

# 4G User Acceptance Technology Prediction using Grey Prediction Algorithm

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**Abstract—** The main objective in this study is to prediction of 4G user acceptance in India. Mobile technologies bring more benefits to users when more people use it in the network. This research will show the adoption intentions of 3G mobile technologies. With the completion of this objective of acceptance the next step to estimate the acceptance of 4G technology with the help of Grey Prediction Algorithm. The Grey Prediction Algorithm is the very powerful algorithm that will give better result for short term prediction. This study will support the migration to a more mobile computing environment by identifying the structural and contextual factors that facilitate the adoption of internet technology.

**Keywords-** 3G service; 4G service; grey prediction algorithm; mobile service; User acceptance and its analysis.

## I. INTRODUCTION

In the area of mobility management in wireless networks, fast and seamless handover is a major goal. Not a few techniques have been proposed to achieve this goal including handover preparation based on cross-layer optimization and mobility prediction [1]. 4G is a term has described the next evolution in wireless communications and data rates. A 4G system will provide a comprehensive IP solution where voice, data and multimedia can be given to users on an anytime and anywhere basis, and at higher data rates than 3G generations. Therefore 4G will be able to connect various high speed networks together, which would enable each one of us to carry digital devices even in dispersed locations[2]. Although a large number of Internet users now enjoy high-speed access, there are still number of geographic regions where broadband services are expensive or simply unavailable at any price.

Hence 4G is capable of providing new horizon of opportunity for both existing and startup telephone companies. [2]. The main objective of 4G system is 4G is a fully IP-based integrated system. It provides a higher data rate and 4G will be capable of providing between 100 Mbit/s and 1 Gbit/s speeds both indoors and outdoors, with quality and high security. 4G will use smart antennas for the better outcome. It will be multiple inputs and multiple outputs (MIMO) system based and it is also based on dynamic packet assignment.

## II. GREY PREDICTION

Gray prediction can also be used for the time series prediction it refers to the process by which the future value of a system are forecasted. The future value is based on the information obtained from the past and the present data points. We can use the mathematically or logically model for this purpose.

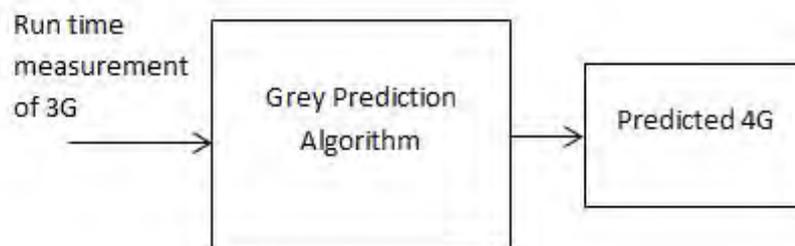


Figure 1: Grey prediction

The main task of grey system theory is to extract realistic governing laws of the system using available data [3]. The presented method establishes the suitable model according to the characteristics of data, and also improves the prediction accuracy of small data sets [4]. A prototype of grey prediction model GM(1,1|a) is introduced in the grey system theory 1982 [7]. We use the 3G predictive based to improve accuracy of mobile user acceptance. For 4G user acceptance prediction the proposed grey prediction approach utilizes the grey system to predict reliability.

### III. USER ACCEPTANCE

The performances of information systems depend on user acceptance or rejection. These days, information is universally regarded as a very important tool in improving the competitiveness of economy. It is said that technology impacts a significant effects on the productivity of organizations. Moving from basic analog to high-speed digital in a approximately 20 years is quite a feat. Wireless networks have capabilities to providing high and fast data transfer rates that make it easier to access applications and the Internet from mobile devices and your pc at home. Continuous improvements in computing technologies encourage the wireless industry and consumers to automatically predict what's next.

The main challenge when exploring user needs and wants lies in the intersection of unknown future customers' needs and wants and new technology [5]. Acceptance of new information technologies has been important research area since 1990s [6].

### IV. FACTOR OF ACCEPTING TECHNOLOGY

- 1) *Perceive Enjoyment*: Perceived enjoyment and fun means that individuals that themselves experience immediate pleasure and fun from using the machine and perceived any activity involving using the computer to be enjoyable in its own right [10]. This emphasize on enjoyment. Perceive enjoyment expect weather the user using this service for enjoyment or not e.g. watching movie, playing online game.

