

3rd Generation Mobile Technology Impacts on the Profitability: A Systems Dynamic Approach

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Abstract

Mobile operators in Egypt are facing a number of challenges due to the decline of the average revenue per user combined with local currency devaluation yielding to a difficult business position. Additionally, the ongoing competition between the existing two operators *MobiNil* since 1997 and *Vodafone* Egypt since 1998, the challenges are mounting. The competition adds more pressures on existing operators to differentiate their services and introduce innovative solutions to maintain their competitive edge. Therefore, newly diffused technologies with diversified revenue channels are needed. This paper documents the findings of a study conducted in 2003 investigating the possibility of using the 3rd Generation mobile services as a tool for generating additional revenues and accordingly profits to mobile operators. To support the findings a system dynamics approach has been conducted to capture the dynamics of the current industry to help explain its profitability.

Introduction

The explosion of new competition, the liberalization of markets, the globalization of many leading players, the steady downward pressure on the price of basic telecom and the imminent virtual 'commoditisation' of voice traffic. All these factors contribute to a highly volatile industrial environment where strategic agility would seem to have more value than long-term planning. But, in spite of all the uncertainties, operators really have no option but to make long-term commitments and massive long-term investment decisions, driven by the inexorable emergence of new mobile technologies. Second generation mobile WAP (Wireless Application Protocol) devices have rapidly gained mainstream status in most developed markets and value-added services are appearing to exploit 2G's admittedly rather limited data capability. The latest wave of change is imminent in the shape of 'Next Generation' (sometimes referred to as 2.5G) services. Enabling technologies like GPRS and EDGE will arrive in many markets at the turn of the year, transforming the speed and volume of data flowing across wireless networks, opening the way for operators to offer true IP-based data services. However, all this will pale into insignificance when, in about 2002 – 2003, 3G services will start to become an established part of life through most of the developed world. 3G will offer the kind of

bandwidth that was, until recently, undreamed of in a mobile environment and will allow operators to compete realistically in the mainstream Internet marketplace.

Adding to the above that the telecommunications world is changing as the trends of media convergence, industry consolidation, Internet and Internet Protocol (IP) technologies and mobile communications collide into one. Significant change will be brought about by this rapid evolution in technology, with Third Generation Mobile Technology a radical departure from that came before in the first and even the second generations of mobile technology in a way that:

- The people will look at their mobile phone as much as they hold it to their ear. As such, 3G will be less safe than previous generations- because television and other multimedia services tend to attract attention to themselves- instead of hands-free kits, we will need eyes-free kits.
- Data ('non-voice') uses of 3G will be as important as and very different from the traditional voice business.
- The mobile phone will be used as an integral part of the majority of people's lives- it will not be an added accessory but a core part of how they conduct their daily lives. The mobile phone will become akin to a remote control or magic wand that lets people do what they want when they want.
- Many media and Internet companies have shown a strong interest in using 3G technology as a new channel to distribute their content, opening the opportunity for new entrants and new partnerships and value chains.

Nevertheless, there is uncertainty and the fear of displacement. Third Generation (3G) mobile is topical and contentious for several reasons:

- 3G licenses have been awarded around the world, in many cases at huge cost, necessitating that existing mobile communications companies in the 2G world think about and justify their continued existence.
- Because the nature and form of mobile communications is so radically changed, many people do not understand how to make money in the non-voice world, and do not understand their role in it, especially in the Egyptian market as the VAS applications didn't succeed in changing this perception.
- Many industry analysts and other pundits have questioned the return on an investment in 3G technology- questioning whether network operators will be able to earn an adequate return on the capital deployed in acquiring and rolling out a 3G network.

Problem Statement

Due to the expected decline of the voice revenues and the appearance of a new potential competitor, the mobile operators in Egypt are forced to think of new ways to differentiate in their products and services' portfolio. The devaluation of the Egyptian pound against the American dollar has also its negative impact on the Average Revenue Per user (ARPU) of the mobile operators in Egypt. This fact also is forcing the mobile operators to think of new ways to increase the ARPU and hence their profitability. The appearance of

the 3G services in the world, following to the mobile industry boom, has created new opportunities for the mobile operators to be provided for both business and private users sector. The mobile operators in Egypt will have to evaluate the effect of introducing the 3G applications to the Egyptian market.

Research Objective

The purpose of this analytical study is to understand the possibility of introducing the 3G services in the Egyptian market and its impact on the subscribers' demand and the profitability of the mobile operators in Egypt. In this research, the impact of the 3G services will be defined generally as the possible change in the demand of mobile services as reflection to the introduction of the 3G services that will create new revenue channels for the operators and that will eventually affect their profitability. The researchers will tests the willingness of the potential 3G users, either corporate or individuals, in order to evaluate the expected demand on the 3G services and hence the average revenue per user.

