency and predictability. This results in problems for communication budget definition. In addition, auction-based pricing requires adoption of the technology and hardware. Due to the these drawbacks, it is not sure if auctions will be accepted by users. Relevant input with respect to this question is provided by the INDEX project at Berkeley, which conducts experiments with static, usage-based pricing schemes (Varian, 1999).
3. Content-based pricing

The concept of content-based pricing was introduced by (McKie-Mason, Schenker and Varian, 1996). The authors distinguish content and application blind networks and content and application aware networks. The second type of networks has the possibility for differentiation pricing based on the type of content transported through the network.

Another approach, which proposes pricing for differentiated Internet services is the one proposed by Hartanto and Carle (1999). They propose an application architecture, which allows application of various tariff models (time unit or volume based) for different services (see also Semet et al. 1999).

4 Summary and Outlook

Based on the findings described in the sections above the following conclusions can be drawn:

- The prevailing tariff model for voice communication is the two part tariff model consisting of a fixed entrance fee and Ramsey pricing for a defined time unit of usage. Differentiation is usually performed according to the type of customer, time of the day, distance and day of the year. The Liberalisation of telecommunications markets has therefore not yet led to an application of new tariff models on a large scale.
- The basic differentiation strategy of new entrants was aggressive price policies. Another differentiation strategy of entrants was the redefinition of the parameters in Ramsey pricing and the introduction of numerous discount models, which resulted in great opaqueness of the market.
- For Internet services the prevailing tariff models are free access, flat rate or a two part tariff model with fixed access fee and linear pricing per defined time unit spent online for the end-consumer and volume-based pricing for business customers.
- The growing importance of advice charge and various prepaid cards, which are based on advice of charge is obvious.
- New kind of tariff models such as bandwidth allocation by way of auctions, bandwidth oriented pricing, QoS based pricing, usage based pricing for transmitted volume instead of time used or content-based pricing have had an experimental character.
- The neglectance of possible tariff models other than Ramsey pricing based on time used, can be explained with the following reasons:

- Due to the earlier monopoly, the profit margins included in the prices of the incumbents were high enough to provide a great opportunity for a price war. An aggressive price policy is also a great marketing instrument and efficient for attacking of new customers and for winning market share.
- Discounts are also very efficient marketing instruments and enable individualised pricing without the necessity of introducing new equipment. This fostered their broad usage.
- Telecommunication services on offer have remained basically the same. New services such as interactive TV, video on demand or broad usage of video conferencing, which might require high Quality of Service and bandwidth are still not in wide use. As a consequence there is no demand for tariff models based on QoS or bandwidth allocation.
- The introduction of free access and flat rate for popular services such as the Internet is expected to increase demand for voice communication.

Can this trend of price decrease continue? What could be the future pricing strategies? The following future scenarios can be envisioned and are explained shortly below:

- The opaqueness in the market requires real time feedback for the customer, i.e. advice of charge. AOC is currently available during the call and after the call, but AOC before the call can increase the transparency of the market and is attracting high attention.
- Another possible development is the combination of different tariff models for the same service. For example in many countries early attempts can be observed where during the week a two part tariff is used for voice communication and a flat rate during the weekend. Such pricing strategies have remarkable marketing effects.
- Application of different tariff models with respect to the offered service. For example a common pricing policy can be defined for several services (for instance free Internet bounded to subscription to the provider).
- Volume based tariff models for mobile communication, will become relevant latest with the introduction of GPRS networks.
- Tariff models based on QoS in particular for applications demanding high QoS.
- Application of different tariff models depending on the content transmitted and the used service.
References


About the Author

Dr. Katarina Stanojevsksa-Slabeva (katarina.stanojevska@unisg.ch) is currently working as a lecturer and as a scientific project manager of the research area “Media Platforms and Management” at the Institute for Media and Communications Management at the University St. Gallen. Her research interests are media platforms and telecommunication services, concepts for management of media platforms and reference models for component-based media.