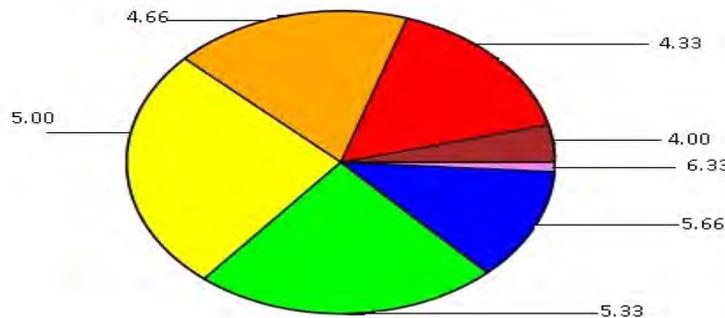


Figure 2: Description of Perceive Enjoyment

Perceive Usefulness					
Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	4.33	2	2.00	2.00	2.00
	4.66	1	1.00	1.00	3.00
	5.00	4	4.00	4.00	7.00
	5.33	21	21.00	21.00	28.00
	5.66	25	25.00	25.00	53.00
	6.00	21	21.00	21.00	74.00
	6.33	16	16.00	16.00	90.00
	6.66	9	9.00	9.00	99.00
	7.00	1	1.00	1.00	100.00
<i>Total</i>		100	100.0	100.0	

Perceive Usefulness		
<i>N</i>	<i>Valid</i>	100
	<i>Missing</i>	0
<i>Mean</i>		5.81
<i>Std Dev</i>		.52
<i>Minimum</i>		4.33
<i>Maximum</i>		7.00

Table 1: Description of Perceive Enjoyment

- 2) *Perceive quality*: The degree of at which describe the quality of service include advantages and merits. Perceived quality is defined as a consumer's belief that the system can provide a satisfactory and reliable service.

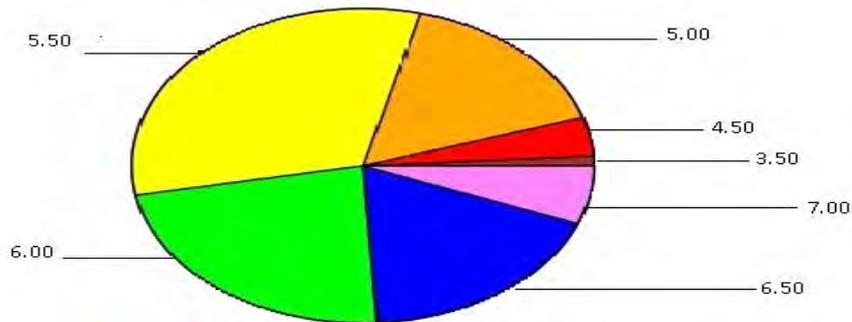


Figure 3: Description of Perceive Quality

- 3) *Price level*: In the price level weather user accepts or rejects the price level. It include weather user satisfy price level or not and how much money he expect to give for the service. This refers to the extent that an individual perceives that 3G mobile video would be a costly technology to adopt [Azjen 2002]. The greater the cost the less likely would be the intention to adopt the technology [9].

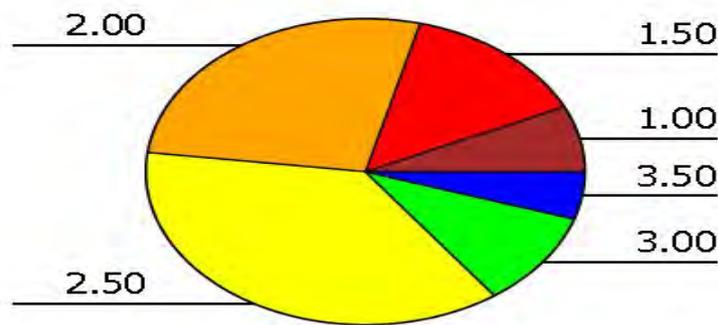


Figure 4: Description of Perceive price level

- 4) *Perceive usefulness*: Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance [8]. It includes how user enjoys the benefits of the service. How they are useful for the user. Weather he/she can finish their work frequently with the help of this.

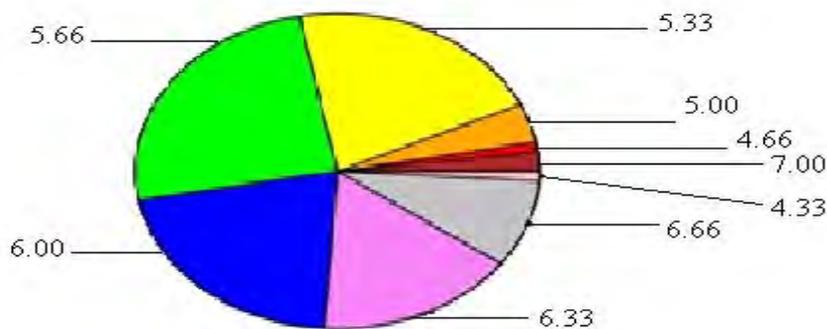


Figure 5: Description of Perceive Usefulness

- 5) *Ease of use*: Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free from effort” (Davis, 1989, p. 323). All else being equal, an application perceived to be easier to use is more likely to be accepted by the users (Davis, 1989) [8]. User feeling convenient or not while using this system.