Theoretical Framework

Throughout the research, the impact of launching the 3G services in the Egyptian market will be measured through the change in subscribers' demand. The introduction of 3G services will be considered as the independent variable. The dependant variable, which is the profitability of the mobile operators in Egypt, will be defined as the profit generated to the mobile operators after launching the 3G services. The following diagram shows the relation between the dependant, independent and the moderating variables.

Third Generation Services Forecasts

Below are some key findings that have been forecasted for the Mobile Third Generation Technology:

- By 2010, the average 3G subscribers will spend around \$30 per month on 3G data services. (*umtsforum., 2002*)
- By 2010, the additional revenue from 3G data services, assuming only 28% penetration into the worldwide mobile base, will add \$9 per month to total worldwide cellular ARPU. (*umtsforum., 2002*)
- Advertising and transaction revenues are a new source of income for the 3G operator, representing almost 20% of revenue (\$60 billion). In addition, these new revenue sources provide an opportunity to strengthen relationships with users. (*umtsforum., 2002*)
- Both business and consumer market segments are forecast to have significant revenue potential, with the consumer segment contributing about 65% of the revenue on a worldwide basis. (*umtsforum., 2002*)
- Throughout the forecast period, Customized Infotainment is the earliest and single largest revenue opportunity among the forecast services, contributing \$86 billion in 2010. (*umtsforum., 2002*)

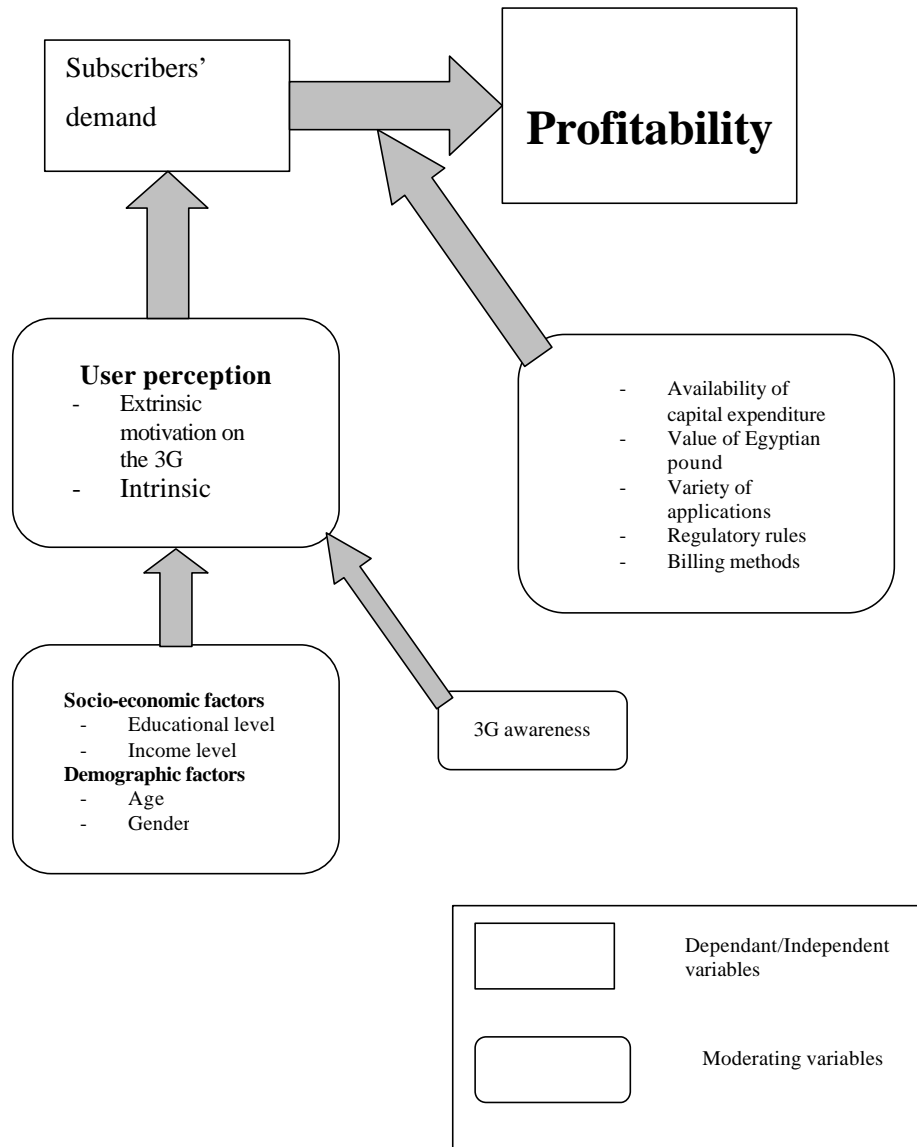


Figure 1 - Research Theoretical Framework

- Non-voice service revenues will overtake voice revenues in the 3G environment by 2004 and comprise 66% of 3G service revenues in 2010. (*umtsforum., 2002*)
- Simple Voice services will remain a vital component of an operator's service portfolio, contributing 34% of total 3G revenue in 2010. (*umtsforum., 2002*).
- Asia Pacific represents the single largest total revenue opportunity (\$120 billion in 2010). (*umtsforum., 2002*).
- With the exception of some Latin American countries, most countries in the Rest of World region will still be in the first few years of service penetration by 2010. Therefore, revenues from all services for this region are small, contributing only 10% (\$33 billion) of worldwide 3G revenues in 2010, but with significant potential beyond the forecast period. (*umtsforum., 2002*).

