Adoption of Cellular Phone Technology in Urban Pakistan:
A Diffusion of Innovation Approach

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Abstract
This paper focuses on the theory of adoption of cellular phone as an innovation and its diffusion and penetration in the Pakistani society and to confirm Roger's theory of diffusion of innovation. More specifically, the study aims to test if five categories of adopters and five stages of adoption [as suggested by Roger (1976)] adequately explain the behavior of cellular phone users in Pakistan. The study also aims to evaluate the role played by advertising in the process of diffusion of innovation. An attempt is also made to study relationships among other variables of interest. To achieve its objectives, this study formulates the diffusion of innovation theory using survey research method from population of Pakistan(a sample of 200 respondents are approached) and various statistical techniques are applied on the information gathered before drawing any conclusions. Our results support the theory of diffusion of innovation. We do not find an evidence to believe that advertising plays a statistically significant direct role in the process of diffusion of innovation, although we have not explored the extent of its indirect contribution in the process.

Keywords: Adoption; diffusion of innovation; cellular phone; Pakistan

I. Introduction
Today's markets have become global. Different requirements of various customer segments at one time are the direct result of this globalization, which arise from different political, social, cultural, and technical perspectives. Industrial revolutions and eras of creative destruction result from major discontinuous technological changes. A new industrial revolution is about to begin. Due to the breakthrough of mobile communication innovations together with development in other communication technologies, mobile technology diffusion is starting to replace existing industrial processes with more efficient ones.

Rogers (1976) says that an innovation is an idea, practice, or object that is perceived as new. Diffusion is the process by which an innovation is communicated through certain channels, over time among the members of a social system. He has
identified five sequential stages awareness, interests, evolution, trial and adoption. And the process of adopting an innovation follows five groups of people innovators, early adopters, early majority, late majority and laggards. This study attempts to testify the Roger’s theory of diffusion of innovation in Pakistani society with reference to cellular phone, and about the role played by advertisement in this respect.

II. Literature Review

Shahid (1994) writes that as consumers of mass communication, we are constantly exposed to material that both informs and persuades information about new discoveries in technology, products designed to make our life easier, inventions and other innovative procedures. The process of diffusion is defined as the acceptance, over time, of some specific item-an idea or practice, by individuals, groups or other adopting units, linked to, specific channels of communication, to a social structure, and, to a given system of values, or culture (Katz et.al. 1963).

Robertson (1967) describes in his article, “the process of innovation and the diffusion of innovation”, that there are different questions related to innovation and its diffusion process, depending on the strategy. Different type of people adopt new ideas at different times (Rodman 2006; Wildemuth 1992). The process of innovation decision has five stages, knowledge, attitude, adoption, implementation, confirmation. He further adds that there are five different adopters of diffusion process e.g. innovators, early adopters, early majority, late majority and laggards (Rogers 1976).

Rogers (2001) says that the adoption process is the mental process though which an individual passes from First hearing about an innovation to final adoption. At knowledge stage the individual is exposed to the innovation but lacks complete information about it. He then becomes interested in the innovation and seeks information about it at the attitude stage. At the adoption stage, the individual mentally applies the innovation to his present and anticipated future situation, and then decides whether or not try it. The individual uses the innovation on a small scale in order to determine its utility in his own situation at the implementation stage. At the confirmation stage the individual decides to continue the full use of innovation. Evidence from research studies indicates the conception of confirmation stage is probably valid.

Markus (1987) studies in his article that companies consider technology factors important in deciding to adopt and deploy wireless devices designed for mobile telephony and information services. Advertising is a vital tool as well as powerful communication force to sell goods, services, images and ideas (Chandra 2004).

Wang and Kettinger (1995) suggest that the tremendous success of success of cellular technology has fundamentally changed the way people communicate and promoted the evolution of a new multi billion dollar wireless communication industry. Advertising effected the sale growth of new, infrequently purchased products (Horsky and Simon 1983) and it attained its maximum effect after several months (Simon and Sebastian 1987).

Shimp (2000) examines a stream of new products is absolutely essential for most company’s success and long-term growth. Despite the huge investments and concerted efforts to introduce new products or services, may are never successful. In the process of
diffusion of innovation innovators are 2.5%, early adopters are 13.5%, early majority is 34%, late majority is 34% and laggards are 16% (Bryant and Thompson 2002).

Pedersen and Ling (2002) Valente and Davis (1999) analyze what are the requirements of users to adopt mobile phone? These requirements are technological, business strategic and behavioral.

