Forecasting the Number of IPTV Subscribers in Serbia

Valentina Radojičić[1], Goran Marković[2] and Marijana Vukašinović[3]

***Abstract* – In this paper we consider the development of IPTV service market in Serbia, which is highly attractive, both for telecom as well as cable TV operators. Based on the real statistical data, we performed the forecast of IPTV demand from the view of the main national telecom operator until the end of the year 2013. We used the main Bass diffusion model for this purpose, because the marketing promotion did not exist for this service.**

***Keywords* – Bass model, forecast, IPTV, operator, subscribers**

I. INTRODUCTION

Internet Protocol Television (IPTV) is advanced telecommunication service that delivers video and live television streams over a terrestrial broadband infrastructure, which is not tunneled through the Internet, but delivered via a service providers' private/closed network using an Internet Protocol (IP). The service is delivered to a Set Top Box (STB), which is then connected to a TV, allowing the user to consume media services in a manner very similar, but not limited to current cable/satellite TV offerings. IPTV is different to Internet TV, which is essentially video streaming via the public internet to a PC. Although it is possible to get Internet TV content to a TV, typically this is not supported by Quality of Service (QoS) and can not be controlled other than via the PC.

IPTV is a relatively new concept, which has been launched by the invasive progress of high-speed broadband technology. Western European telcos and internet service providers (ISPs) were the first to deploy IPTV services using ADSL broadband services in the early to mid 2000s. Most existing IPTV service delivery platforms deliver content in standard definition format which requires download speeds of between 2 – 4 Mbps per channel being streamed. However, as the world moves toward High Definition TV, the capacity requirements increase significantly to 8 – 10 Mbps per channel being streamed. IPTV technology has rapidly evolved since the initial deployments in the early 2000's to achieve significantly greater levels of quality and functionality.

Nowadays, IPTV is highly attractive service to both telecom operators as well as ISPs (Internet Service Providers), because it represents an entirely new revenue stream to bundle with their traditional voice and data services. It is expected that the IPTV will become the killer broadband application during the next few years. The worldwide growth of IPTV subscribers during the last years was very dynamic. The new forecast from Multimedia Research Group (MRG) indicates that the number of global IPTV subscribers will grow from 28 million in 2009 to 83 million in 2013, a compound annual growth rate of 31%, as illustrates Fig.1 [1]

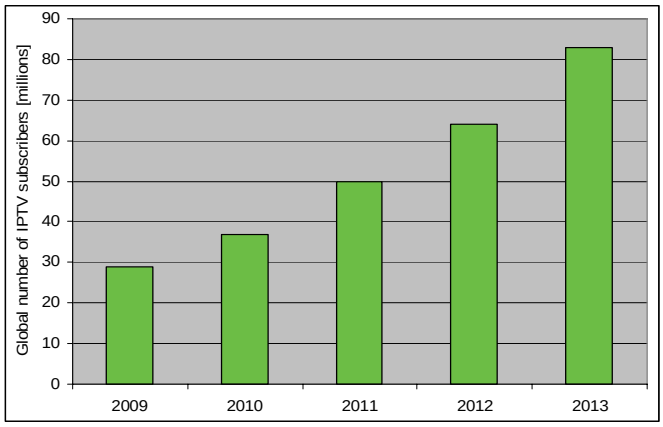

Fig.1 Global number of IPTV subscribers [source MRG, 2009]

IPTV adoption in Western Europe will continue to enjoy dynamic growth up to the 2014 — 19% per year — resulting in 20.3 million IPTV households in 2014 [2]. However, during that period, the dynamics of the IPTV market will change: The main growth factors that drove the IPTV market during its launch phase — home broadband adoption and the analog TV switch-off process — will gradually fade out, and short-term growth will mainly come from the conversion of secondary TVs to digital TV. The IPTV forecast for next five years is both conservative and optimistic, based on very detailed semi-annual analysis of individual Service Providers and on a country-by-country basis.