- Rich Voice services such as consumer videophone and multimedia conferencing, contribute around 7% (\$21 billion) of total 3G revenue by 2010, but are expected to increase significantly in the years beyond the forecast period. (*umtsforum., 2002*).
- Over time, user expectations for the superior connection speeds will be even higher than they are today. (*Telecompetition Inc, 2001*)

These are the worldwide revenue forecasts for each service category, including all the potential 3G services which are: Customized Infotainment, Mobile Internet Access, Multimedia Messaging Service, Location-Based Services, Simple Voice, and Rich Voice. Table 1 lists these forecasts:

Summary of worldwide revenues for 3G services - 2001-2010										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Revenues (\$B)										
Customized Infotainment	0	0.7	5.8	11.2	17.8	31.9	48.1	53.7	64.3	85.8
Mobile Intranet/Extranet access	0	0.9	3.1	5.9	8.5	15.3	23.6	34.1	47.4	60.7
Multimedia messaging Service (Consumer)	0	0.2	1.6	3.6	5.1	8.8	11.8	13.2	15.4	17.8
Mobile internet Access	0	0.2	0.8	1.5	2.2	3.9	6	8.7	9.6	14.2
Multimedia messaging Service (Business)	0	0	0.4	0.9	2.2	5.7	10.3	16.5	22.2	25
Location-Based services	0	0	0.7	1.8	2.7	3.9	5.8	6.8	7.8	9.9
Rich voice	0	0	0	0.1	0.7	1.4	4.2	8.1	13.6	20.8
Simple voice	0.1	1	6.4	12.4	18.6	36.3	54.2	60.2	72.3	87.8
Total	0.1	3	18.8	37.4	57.8	107	164	201	253	322

Table 1 - Worldwide Revenues for the 3G Services

Source: Telecompetition Inc February 2001

Regional Forecasts For All 3G Services

Revenue forecasts and projected mix of mobile services differ from one region of the world to another region. These variations stem from differences in demographics, current state of fixed network services, mobile services, Internet penetration, and user experience from current services and future expectations. In addition, country level assumptions were made on service commercialisation dates based on known action plans and/or estimates of mobility infrastructure plans. Regional forecasts divide the world into four regions: Europe, Asia Pacific, North America and Rest of World. Rest of World includes primarily Latin America and Africa. The forecast revenues by region in 2010 show that

for Asia Pacific all the 3G services revenues will be about 85 billion \$, while for the simple voice it will count about 35 billion \$. For Europe the forecasted revenues that will be generated from all the 3G services are about 72 billion \$ while that for the simple voice is expected to be about 28 billion \$. For north America the forecasts for the 3G revenues are 51 billion \$ and that of the simple voice will be 19 billion \$. Finally the expected revenues from the rest of the world are about 25 billion \$ and that for the simple voice will be 12 billion \$.

The revenue-forecast picture in different parts of the Rest of World region is very mixed. There are some very rich oil producing countries in the Middle East with a high GDP. On the other hand there are some very poor countries with no political stability and a very poor economic situation with little telecommunications infrastructure. "It was assumed that a large portion of the countries in this region would not commercialize any 3G services until after 2007" (*Telecompetition Inc, 2001*).

The Mobile Industry in Egypt

The telecommunications industry is continuously changing as the trends of media convergence; industry consolidation, Internet and Internet Protocol technologies and mobile communications collide into one (*American Chamber of Commerce in Egypt, 2001*).

With the introduction of 3rd Generation Mobile Technology Services more rapid evolution is expected. The service should be launched in Egypt in 2006 pending a massive effort and requirements provision from different players in the industry in the years to come. The telecommunications sector reform program undertaken by the government in recent years has encouraged uplifting Tele-density and user's intensity. Moreover, the telecommunication network has been modernized and enhanced very rapidly. Telecom Egypt has been aiming to add one million telephone lines each year from 1999 to 2002, which would cost an approximate 1 billion US dollars annually (International Telecommunications Union, 2001). The number of fixed lines subscribers reached 8.3 million taking the Tele-density to 12.1% i.e. one line for every 12 citizens (*Fahmi, 2003*).