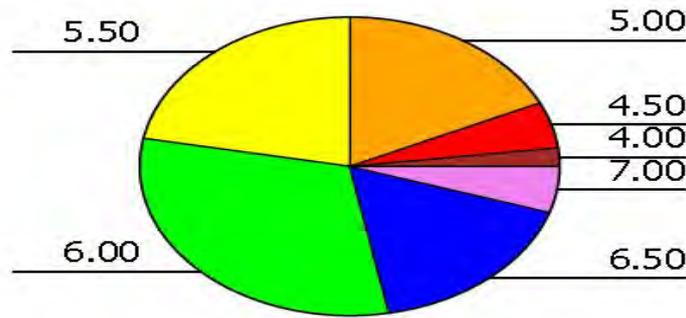


Figure 6: Description of Easy of Use

6) *Behavioral Intention (BI)*-Behavioral Intention to use is a measure of the likelihood that a person will adopt the application, whereas the TAM uses actual usage to represent a self-report measure of time or frequency of adopting the application (Davis *et al.*, 1989). However, it is not easy or practical to obtain an objective measurement of an individual’s intention to engage in behavior [8].

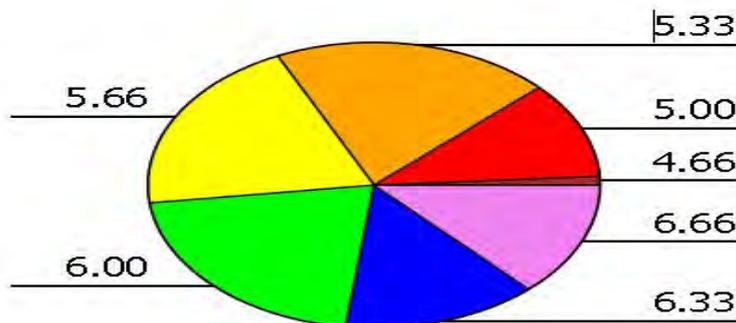


Figure 7: Description of Behaviour Intention

## V. METHODOLOGY

### 1. Research Instrument and Respondents

At first data were collected from a city by means of a questionnaire that was especially developed for this study. Questionnaire was developed in terms of validity, accuracy and logic. The questionnaire consisted of two parts. In the first part of the questionnaire was designed to identify the information of the respondents such as gender, age and qualification. Here also design the information about organization and area of specialization. In this survey the data has taken from Shimla city of himachal Pradesh (India). And also developed information about 7 point likert scale used in psychometric studies. Such as how the respondents have to give response back. In the second part contains a series of factor about the perceived usefulness (PU), perceived ease of use (PEOU), perceived enjoyment (PE), perceived quality (PQ), Behavioural intention (BI) and price level(PL). For ratings, 7- point likert scale was used as suggested by Ajzen and Fishbein, where 1- completely disagree, 2- moderately disagree, 3- somewhat disagree, 4- neutral, 5- somewhat agree, 6- moderately agree and 7- completely agree. After getting the questionnaire, data was fed into spss data editor tool, which is software for analyses of sampled data, gathered in a survey and future 4G prediction implemented on matlab tool.

Strongly disagree			Neutral	Strongly agree		
1	2	3	4	5	6	7

Figure 8: Seven point likert scale (Ajzen and Fishbein)

A total number of 130 survey questionnaires was developed and distributed to student’s deployment located in Shimla Valley area. Questionnaires are distributed via a drop-off-method, via this method the hand delivery of self-administered questionnaires, followed by personal collection.

2. Reliability Test

For the user acceptance technology of 4G prediction we must use the reliability test through reliability analysis. All the factors of user acceptance perceive usefulness, behavior intention, ease of use, perceive quality and perceive enjoyment are accepted for the user acceptance technology because generally a reliability must be higher than 0.800 is expectable, but if in any circumstances that will be 0.700 is also acceptable. Here all the variables have value of greater than 0.700 are supportable and variable price level is also supportable for 4G because of its fast speed and features. Because of un-estimated value of 4G service here this algorithm can also support it. In the 3G service due to its price level they reject it because they can have much reason. Price level is one factor that has not use for acceptance of technology. After the test has been implemented the result has conclude that all the test factor for 4G prediction has greater than 80 i.e. the result has perfectly in positive (+ve) direction. With the help of Grey prediction algorithm it has cleared that it is helpful for short term prediction. Time series forecast is also useful for this prediction. All the factor has implemented separately to find acceptable and accurate result.

