

An Empirical Study on Mobile Adoption in Bangladesh- An Application of Bass Model

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Abstract: Bangladesh is passing through a digital era which is evident by the high rate of adoption of mobile users. It is undoubtedly a question why such diffusion takes place in Bangladesh. This study thus intends to reveal the issue through the Bass model which proposes two major factors of diffusion namely innovation and imitation factor. An empirical study outcome revealed that imitation effect (word of mouth and subjective norm) was higher than innovation effect (usefulness, ease of use and self-efficacy). Rate of literacy, low rate of business usage, less technical knowhow and higher influence by others are some aspects behind the result. Thus operators should understand the reasons behind the diffusion and take proper steps for different business purposes.

Keywords: Mobile Adoption, Diffusion of Innovation, Innovation Effect, Imitation Effect, Word of Mouth.

1 Introduction

Adoption studies used to predict the future trend of the products or services. Different diffusion theories are thus getting attention throughout the world by the researcher. This paper intends to compare the diffusion pattern and various factors affecting diffusion among microfinance, compressed natural gas (CNG) vehicle and mobile in Bangladesh. Among them microfinance is a financial service and other two CNG vehicle and mobile are consumer product. The diffusion phenomena will be important for the marketer to understand the future trend and improvement of the products and services in the long run. In this regard, this paper used Diffusion of Innovation (DOI) model given by Bass (1969) to find out the effects and interpret them in the context of Bangladesh. Later the paper will discuss about the findings from application context.

First cellular mobile phone company namely Pacific Bangladesh Telephone Limited and Bangladesh Telecom got licensed in 1989. This mobile telecommunication sector stuck in monopoly domain from 1989 up to 1996. Grameen phone, the largest mobile phone operator (at present) and Telecom Malaysia International Bangladesh got licensed in 1996. Before that time the diffusion of mobile also progressed very slowly due to high price of the mobile set and high charge of communication. The government authority established for the specific mobile operation purposes in 2001 under the new name Bangladesh Telecommunication Regulatory Commissions (BTRC). The first state owned mobile operator namely Teletalk started 2004. Only one operator (Pacific Bangladesh Telecom Limited) is using Code Division Multiple Access (CDMA) and all other operators are using Global System for Mobile Communications (GSM). Bangladesh just enters in the world of 3G (Third generation) technology era in mobile communication sector. Though 2G (second generation) technology is prevailing at mass level. According to the statistics given by Bangladesh Telecommunication Regulatory Commission (BTRC) websites, it is evident that at the end of September 2012, total mobile phone subscriber reached at 98.466 million.

2 Literature Review

Diffusion studies are getting importance by the researchers and practitioners to identify factors that affecting to diffusion. In past literature concept of imitation has been revealed as a notion of following others action, accepting views and taking decision in this regard (Tarde,2000). Griliches investigated the diffusion of hybrid corn technology in United States (Griliches, 1960). But in this domain, Roger's Book of "Diffusion of Innovation" made considerable interest on researchers in social science area (Roger 1962, 1983, 1995, 2003). Rogers defines diffusion as the process in which an innovation is communicated through channels over time among the members of a social system. (Rogers, 1995) He proposed 4 main elements that influence the spread of a new idea: the innovation, communication channels, time, and a social system. Usually, the innovation is supposed to be beneficial to the potential users or adaptors, but this advantage is not so clear to the intended adopter because of the uncertainty about the consequences in the mind of the potential users. In this regard the likely benefit to be derived from the innovation prompts the individual to put on effort to acquire more knowledge about the new idea. This innovation-decision process is essentially an information-seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation (Rogers, 1995). The idea of diffusion has been investigated in many forms and in many disciplines. While adopting any new product and services, certain factors stimulate to the adopters. For example, both mobile and CNG vehicle technology has been widely accepted by the mass people because of individual and social need. People find it usable for meeting their needs. At the same time, if any product or service is easy to use then, its adoption can be faster than others. People also consider psychological aspects while using a product or services. In examining such effects Bass Model proposes main factors, that is 1) the external influence and 2) internal influence. The external influence is also denoted by the coefficient "p" referred to as the coefficient of innovation or the innovation effect, the internal influence is denoted by the coefficient "q" referred to as the coefficient of imitation effect. Previous research using the Bass model have been used to show how the coefficient "q" (imitation effect) differs between countries (Samli, 1995;, Takata and Jain, 1991;Bass 1969). On the other hand by nature people influenced by social pressure and consider word of mouth in adopting the product which Bass describes as imitation effect.