The mobile industry penetrated the market in Egypt with the first global system for mobiles (GSM) network in November 1996 by Telecom Egypt then it was sold to the Egyptian Company for Mobile Services (MobiNil) in April 1998, which launched its services one month later. MobiNil (a consortium of Egypt's Orascom Telecom, Al-Ahram Press Group, Motorola's agent Systel and Alcatel's agent in Egypt in addition to the United State's Motorola and France Telecom Mobile International) paid approximately 470 million US dollars in May 1998 to obtain the license from Telecom Egypt (Economist Intelligence Unit, 2001). The second operator is Vodafone Egypt, founded in November 1998 as Misrfone Telecommunications S.A.E (a consortium of the UK's Vodafone, the world's largest mobile communications company, the UK's Mobile Systems International, Frances' CGSAT, Egypt's Banque du Caire, Investment House EFG-Hermes and the Alkan Group). In 1999, the company bought the license for 468 million US dollars (El Bakry, 2003). Both companies (MobiNil and Vodafone Egypt)

were guaranteed of market exclusivity until the end of 2002. This agreement with the government, has led both companies to benefit from a monthly growing subscribers ratio of around 1.43% per company (El Bakry, 2002). However, with the ongoing developments of the sector and with the need to maximize quality and increase competition for better service provision, the minister of communications and information technology announced the purchase by Telecom Egypt of the 3rd mobile operator's license. The new company labelled (Wataneya) is expected to go live in the 4th quarter in 2004 (El Bakry, 2003). There are a lot of potentials perceived for Wataneya in specific and for the mobile market in Egypt at large with a country of 70 million people (60% of whom are under the age of 30) and a mobile penetration rate of 6% as announced by the chairman of Telecom Egypt (El Bakry, 2003). Table 2 demonstrates the growth of the sector between 1999 and 2003.

Item	October 1999	January 2003	Increase %
Exchanges Capacity in million lines	6.4 m line	10.3 m line	61%
Fixed Line Subscribers in million	4.9	7.7	57%
Waiting Line in million	1.265 m	200,000	-84.20%
Suburb exchanges	775	1008	31%
Mobile Subscribers	654,000	4.5 mil	588%
Payphone	13,300	48,000	261%
No of operational International Circuits	6,130	11,900	94%
Internet Users	300,000	1,700,000	466%
International Internet Bandwidth	20 Mbps	850 Mpbs	4150%

Table 2 – Egypt Telecommunications Figures [1999-2003]

Source: www.mcit.gov.eg (2003)

The structure of the mobile services in Egypt is expected to change as soon as the government launches the 3rd operator (Wataneya) through Telecom Egypt. Table 3 shows the evolution of the mobile service (Pyramids Research, 2000). Moreover, due to the expected decline of the voice revenues and the appearance of Wataneya, mobile operators in Egypt are forced to think of new ways to differentiate their products and services portfolio. Moreover, the devaluation of the Egyptian pound had also its negative impact on the average revenue per user. Both factors were forcing mobile operators to find new solutions to improve their profitability and the innovation of 3G services created new opportunities for mobile operators. Throughout the study, the impact of launching 3G services in the market is measured through the change in subscribers' demand and profitability is measured as the percentage delta change of the expected average revenues before and after launching 3G services.

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Mobile Subscribers (000)	27	83	177	877	1,578	2,281	3,541	3,951	5,531
Penetration	0	0.13	0.28	1.36	2.4	3.41	4.37	5.34	7.35
Revenues (Million US\$)	13	50	101	281	598	912	1,132	1,320	1,738

Table 3 – Mobile Services Evolution

Source: Pyramids Research, 2000

The Egyptian mobile market is infatuated with prepaid services, which was introduced by Vodafone Egypt in December 1998, and followed a month later by MobiNil with prepaid services in the market accounting for more than 85% of subscribers (Pyramids Research, 2000). By 2004 the mobile market in Egypt is expected to exceed 5.5 million subscribers and prepaid subscribers are expected to account for 62% of the total added subscribers.

Study Design and Methodology

In order to test the effects of launching the 3rd Generation Mobile services on profitability for different mobile operators, it was important to formulate the theoretical framework of the study which included (a) the dependent variable which is the profitability of mobile operators; (b) the independent variable which is the response of the GSM market in terms of subscribers demand; (c) the moderating variables which include the billing model, the demographic factors, the socio-economic factors, the mobile awareness, the availability of capital expenditure budget, the currency value, the regulatory rules and the variety of applications available. The study is qualitative in nature with a set of interviews conducted and a questionnaire that was distributed to a sample of 260 mobile subscribers based on convenience sampling. Questionnaires were used to measure the research variables related to the consumer response towards launching the 3G services. Interviews were conducted with three multinationals in the telecommunications industry representing operators and suppliers in the market as well as key personnel in the industry.