Variables	Cronbach's Alpha (3G)	Reliability Test (4G)	
Perceived Usefulness	0.734	>80	Test +ve
Perceived Ease of Use	0.700	>80	Test +ve
Behavior Intention	0.707	>80	Test +ve
Perceived Enjoyment	0.728	>80	Test +ve
Price level	-0.021	>80	Test +ve
Perceive Quality	0.736	>80	Test +ve

Table 2: Reliability Analysis for variables (factors) in 3G and predicted 4G

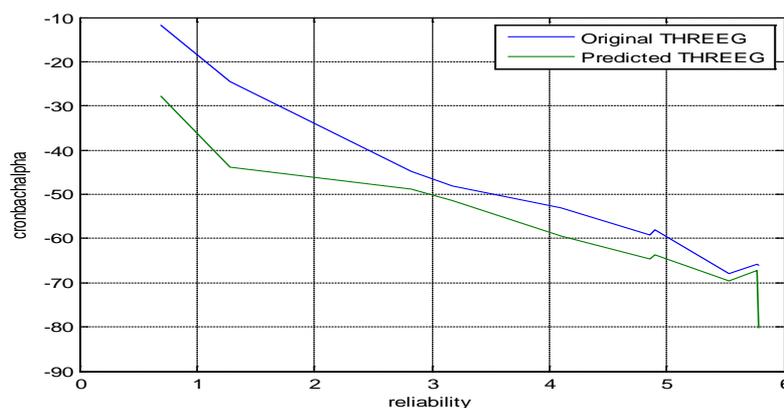
w2 = 0.707

Observed and predicted values of the THREEEGs in cronbach's alpha in **behavioral intention** are

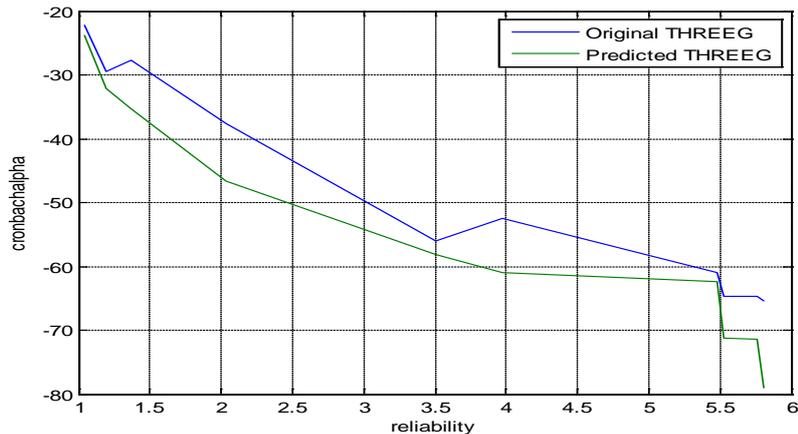
-20.9335	-24.7167	-24.7291
-24.7167	-28.1437	-28.2643
-28.1437	-38.4721	-37.3514
-38.4721	-52.7024	-51.3576
-52.7024	-55.9797	-56.1477
-55.9797	-64.3357	-63.4218
-64.3357	-64.5332	-65.9400
-64.5332	-65.6538	-66.6340
-65.6538	-65.8366	-67.2506
-65.8366	-82.1527	-80.7471

Elapsed time is 1.000034 seconds

Table 3: behavioral intention test



Graph 1.1: Behavioral intention test



Graph 1.2: Behavioral intention test

## VI. CONCLUSION AND FUTURE SCOPE

The experimental study concludes that there is strong relationship between the different constructs of TAM model. These different constructs are Behavior intension, price level, perceive quality, Perceive usefulness, perceived enjoyment, ease of use. We construct the simple correlation between all of these variables along with Age, Gender, Education, Experience, Individual Impact, Organizational Impacts etc. and Behavior Intension itself. This analysis is very useful for future hypothesis and experiments on 4G TAM acceptance models and also it is useful to the acceptance of different location. It can be subdivided into different category like prediction and acceptance of software computing, desktop software, technology acceptance etc. The finding of study tells about the relation between the moderators and factor. The results of study tells that Behavior Intension, Perceived Quality, Perceive Enjoyment, Ease of Use, Perceive Usefulness using different model's accepted by the user but they do not prefer Price Level for the Social Influence. The Cronbach's Alpha test shows that all the variables and moderators are reliable and valid for present and further research processes.

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