In this study, innovation and imitation effect of Bass model uses as a basis for comparing adoption of microfinance, CNG vehicles and mobile adoption in Bangladesh. So in describing innovation effect, this paper means as usefulness (Davis 1989), ease of use (Davis 1989) and self-efficacy (Bandura, 1994). While meaning of imitation effect is conceptualizing as the aspects of The subjective norm (Ajzen, 1985, 1988 and 1991, Rogers 1976) and Word of mouth (Webster,1991; Kahneman and Tversky, 1979; Einhornn and Hogarth, 1981; Aharony and Swary, 1980, Lang and Litzenberger, 1989; Michaelyet *al.*, 1995; Islam et al., 2009).

3 Methodology

Time series data of clients or member of microfinance institutions in Bangladesh for the period of 1990 to 2009, CNG vehicle from 2003 to 2009 and, mobile users' data from 1997 to 2011 has been used to derive factors influencing diffusion in respective areas. Data has been taken from the government database such as Microcredit Regulatory Authority (MRA) Bangladesh, Rupantarita Prakritik Gas Company Limited which is a company of Petro Bangla, and Bangladesh Telecom Regulatory Commission (BTRC). Nonlinear least square method had been applied to infer the result.(Mahajan et el., 1990) Curve fitting approach followed where exponential curve has been fitted with consideration of least error margin. R software has been used for this quantitative analysis.

The following model used to testify the data

Sales per unit time at time t are

$$S(t)=mf(t)=\frac{m(p+q)^2e^{-(p+q)t}}{p[1+(q/p)e^{-(p+q)t}]^2}$$

Where,

P= Innovation effect , q= Imitation effect,

m= number of eventual adopters

Figure 1 will show that external influence due to different reasons like mass media communication where it indicated the innovators and internal influence for the imitator's adoption stages.

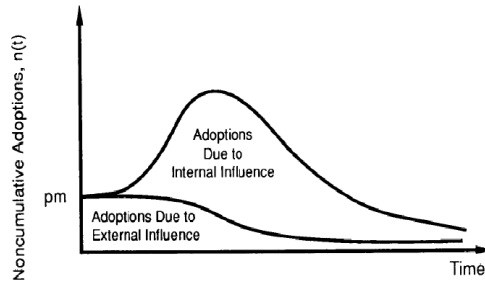


Figure 1: External and internal Influence in Bass model

In figure 2 t^* shows the point of inflection in the S curve which is the peak point in the non-cumulative adoptions case

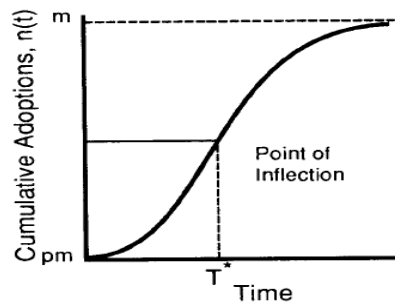


Figure 2: Analytical Structure of Bass Model

4 Results and Findings

Formula: $y \sim M * (((P + Q)^2/P) * \exp(-(P + Q) * T79))/(1 + (Q/P) * \exp(-(P + Q) * T79))^2$

Parameters:

Estimate Std. Error t value Pr(>|t|)

M 1.416e+09 6.516e+07 21.732 7.67e-14 ***

P 4.581e-04 8.830e-05 5.188 7.41e-05 ***

Q 3.536e-01 1.587e-02 22.287 5.07e-14 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4421000 on 17 degrees of freedom

Number of iterations to convergence: 8

Achieved convergence tolerance: 7.381e-06

It can be seen from table 1 below that Microfinance had the highest innovation effect (0.003567) with CNG and mobile technology following it respectively (0.001007 and 0.000082). On the other hand, Imitation effect of Mobile Technology showed the highest value (0.679400) followed by CNG and Microfinance (0.607500 and 0.1727). This shows that subjective norms and word of mouth could have affected the high imitation effect, while ease of use and usefulness affected the innovation effect. For CNG 11 iterations were completed for convergence, followed by 10 for mobile technology and 7 for microfinance.