Data Analysis

The study questionnaire was distributed in the cities of Cairo, Port Said and Alexandria among potential persons at universities, companies and in some public places. The total size of the sample used was 260 representing around 0.007% of the total active population of mobile users in Egypt. The distribution of the sample was 31% for age bracket 13 to 25; 39% (26 to 40) and 21% (41 to 60) 9% older than 60 years. Findings showed that 3G services will be of higher potential among the younger generation. 62% of the samples were males. In terms of level of education, 20% had completed their post-graduate studies, 64% had university degrees and the rest were enrolled in schools. With respect to the income level, about 16% were without income (high school or less) or graduates unemployed. Almost 88% were mobile users while 12% were not using mobiles in their daily lives. Findings also indicated that most mobile users were coming from the middle class, which has an average annual income of around 2,600 US dollars. Among the 88% using mobiles only 58% were aware of all the services offered from the operators. Findings also indicated that around 70% were post paid subscribers, 30% of which were business subscribers and 40% were individual subscribers. In terms of daily usage, only 27% of the sample was using mobiles for less than 10 minutes a day, while

39% used it more than 30 minutes a day, while about 17% used it more than 1 hour a day. Such figures indicate that users depend on their mobiles more than just being a pager tool or as a short messaging service. Around 57% were aware of 3G services and around 28% perceived it extremely useful while 47% felt it was somehow useful. In terms of payment and billing methods, 62% preferred post paid accounts and 50% favoured a billing method that was based on volume of data while 27% favoured billing based on connection time.

The analysis of the findings indicate that mobile operators need to put a number of elements into consideration including (a) focusing more on the youth segment, as they are highly affected by 3G services and have shown great interest in it which can be done through conducting various promotional campaigns; (b) focusing on university and graduate students to make a great use of their positive perception towards the 3G with average annual income of 3,700 US dollars. These issues will be important for mobile operators when setting their strategies and business plans.

A System Dynamics Perspective

The findings of the analysis encouraged simulating the different research variables to be able to make a better use of the data collected through predicting its degree of affection on each other within a specific time frame. A system dynamics approach (Sterman, 2000) has been conducted to help conceptualise the current situation and capture the most important drivers for the operator's profitability. In that respect, developing a causal loop framework (mental model) with the first loop (reinforcing loop) addressing the demand, it is important to note that profitability positively affects the advertising budget where if profitability increases, the advertising budget increases accordingly. Therefore, having a relatively high advertising budget encourages operators to launch new campaigns for different services and products. However, the cost of one campaign affects the number of campaigns launched negatively and the number of campaigns as opposed to having only one campaign affects positively the users' awareness for 3G technology; respectively, when awareness increases, the positive users' perception towards 3G technology increases. Moreover, age, the education level and the average annual income have their positive effect on users' perception, which in turn positively affects subscribers' demand. Additionally, subscribers' demand is positively affected with the variety of billing methods and the additional services launched in the market. While it can be affected negatively with the tariff structure, the quality of substitute and the demand for a new technology, which can be the 4G (for example), this exogenous variable damps the subscriber demand for 3G services after about 4 years from launching. The subscribers' demand affects positively the revenues generated from 3G services and revenues accordingly affect directly the profitability.

The second reinforcing loop being service, profitability affects positively the expected expenditure that enables operators to launch new services in the market; therefore, expenditures affect directly the additional services where the cost of additional services affects the trend of launching new services. In this model, there are two main loops, both are positive reinforced loops. Figure 1 show both demand and service causal loops. Translating the above causal loops into a stock and flow representation using the

STELLA software can give meaningful expectations for the users' perception, subscriber demand and revenues that can be generated from launching the 3G services in the market. It can also simulate the expected response of the users' perception, subscriber demand and revenues with the change of any of the variables including age, annual income, educational level, tariff, quality of substitute, 3G awareness, cost of additional service and campaign effect.