In this paper, we focused on forecasting the number of IPTV subscribers at Serbian telecommunication market for the main national telecom operator. For this purpose we used the main Bass diffusion model, because the marketing campaign did not exist [3]. The paper is organized in following manner. The second Section describes the basic analytical expression of the Bass diffusion model. The third Section gives the forecasted results for the IPTV users in Serbia. In the final section, the concluding remarks are given.

II. THE BASS DIFFUSION MODEL

The mathematical structure of the Bass model is derived from a hazard function corresponding to the conditional probability that an adoption will occur at time *t* given that it

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has not occurred yet [4,5,6]. If *f(t)* is the density function of time to adoption and *F(t)* is the cumulative fraction of adopters at time *t*, the basic hazard function underlying the Bass model is given by following equation:

$$\frac{f(t)}{1-F(t)} = p + q \cdot F(t) \quad (1)$$

Parameter *q* reflects the influence of those consumers who have already adopted the product/service (i.e. word-of-mouth communication from previous adopters), while *p* captures the influence that is independent from the number of adopters (i.e. external communication). The solution of equation (1) is given by following equation:

$$F(t) = \frac{1-e^{-(p+q)t}}{1+\frac{q}{p}e^{-(p+q)t}} \quad (2)$$

If *m* denotes the market potential for the new product/service, then the cumulative number of adoptions, *Y(t)*, at time *t* is given by:

$$Y(t) = m \cdot F(t), \quad (3)$$

while the current (non-cumulative) product or service sale at time *t*, *S(t)* is given by:

$$S(t) = mf(t) = pm + (q-p)mF(t) - qm(F(t))^2 =$$
$$= pm + (q-p)Y(t) - q/mY^2(t) = a + bY(t-1) + c[Y(t-1)]^2 \quad (4)$$

Where *t*=2,3,..., *Y*(*t*-1) is the cumulative sale at time *t*-1, *a*, *b*, *c* are the coefficients that have to be calculated based on the regression analysis. Hence, the value for *m* can be obtained as:

$$m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2c} \quad (5)$$

For *m*>0, the Bass model parameters of innovation (*p*) and imitation (*q*), could be obtained by following equations:

$$p = \frac{a}{m} \quad (6)$$

$$q = -mc \quad (7)$$

Based on thus estimated parameters *p* and *q*, the new service/product adoption for future period can be calculated.

III. Forecasting the Number of IPTV Subscribers

Based on the data of actual and forecasted total IPTV subscribers in the world, it was shown in our research that the estimated Bass parameters *p* and *q* are not directly applicable to the Serbian telecommunication market. Namely, if we use the same values for *p* and *q* (calculated based on the relevant historical IPTV statistical data), we obtained the great disproportion between the actual and forecasted results for the IPTV users in Serbia. Therefore, first of all, we try to estimate the valid values of parameters *p* and *q*, based on the real data from the Serbian IPTV market during the previous year.

Table I gives the data of the actual IPTV service sales during the year 2009. The total market potential for IPTV service in Serbia is currently estimated to be *m* = 500.000 subscribers.

In order to estimate the values for *p* and *q*, we performed the linear regression analysis to calculate the unknown parameters *a*, *b*, and *c*, from the equation (4).The values of (one time period) delayed cumulative sales *Y(t-1)*, as well as their square values, Y^2(t-1) could be simply obtained from the last column of Table I. The results of the regression analysis are given by Table II.