III. Statement of the Problem
Primary objectives of this study are to answer the following two questions: How has the innovative cellular phone technology diffused in Pakistan? How significant has been the role of advertisement in this diffusion process?

Hypothesis:
To answer above questions, we construct the following hypotheses based on what has been observed from the literature reviewed on diffusion of innovation theory:

H1: Process of adopting an innovation (like cellular phone), in case of Pakistan follows 5 groups of people to include innovators, early adopters, early majority, late majority and laggards.

H2: Diffusion of information (like cellular phone technology) completes in 5 stages to include awareness, interest, evolution, trial and adoption.

H3: The most common reason to adopt the innovation (cellular mobile technology in the case) is media campaign.

Statistical Hypothesis
To judge the study statistically, following hypotheses are also advanced:

H4: Gender and type of mobile phone connection (Prepaid/Postpaid) are statistically related with each other

H5: Type of mobile phone connection (Prepaid/Postpaid) is statistically related to education.

H6: Age has a statistically significant impact on the type of mobile phone connection (Prepaid/Postpaid) adoption.

H7: Occupation of individual has a statistically significant bearing on the selection of type of mobile phone connection (Prepaid/Postpaid).

H8: Prepaid connection is the first choice of adopters.

H9: Male prefers to own prepaid connection of mobile phone.

H10: Female prefers to own prepaid connection.

H11: Gender has a statistically significant effect on the length of time mobile is held.
H12: Education has a statistically significant affect on length of time mobile is held.

H13: Gender does not provide statistically significant explanation if the mobile ownership depends on it

H14: Age of individual has a statistically significant affect on the trend of mobile ownership.

H15: Education has a statistically significant affect on mobile ownership.

H16: Occupation has a statistically significant impact on mobile ownership.

IV. Research Methods

By considering the need, nature and objectives of this research study, different research methods and techniques have been used. To obtain basic data for hypothesis testing, survey questionnaire method has been used. The structured questionnaire comprises of mostly closed ended questions with a few questions having an option of “other”. The survey uses both descriptive and analytical method to address the stated research aims.

Population

The random sample consists of 200 respondents, which is a statistically appropriate sample size. The sample is characterized with a number of features which are a very close representation of the actual population. Davies and Mosdell (2006) write that sampling is mainly used in large scale quantitative surveys where having a representative sample is essential to provide results which can be generalized to a population at large. Sample is selected from five major cities of Pakistan including Multan, Lahore, Islamabad, Peshawar and Karachi. Every city gets 20% representation in the sample of 200.

Description of Data Set

Random sample tracks true population very closely. Just over 60% of sample constitutes an age group of people between 10 and 29. This age group represents about 60% of Pakistan’s total population as well, hence random sample tallies the actual population very closely.

V. Findings

Primary objectives of the survey have been to answer the following two questions: ‘How has the innovative cellular phone technology diffused in Pakistan?’ and ‘how significant has been the role of advertisement in this diffusion process?’

Of the surveyed sample, 92% of the respondents were using mobile phones. The fact that the sample had a bias towards urban population, vast majority of the sample was expected to be using this technology anyway. Due to budgetary reason it was not possible to access rural areas.
Figures indicate that those who have held this technology primarily had it during the last three years (30%). In total, about 60% of the respondents have had mobile phones for last 5 years. This finding is quite in line with the figures released by Pakistan Telecommunication Authority PTA (2008) according to which in 2002 total number of mobile phone users were only 1.7 million. This number has tremendously increased in the last five years to about 77 million by the end of 2007 (almost half of Pakistan’s population is now using mobile cellular technology). It is assumed that in the next few years, this number is expected to increase further although with a relatively slow growth rate as saturation has already started to feature in the country now.

Findings of Figure 1 also lead us to accept the null hypothesis 1 (H1). Hence, as suggested by Roger (1976), the diffusion of innovation takes place in five stages. We note that innovators were only 3% of the surveyed population. These were followed by 19% early adopters, 29% early majority, 30% late majority and 10% laggards. The statement made by H1 seems to have a statistically significant value to assume that process of adopting an innovation like cellular phone follows 5 groups of people innovators, early adopters, early majority, late majority and laggards in case of Pakistani society (Figure 1).