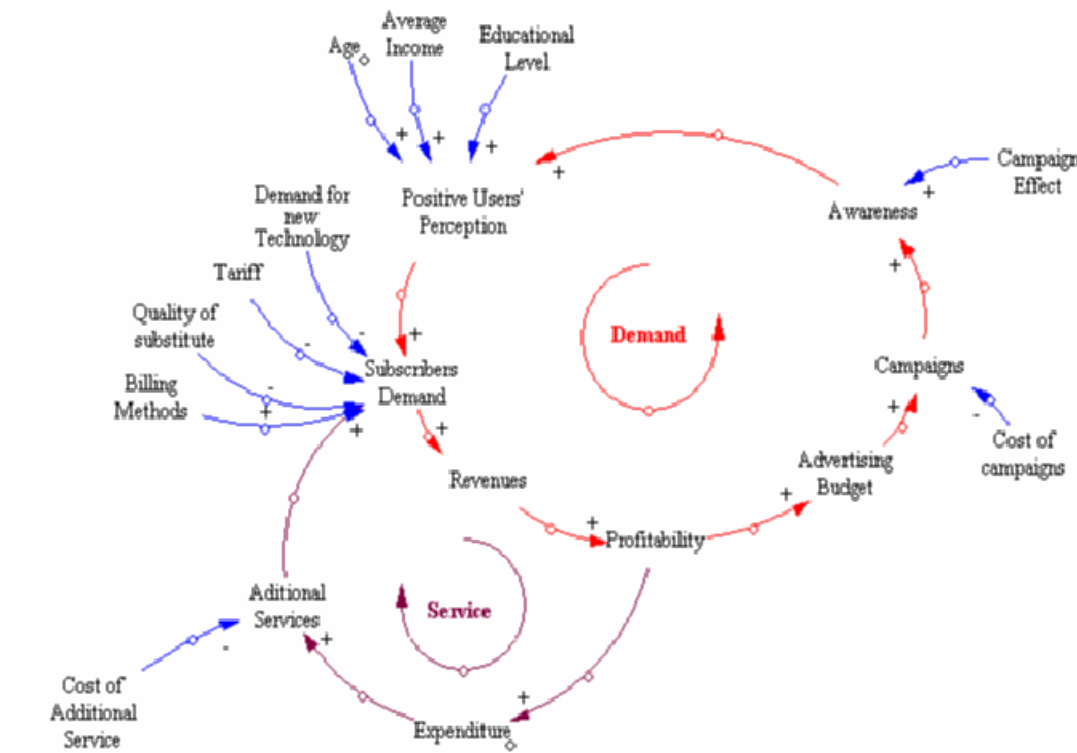


Figure 2 - Demand-Service Causal Loops Diagram

The expected response during a period of about 6.5 years could be one of three scenarios as shown in figures 3, 4 & 5. (a) If conditions are normal, then during the first 20 months, the users' perception, subscriber demand, and revenues will increase exponentially because they are located in a reinforced loop as shown in figure 1. Starting from the 20th month onwards, these variables will start to saturate for about 25 months before starting to decline due to the interference of a new technology that might be 4G technologies (for example). This new technology will generate a different perception and accordingly will affect the users' perception for the old technology as well its demand and revenues generated representing the life cycle of 3G technology. (b) If conditions are pre-eminent the tariff will be 1 unit, availability of 6 different billing methods, cost of 1 additional service is 1 unit only, campaign effect is 3 units, cost of campaign is 1 unit and quality of substitute is the least. (c) If conditions are worst, the scenario could be negative for mobile operators if the tariff is 5 units, billing methods available are limited to 1 method, the quality of the substitute will be the best, the campaigns for 3G services will be of minor effect on the customers. Respectively, the cost of the additional service will be 10 and the cost of campaign will be 3 units.

