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AN EMPIRICAL STUDY ON IMPACT OF BRAND KNOWLEDGE AND BRAND EXPERIENCE ON BRAND PREFERENCE

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ABSTRACT

In this era of throat-cut competition, it is very essential for a brand to be in the minds of customers for its sustainability. This study focused on exploring the factors of brand knowledge that make brand a preferred brand as well as to understand the brand experience factors developed due to impact of brand interactions. This study further focused on understanding the impact of brand knowledge and brand experiences which helps in making brand, a preferred brand. To achieve these focused areas, six hypothesis were created at 5% level of significance which were further analyzed with the help of various statistical tools like correlation and multiple regression analysis. The analysis was done with the help of SPSS 20 version software to investigate the impact of preferred brand on the intention to re-purchase and various recommendations were given in the end.

Keywords : Brand Experience, Brand Knowledge, Brand Preference, Correlation, Multiple Regression.

I. INTRODUCTION

The term brand is neither the physical entity nor it is the actual service. It is the customers only which make any product a brand. Branding is done in the minds of the customers. **Kevin Keller**defined brand knowledge as awareness of the brand name and belief about the brand image.[3]Valuable beliefs are reliable beliefs – consistent and durable. In addition to belief, consumer experience is asignificant part of brand knowledge and understanding. Consumer experience consist of emotions, sentiments, excitements, sensations, and activity.Brand awareness is connected to the perceptivedepiction of the brand(**Peter and Olson 2001**). In the terms of a layman, the brand awareness and understanding of customers is basically the information of product that is stored in the memory of the customers. This brand knowledge includes full description of the product as well as the evaluated and criticized brand information. The perception, observation and opinion of the customers about the actions of brands is known as brand experience. A brand experience is basically the interfaceamong the individual and a tangible or intangible brand. Hence a brand experience can include one or more of a recipient's five senses and cause any kind of response.Experiencing the brand through a variety of situations creates in the mind of a potential consumer a kind of profile full of feelings and attitudes about the brand,

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helping the consumer to psychologically predict what items associated with it are likely to be like.Preference for any brand reflects anaspiration of customer to use a particular product(s) or service(s) of a company; even when there are equally-priced and equally-available alternatives. In fact, more often than not, brand preference indicates a desire to seek out a specific product or service even when it requires paying more or expending more effort to obtain it! Brand preference is important to companies because it provides an indicator of their customers' loyalty, the success of their marketing tactics, and the strength of their respective brands.The notion of preference has been considered in different disciplines such as economists, psychologists, sociology. On the other handthere is no commonly agreed definition of preference among these disciplines.

II. REVIEW OF LITERATURE

Brands are important valuable intangible assets for companies, a distinctive tool that builds a long-term relationship with the consumers, and protects its' rights **(Kolter et al., 2009).**The first three decision-making phases of brand loyalty constitute the focal point of brand preference. It describes the stated preference toward certain brands over time, accompanied by behavioural consistency **(Moschis et al., 1984).**Brand preference is distinct from attitudinal loyalty **(Mattila, 2001);** however, both assume that consumers' strong beliefs about the brand cognitive structure enhance brand loyalty **(Kim et al., 2011)**.**Rossiter and Bellman, (2005)** suggested different levels of preferences and their corresponding states of loyalty. There is strong brand preference for single or multiple brands; the state at which consumers can be loyal to a certain brand.Economically, the main target of the consumer in the choice task is to satisfy his preference and select the alternative with maximum utility **(Rizvi, 2001)**.Brand liking is related to the strength of positive brand assets **(Anselmsson et al., 2008).** Brand commitment refers to the deep emotional attachment of consumers to brands **(Carlson et al., 2008; Desai and Raju, 2007)**.**Petruzzellis (2010)** compared the impact of hedonic and utilitarian benefits on consumer brand choices of mobile phones. He categorized consumers into three groups. The brand huggies refers to those who use mobiles to keep in touch with their distant life. Technology enthusiasts focus on the technology and technical performance more than social life, while pragmatists focus on price. The results of that study demonstrated the importance of hedonic attributes over the utilitarian attributes in mobile choices.The study of **Tzou and Lu (2009)** addressed the impact of brand attachment on the use fashion technology (laptop-Sony Vaio) and the mediating role of utilitarian and hedonic brand attributes. The results supported the significant indirect impact of brand attachment on fashion technology usage mediated by the hedonic factors. Moreover, the findings show insignificant impact of the brand usefulness on fashion technology usage and negative impact of the perceived ease of use on behaviour.**Lin (2002)** found that differences on brand preferences can be related to demographics and/or psychographic variables.

III. RESEARCH GAP

As per the review of literature it was observed that most of the prior studies concerned with examining the impact of brand experience on brand loyalty **(Brakus et al, 2009; Biedenbach and Marell, 2010; Pullman and Gross, 2004),** brand relationship **(Chang and Chieng, 2006),** satisfaction **(Ha and Perks, 2005; Morgan-Thomas and Veloutsou, 2011 Rose et al, 2012),** and brand value **(Tsai, 2005).** However, this considers being

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the first study assuming the direct impact of brand knowledge, brand experience on brand preference and consequently on the re-purchase intention and recommendation to others.