H2 states that diffusion of information (like in case of cellular phone technology) shall complete in 5 stages: awareness, interest, evolution, trial and adoption. Results have led us to accept H2 as well. It was found that at awareness stage individual is exposed to the innovation but lacks complete information about it. As confirmed by results that more than 70% respondents have a memory of reading/watching/ hearing the media advertisement campaigns. Individual then becomes interested or shows attitude to the innovation and seeks information about it as 80% respondents remember the advertisement and they access media to get information. At the evolution stage the individual mentally applies the innovation to his present and anticipated future situation and then decides whether or not is trying it. As calculations explore that 95% respondents have evaluate the application of mobile phone into their life. The individual, then, uses the innovation on a small scale in order to determine its utility in his own situation at the trial implement stage. As only 3% respondents adopt this innovation as a trial. At the adoption stage the individual decides to continue the full use of innovation. According to
Hypothesis H3 predicts that the most common reason to adopt the innovation (cellular mobile technology in the case) will be the media campaign. Figures revealed that the most common reason (for 48% of the respondents) for accessing mobile technology was a professional/business need. Hence, results indicate that H3 must be rejected. Having said that, common sense dictates that in today’s age advertisement campaigns certainly play a significant role in peoples’ behaviour. The professional / business need must have had some benefit of the advertising done by cellular companies. Unfortunately, however, our study does not explore this particular angle leaving it for future research to quantify. (Figure 2)
H4 explores if gender and type of mobile phone connection (prepaid/postpaid) were related to each other. However, p value suggests that H4 needs to be rejected as there was no statistically significant evidence of their dependence on each other. Hence, we can conclude that selection of type of mobile connection does not necessarily depends on gender of the user. (Table 1)

H5 predicts that type of mobile phone connection (Prepaid/postpaid) is related to education. No evidence exits to support H5 (P=0.457). Hence, we cannot say with certainty if level of education of mobile user shall have an impact on the type of mobile phone connection. (Table 1)

Hypothesis H6 predicts that age of the mobile user affects one’s decision on the type of mobile phone connection (prepaid/postpaid) adoption. However, there is no such statistical evidence to believe (P=0.230) that it really does happen. We rather reject H6 concluding that age does not have a bearing on such a decision making. (Table 1)

H7 predicts that occupation of individual affects the selection of type of mobile phone connection (prepaid/postpaid). Chi-square analysis, however, suggests that occupation of individual does not impact the decision of selection of type of mobile phone (p=0.859), resulting into rejection of H7. (Table 1)

H8 predicts that prepaid connection is the first choice of adopters. Test and CI for one proportion supports the hypothesis as majority of the persons preferred prepaid connection (P=0.000). (Table 2)

H9 predicts that male users prefer to own prepaid connection of mobile phone. Test and CI for one proportion (P=0.000) supports the hypothesis that most of the respondents who own prepaid connection happen to be male. (Table 2)

H10 predicts that female prefer to own prepaid connection. After the test and CI for one proportion (P=0.000) this hypothesis is accepted as well. (Table 2)

Hypothesis H11 predicts that there is a relationship between gender and length of time mobile held. This hypothesis is accepted it is a statistically significant finding (P=0.039). (Table 1)

H12 predicts that length of mobile held is related to education. Chi-square calculation indicates that there is no statistically significant reason to believe that it is true (P=0.756). Hence, we reject null hypothesis of H12 against the alternative. (Table 1)

Hypothesis H13 predicts that gender does not determine the decision to own mobile. Chi-square test results into us rejecting H13 (P=0.159) suggesting that gender does drive the decision to own mobile. (Table 1)

Hypothesis H14 predicts that age of individual affects the mobile ownership. Chi-square rejects this hypothesis (P=0.041) suggesting that age does drive the decision to own a mobile. (Table 1)
H15 predicts that level of education impacts one’s decision to own mobile. This hypothesis is rejected on the basis of Chi-square test (P=0.15) suggesting that education does not necessarily decide if one would own a mobile or not. (Table 1)

Hypothesis H16 predicts that peoples’ occupation contributes in decision of mobile ownership. Test and CI for one proportion (P=0.000) leads us to accept H16, implying that occupation does count as a factor towards owning a mobile phone. This is in line with our finding that majority of the users have mobile phones due to their professional / business need. (Table 2)