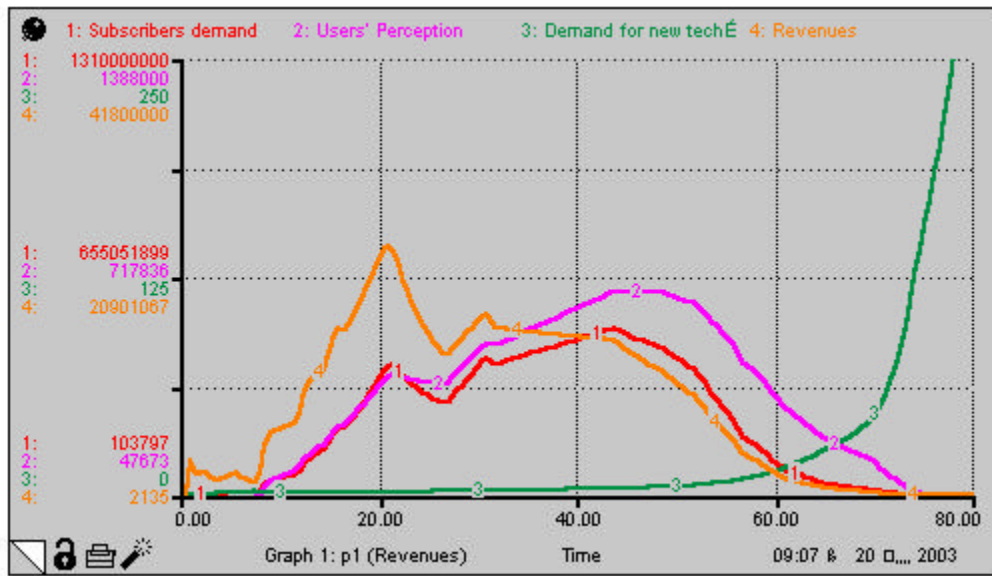


Figure 3 - Expected Response from the Stella Model in the Normal Conditions

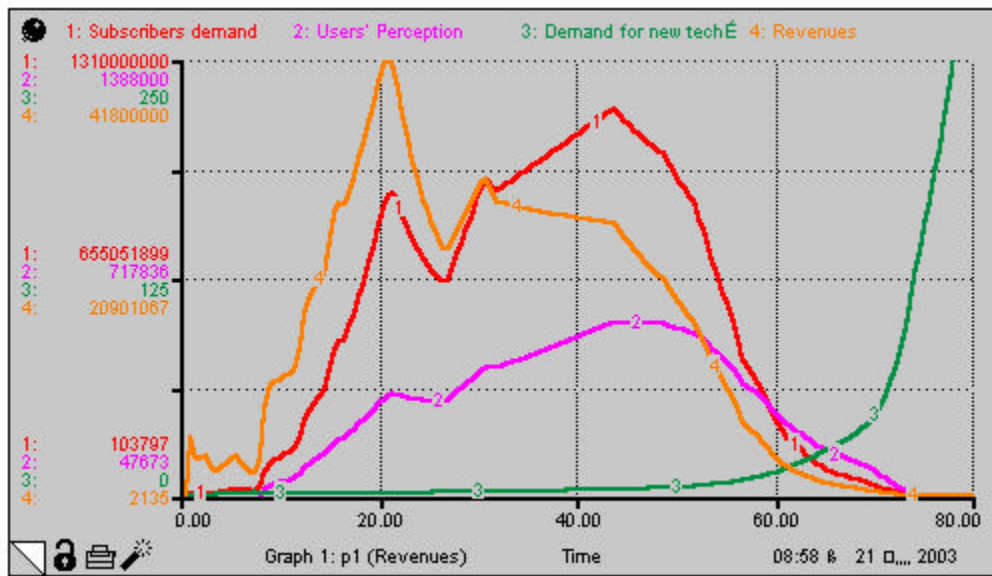


Figure 4 - Expected Response from the Stella Model in the Preminent Conditions

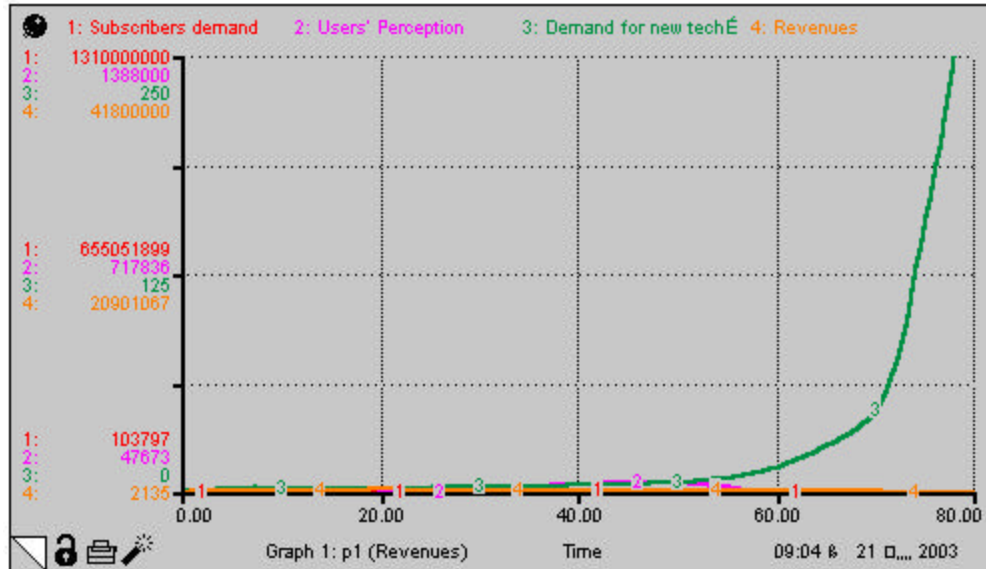


Figure 5 - Expected Response from the Stella Model in the Worst Conditions

Study Findings

With respect to the effects of socio-economic and demographic factors on customer perception and the usefulness of 3G services, the findings show that the age factor has its effect on customer perception towards the usefulness of 3G where the 13-25 years category have shown great interest while the above 60 years category showed the least interest with no expected usefulness for the services.

With respect to gender, it was equally balanced with same perception for the 3G services as being useful. In terms of the educational level and average annual income, post graduate study holders were more interested than university degree holders and with respect to average annual income, the (no income) category were highly supportive to the service while the 2,600 US dollars annual income salary (middle class) category were less interested.

Findings also show that willingness to subscribe to 3G services is highly affected by age reaching almost 79% among the youth and as low as 4% for people over 60 years. There is also a clear relation between the level of education and the demand for 3G services. Respectively, for the post graduate category 55% were willing to subscribe while for the university degree and high school category students it varied between 72% and 80%. With respect to the income level, the (no income) category it recorded a high demand for 3G subscription, 93% of this category is from the youth segment while the other categories had a moderate demand except for the category making more than 9,000 US dollar per year which had relatively low demand if compared with the no income category. The reason is that most of the high-income category is over 60 years old. With respect to gender distribution and willingness to subscribe to 3G services, there is a slight difference between the responses of males and females towards launching 3G services as for mobile and 3G awareness, mobile awareness strongly affects the demand for 3G services and encourages the willingness towards 3G subscription and the same occurs for 3G awareness where people who are aware of 3G technology and willing to subscribe to

3G services are about 75% while those who are not aware with 3G services and willing to subscribe are about 20%.