Table 1: Innovation Effect, Imitation effect and Number of Iterations to Convergence on Mobile Technology

Parameter	Mobile Technology (1997-2016)
Innovation Effect (P)	0.0005***
Imitation Effect (Q)	0.3536***
Number of iterations to convergence	8

Sources: Bangladesh telecommunication Regulatory Commission
 Signify. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 ' '.

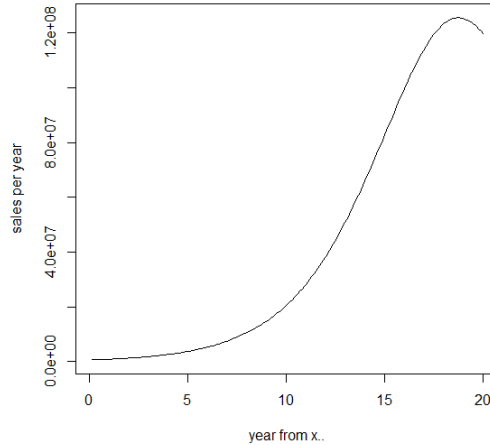


Figure 3 The exponential Curve of Mobile Technology Adoption in Bangladesh

5 Innovation Factors:

5.1 Usefulness:

For the people of Bangladesh, who are generally quite sociable, mobile technology has had a positive effect. It is mostly used for verbal communication, whereas, usage in economic affairs are mostly non-existent, given the high illiteracy rate.

5.2 *Ease of use:*

Given the high illiteracy rate of the people of Bangladesh, almost 44.1% of them don't know how to properly handle SMS, MMS or check emails and mostly sticks to voice communication. The culture of adopting various technology is low due to energy, economic and social problems.

5.3 *Self-Efficacy*

There is yet to be an Economic movement, similar to the geopolitical movements of 1947, 1952, and 1971, although GDP growth rate has remarkable increase. Mobile technology allows more fluid exchange of information and thus are used in various negotiations in the business sectors. This technology also allows transaction, negotiation, marketing and after sales services.

6 Imitation Factors

6.1 *Subjective Norm of Belongingness*

In the national economy, the second highest contribution is through the remittance method. Strong family bonds cause's people who are living and working abroad to send money back to their families, in the form of remittance. Using this core cultural characteristic, MFI give loans after forming a group first, where the members of the group insure each other. The people of Bangladesh tend to follow others proven financial behavior. Women in rural areas of Bangladesh remain indirectly involved with the economic activities.

Positive experiences of acquaintances influenced the choices of most people. Consulting with people who have had positive experience greatly added to the positive view of CNG and thus more people were more inclined to using it.

Social belonging is very important in the culture of Bangladesh, so in various festivities, mobile technology is used to convey greetings.

6.2 *Word of Mouth*

Word of mouth greatly influences the choices of people of Bangladesh, it can also be proven that they use the use of mobile phone in their daily life.

Given the cultural, social and economic norms of the country, the people are more concerned about the information of others instead of applying own knowledge. The "Halal Soap" is a good example where the claims were not supported with science but yet through word of mouth it was perceived to be the case.

7 Conclusion

In comparison to the above three sectors, it is evident that mobile diffusion was higher comparing to CNG vehicle and microfinance due to the high rate of imitation effect. In Bangladesh, social communication and specially word of mouth effect impact at a high rate for most diffusion. Thus, marketer should carefully take necessary steps to ensure their sustainable growth. Consumer attention can be gained through the understanding of proper effect of imitation effect. Also from the comparison, it is found that for the entire given products, diffusion rate will not be similar and even within the sector, competitors diffusion will differ based on the external and internal influence.

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Data source :

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