### Table 1
**Chi-Square test table showing relationship among different variables**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Chi-Square</th>
<th>DF</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4</td>
<td>1.616</td>
<td>1</td>
<td>0.187 N.S</td>
</tr>
<tr>
<td>H5</td>
<td>3.558</td>
<td>4</td>
<td>0.457 N.S</td>
</tr>
<tr>
<td>H6</td>
<td>2.298</td>
<td>2</td>
<td>0.230 N.S</td>
</tr>
<tr>
<td>H7</td>
<td>1.936</td>
<td>5</td>
<td>0.859 N.S</td>
</tr>
<tr>
<td>H11</td>
<td>8.050</td>
<td>4</td>
<td>0.039 *</td>
</tr>
<tr>
<td>H12</td>
<td>8.116</td>
<td>12</td>
<td>0.756 N.S</td>
</tr>
<tr>
<td>H13</td>
<td>2.124</td>
<td>1</td>
<td>0.159 N.S</td>
</tr>
<tr>
<td>H14</td>
<td>7.535</td>
<td>2</td>
<td>0.041 N.S</td>
</tr>
<tr>
<td>H15</td>
<td>12.337</td>
<td>4</td>
<td>0.015 N.S</td>
</tr>
</tbody>
</table>

* The relationship has significance  
N.S. The relationship has no significance.

### Table 2
**Proportion test table about different variable**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>X (Respondent)</th>
<th>N (Total No.)</th>
<th>Sample Proportion</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H8</td>
<td>149</td>
<td>179</td>
<td>0.832402</td>
<td>0.000</td>
</tr>
<tr>
<td>H9</td>
<td>107</td>
<td>131</td>
<td>0.816794</td>
<td>0.000</td>
</tr>
<tr>
<td>H10</td>
<td>43</td>
<td>48</td>
<td>0.895833</td>
<td>0.000</td>
</tr>
<tr>
<td>H11</td>
<td>150</td>
<td>179</td>
<td>-0.079039</td>
<td>0.204</td>
</tr>
<tr>
<td>H16</td>
<td>160</td>
<td>185</td>
<td>0.864885</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### VI. Discussion
In recent past, the overwhelming growth in information and technology, has lead the rapid pace of current advancements in all spheres of life. The trend is reflected in from of many different innovative products and services, on which human race has started to show an inevitable reliance over time. Computers, internet, email, variety of transportation means and cellular phones all are amongst the examples of such innovations.

Roger (1976, 2001) depicts that diffusion is the process by which an innovation is communicated through certain channels, over time among the members of a social system. The diffusion process remains a significant research interest in communication, and diffusion theory remains a dominant theoretical paradigm for new media studies.

This has explored different aspects of usage of cellular phone. According to Roger’s theory, diffusion of innovation is a complete process. It has five stages and there
are also five categories of adopters (Rogers 1976, 2001) and advertising campaigns play a significant role in the process of diffusion of innovation.

All, but one, hypotheses were tested as positive suggesting that diffusion of innovation follows five stages and steps as suggested by Rogers as innovators, early adopter, early majority, late majority and laggards and five stages as awareness, interest, evolution, train and adoption (Roger’s 1976, 2001). However, we could not find sufficient statistical reason to conclude that advertising campaigns play a significant role in diffusion of innovation. It was observed that peoples’ choice and adoption to the innovation was driven by factors other than advertisement campaigns (particularly professional / business needs). Having said that one may not be able to discount the indirect role of advertising campaigns as no user would typically go after such an innovation without some degree of exposure to such campaigns. While advertisement campaigns of various cellular companies do not necessarily play a decisive role in case of individuals accessing the technology, such campaigns indeed proved instrumental in introducing the technology to masses and helping achieve the critical mass in due time. Moreover, it is very much expected that these campaigns continue to remain an important factor for businesses to decide in favor of accessing the technology.

Findings suggest that innovation of mobile cellular technology has followed the diffusion of innovation process in accordance with the famous theory of Roger. All the suggested stages of innovation diffusion have closely been observed in case of Pakistan, whereby the critical mass has been observed to have reached in about 8 – 10 years time.

In terms of policy implications, researcher draws a number of conclusions from the research findings. The fact that about half of Pakistan’s population has already accessed this technology by now, it is very unlikely that this pace of technology access shall be witnessed for long. Hence, the growth of adoption to the technology is expected to be slower in the years to follow. This also means that the cellular companies are to face an intense competition ahead if they are to remain successful in the business. More and more competition in price plans, service quality and package offering shall become the key to success for all. This will of course give rise to even greater market competition.

For government policy makers, it is important to ensure that as more and more users of this technology are emerging over time, service providers’ capacity to serve these customers satisfactorily remains intact. At times, such a demand trend by customers motivates companies to extend their customer base beyond their limits and reach. This obviously is not a healthy sign and kills the whole purpose of technological development.

References


PTA (2008), Pakistan Telecommunication Authority, accessed on November 12, 2008 from http://www.pta.gov.pk/