It is important to note that the variety of application may have a great effect on 3G demand. The findings show that around 91% will be using all 6 services offered by the operators and only 7% will be using 1 service indicating that the more the services offered the more the willingness to subscribe will increase; respectively showing that the variety of applications strongly affects the demand for 3G services. With respect to billing methods and its effects on 3G subscription willingness, the findings show that if the billing method will depend on the volume of data, this will affect positively the demand for 3G services and that subscription willingness can go up to 95%, however if the billing method will depend on the connection time the subscription willingness can reach 67%.

Conclusions

The 3G technology will be launched in Egypt by 2005 and requires massive efforts from the different players in the industry. The market has much potential for such technology.

(a) In terms of profitability, although there is a high demand for 3G technology and its applications (78%) with a good perception for its usefulness and (81%) willingness to subscribe for 3G services, the expected increase in the average revenues will vary between 12% to 16% having in mind that such increase is pending the provision of all 6 3G services. This range is needed to breakeven. Respectively, it is fair to say that the expected profitability is relatively low.

(b) In terms of youth demand, about 82% of the potential 3G users in Egypt are below 40 years old, while 42% of the total sample belongs to the youth category. Moreover, 70% of the sample surveyed has a good perception on the usefulness of 3G services, which gives a strong push to their subscription willingness, in which the younger generations showed more interest and willingness to subscribe with an average of 65%.

(c) In terms of gender perception, there was no effect on the users' perception towards 3G applications based on gender.

(d) In terms of education level, the users' perception relatively changes from one educational level to another. In general, more than 50% at each level have a good perception towards 3G applications with 68%, 89% and 76% are the perception averages for post graduate, university degree and high school categories as for their willingness to subscribe in any of the 3G services, willingness percentages of all segments ranged from 55% for postgraduates to 80% for the university students.

(e) In terms of income level, there is a good perception towards 3G services and it can be normally distributed, except for the no income category which is high as the youth segment represents most of this category and the same also can be noticed for the willingness for 3G subscription.

- (f) In terms of 3G awareness, 57% are aware of 3G technology and services amongst which 75% are willing to subscribe and 20% of those who are not aware with the 3G services are willing to subscribe.
- (g) In terms of sense of security, 71% of those who are willing to subscribe to 3G services are not feeling secure with it while 89% of those not willing to subscribe are also not feeling secure which showed the irrelevance of the sense of security.
- (h) In terms of billing methods, 50% of potential 3G users have asked to be charged according to the volume of data downloaded or uploaded or transferred while 27% have asked to be charged by time of connection and 23% on volume of data depending on the application used. Respectively, the variety of the billing methods affects the willingness to subscribe to 3G services.
- (i) In terms of variety of applications, 61% of potential 3G subscribers are requesting more 3 3G services or applications pointing to the fact that the market is keen to try new technologies rather than some specific applications.

References

American Chamber of Commerce in Egypt (2001) Telecommunications in Egypt, Business Studies Series.

Economist Intelligence Unit (2001) Statistics on Information and Communication Technology in Egypt.

El Bakry, R (2002) Does Not Compute, Business Today, October.

El Bakry, R (2003) Targets: Acquired, Business Today, February.

Fahmi, H (2003) World of Telecommunications, Al Ahram Newspaper, 08 June.

Information and Decision Support Center [www.idsc.gov.eg] Last accessed 12 August 2003.

International Telecommunications Union (2001) Internet on the Nile: Egypt Case Study, March.

Pyramids Research (2000) Communications Markets in Egypt, Analysis of Data, Voice and Convergence Opportunities, Economist Intelligence Unit.

Sterman, John (2000) Business Dynamics: System Thinking and Modelling for a Complex World, McGraw-Hill.

Telecompetition Inc (2002) 'The UMTS Third Generation Market - Structuring the Service Revenues Opportunities' Available:
<http://www.telecompetition.com/Downloads/Downloads.htm>.

Telecompetition Inc (2002) 'The UMTS Third Generation Market - Phase II: Structuring the Service Revenue Opportunities' Available:
<http://www.telecompetition.com/Downloads/Downloads.htm>. Accessed (2002, December 16)

UMTS Forum (2002) 'The 3G Evolution'. Available: http://www.umts-forum.org/servlet/dycon/ztumts/umts/Live/en/umts/Resources_Reports_27_index
(Accessed: 2002, December 24).