TABLE I
NUMBER OF IPTV SUBSCRIBERS DURING THE YEAR 2009

Month (2009)	Monthly # of IPTV subscribers *S(t)*	Cumulative # of IPTV subscribers *Y(t)*
January	1.975	1.975
February	1.594	3.569
March	1.425	4.994
April	1.152	6.146
May	1.930	8.076
June	3.408	11.484
July	3.421	14.905
August	2.640	17.545
September	1.679	19.224
October	1.509	20.733
November	1.704	22.437
December	1.579	**24.016**

TABLE II
THE RESULTS OF REGRESSION ANALYSIS

$S(t) = a + bY_{t-1} + cY_{t-1}^2$	
a	1302
b	0,5
c	-0,00000096

Based on the obtained values for *a*, *b* and *c*, we can now calculate the Bass parameters *p* and *q* using the equations (6) and (7), respectively:

$p = a/m = 1302/500000 = 0{,}002604$

$q = -cm = 0{,}00000096 * 500000 = 0.48$

Thus, the forecasted values of non-cumulative sales at time *t*, obtained by the Bass diffusion model could be calculated using the following expression:

$$p*(m-Y_{(t-1)}) + q*(Y_{(t-1)}/m)(m-Y_{(t-1)})$$

For the first time (month), the forecasted non-cumulative IPTV sale is 1302 subscribers. For the second month, the forecasted number of IPTV users equals to 0.002604*(500.000-1.302)+0,48*(1.302/500.000)*(500.000 - 1.302) = 1922. The calculated forecasted values for other months during the year 2009 are given in Table III.

TABLE III
FORECASTED NUMBER OF IPTV SUBSCRIBERS IN 2009
(p=0,002604 and q=0,4)

Month in year (2009)	Actual non-cumulative IPTV sale	Forecasted non-cumulative IPTV sale	Actual cumulative IPTV sale	Forecasted cumulative IPTV sale
January	1.975	1.302	1.975	1.302
February	1.594	1.922	3.569	3.224
March	1.425	2.831	4.994	6.055
April	1.152	3.549	6.146	9.604
May	1.930	4.309	8.076	13.913
June	3.408	4.994	11.484	18.908
July	3.421	5.660	14.905	24.568
August	2.640	6.279	17.545	30.847
September	1.679	6.865	19.224	37.712
October	1.509	7.411	20.733	45.124
November	1.704	7.922	22.437	53.046
December	1.579	8.396	24.016	61.442

Fig. 2 illustrates the comparative results for actual and forecasted cumulative number of IPTV users in a case of parameters values p=0, 002604 and q=0,4 for the year 2009.

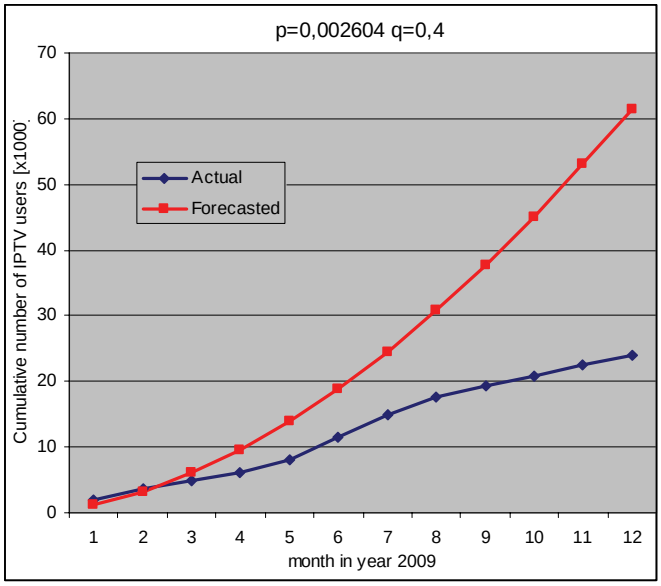

Fig.2 Cumulative number of IPTV users in year 2009 (p=0,002604 and q=0,4)

It could be seen from the Fig.2 that there are huge disagreements between the actual and forecasted cumulative number of IPTV subscribers. Therefore, the values for diffusion parameters have to be updated to achieve better accuracy between these two set of data. By keeping the same value of the parameter p and by iterative reducing the value of parameter q, it could be obtained better agreement between the actual and forecasted results. In the case when the values of parameters are q=0,08 and p=0,002604, the obtained forecasted results are given in Table IV.

TABLE IV
FORECASTED NUMBER OF IPTV SUBSCRIBERS IN 2009
(p=0,002604 and q=0,08)

Month in year (2009)	Actual non-cumulative IPTV sale	Forecasted non-cumulative IPTV sale	Actual cumulative IPTV sale	Forecasted cumulative IPTV sale
January	1.975	1.302	1.975	1.302
February	1.594	1.402	3.569	2.704
March	1.425	1.510	4.994	4.215
April	1.152	1.625	6.146	5.840
May	1.930	1.749	8.076	7.589
June	3.408	1.880	11.484	9.469
July	3.421	2.020	14.905	11.489
August	2.640	2.170	17.545	13.659
September	1.679	2.329	19.224	15.989
October	1.509	2.499	20.733	18.487
November	1.704	2.678	22.437	21.165
December	1.579	2.868	24.016	24.034

Fig. 3 illustrates the comparative results for actual and forecasted cumulative number of IPTV users in a case of parameters values p=0,002604 and q=0,08 for the year 2009.

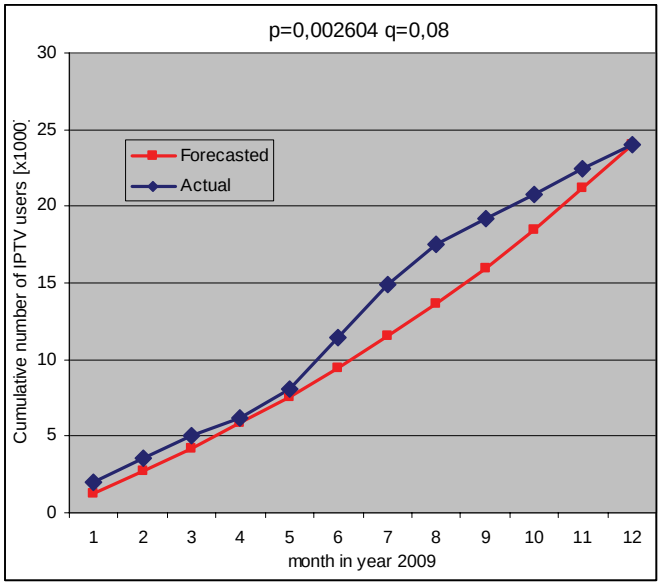

Fig.3 Cumulative number of IPTV users in year 2009 (p=0,002604 and q=0,08)

Based on the results given in Fig.3, it can be seen that in a case of parameters values p=0,002604 and q=0,08, there are acceptable disagreements between the actual and forecasted results. Therefore, we can used these diffusion parameters values to forecast the IPTV demand in short-term future period.

The forecasted cumulative and current (monthly) results for IPTV service demand, from the begining of the year 2009 up to the end of the year 2013 (60 months) are given by Fig. 4 and Fig.5, respectively.

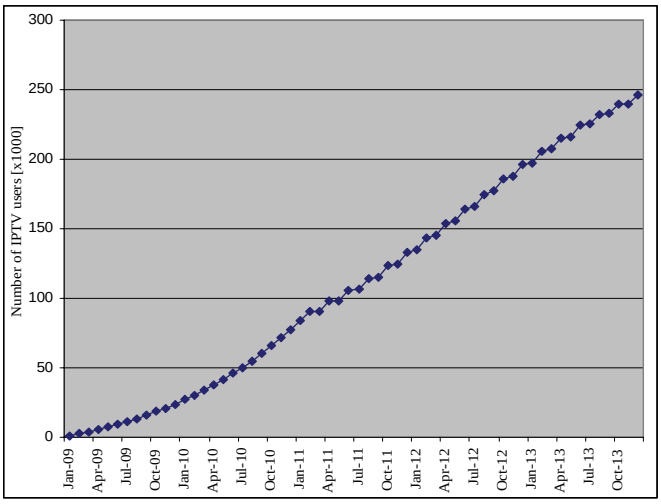

Fig. 4. Forecasted cumulative number of IPTV subscribers

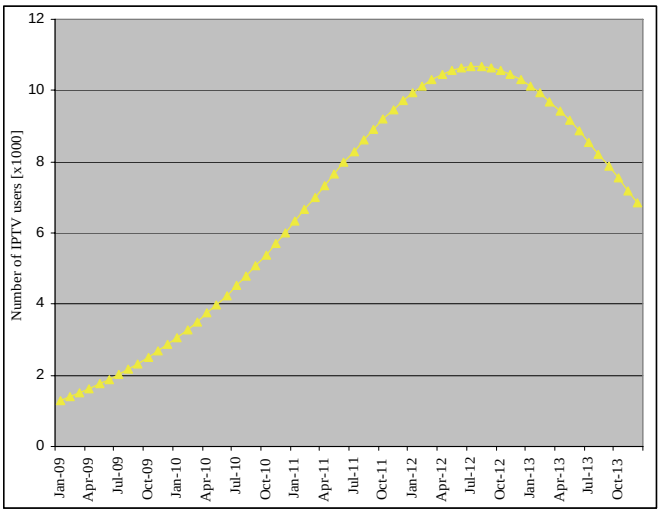

Fig. 5. Forecasted monthly number of new IPTV subscribers

Finally, in the Fig.6 we compared our forecasted cumulative number with the firstly planned number of the IPTV users after it being actually launched by the telecom operator (in the year 2008).

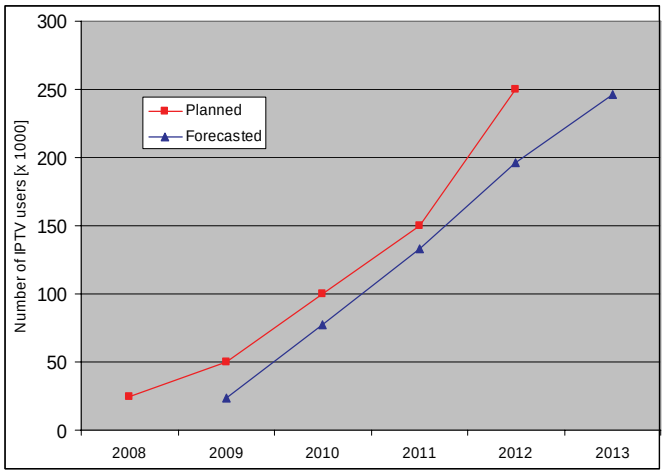

Fig. 6. Comparision of the forecasted and planned number of IPTV the user

The real number of users at the end of the year 2009 was nearly the forecasted number in that moment, which is less than the planned number of users, as could be seen from the Fig 6. It means that the plann was not fulfilled beginning from the service was launched.

IV. Conclusion

The IPTV service might become the killer broadband application in the near future. Both, telecom operators as well as cable operators are highly interested to offer the IPTV service to their customers, mainly due to increase their profits and also to achieve the greater satisfaction of the end users. There were many research studies concerned with the forecasting the number of IPTV users in different part of the world. However, a particular and precise forecast has to be done for each country as well as for each operator in the considered country. In this paper we presented the results of the forecasted number of IPTV subscribers from the point of view of the main Serbian telecommunication operator.

By analyzing the obtained results, we can conclude that the preliminary expectation plans about the adoption rate of the IPTV service were not achieved. The actual number of subscribers was only 50% than expected at the end of previous year. The main reasons could be found in facts that the time of the service launched was delayed, also due to relatively high service implementation costs to the individual subscribers. Such situation indicates that the potential market was not considered adequately. We took into account that circumstances in our forecasting procedure and try to obtain more precise data about the future demands for IPTV service.

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