IV. OBJECTIVES OF STUDY

1. To explore the brand knowledgefactors that make brand a preferred brand.
2. To understandthe brand experience factors developed due to impact of brand interactions.
3. To understand the impact of brand knowledge and brand experiences in making brand a preferred brand.
4. To investigate the impact of preferred brand on the intention to re-purchase and recommendation to others.

V. HYPOTHESES OF STUDY

The following Hypotheses were formulated as follows:-

Here HO represents Null Hypothesis and HA represents Alternative Hypothesis.

Hypothesis 1:-

H01: There is no significant relationship between Demographic factors (Age, Gender, Income, Education, and Marital Status) with that of the Brand Preference.

HA1: There is significant relationship between Demographic factors (Age, Gender, Income, Education, and Marital Status) with that of the Brand Preference.

Hypothesis 2:-

H02: There is no significant relationship between Brand Knowledge with that of the Brand Preference.

HA2: There is significant relationship between Brand Knowledge with that of the Brand Preference.

Hypothesis 3:-

H03: There is no significant relationship between Brand Knowledge with that of the re – purchase intentions and recommendation to others.

HA3: There is significant relationship between Brand Knowledge with that of the re – purchase intentions and recommendation to others.

Hypothesis 4:-

H04: There is no significant relationship between Brand Experience with that of the Brand Preference.

HA4: There is significant relationship between Brand Experience with that of the Brand Preference.

Hypothesis 5:-

H05: There is no significant relationship between Brand Experience with that of the re – purchase intentions and recommendation to others.

HA5: There is significant relationship between Brand Experience with that of the re – purchase intentions and recommendation to others.

Hypothesis 6:-

H06: There is no significant relationship between Brand Preference with that of the re – purchase intentions and recommendation to others.

HA6: There is significant relationship between Brand Preference with that of the re – purchase intentions and recommendation to others.

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VI. RESEARCH METHODOLOGY

The main objectives of the study are to understand the impact of brand knowledge and brand experience on the brand preference and consequently leading to the intention to re – purchase and recommendation to others. In order to achieve this objective, the researchers had employed the deductive approach of the research and followed the step by step procedure. The theoretical foundation of the proposed hypothesis is obtained from the literature. However the researchers do not maintain completely the deductive approach of research and apart from this the primary data was obtained to add on variables that were missing in the existing literature.

6.1 Research Design

This study is trying to investigate the dimensions of brand preferences and consequently its impact on the intention to re – purchase and recommendation to others. As the literature plays a vital role in the theoretical foundation of the proposed hypothesis, so the research design in this study is being divided in two stages viz. first stage comprised of the exploratory stage as the researcher has keen interested in gaining insights about the factors affecting the customer preferences for different brand while second stage comprised of the primary data obtained from cross sectional sample survey about the characteristics of the customers. This second stage research design is called descriptive – explanatory stage. A systemized and organized study was done to reach the desired objectives of the study.

6.2 Focus Group

The most frequently used method in marketing and business research is focus groups which examine attitude, behavior, emotions, experiences etc. of the customers about a particular product or service. From this method some important factors and priorities were notices that were missing in the literature. The main objective of introducing focus group in this study as it helps in qualitative analysis of data. In this study the same particular questions in sequence given to four focus groups. These four focus groups consisting of homogeneous participants. The sampling frame of the focus group survey includes respondents living in Delhi of both the genders. This focus group helped in investigating the differences across the respondents. The focus groups are formed on the basis of gender, age and education level of the respondents. There were eight respondents in each focus group and were arranged using a snowball technique.

6.3 Sources of Data

To cater the need of the research, the researchers have used primary data through self-constructed structured Questionnaire and as far as the secondary data is concerned that was obtained from various reports, web sites, and journals etc.

6.4 Sampling Technique

For this study, the population is the respondents living in Delhi which are users of mobile phones of different genders. Cross sectional research design was adopted.Non Probability convenience sampling technique was used to gather data from the respondents because the sampling frame is unavailable.

6.5 Data Collection Technique

Self – constructed structured questionnaire was used to gather data from the respondents living in various areas of Delhi and using mobile phones. As the shopping malls are expanding and flourishing in Delhi so the researchers decided to approach respondents in various malls of Delhi. A sample size of 300 was considered good for the study.A total of 351 filled questionnaires were received from the respondents. Out of these 26 questionnaires were discarded and 325 questionnaires were used for the study.

6.6 Statistical Tools Used

Various statistical tests like Normality, Reliability and Validity tests were done to fulfill the necessary and sufficient conditions of statistical tools. Hypothesis testing was done with the help of correlation and regression analysis using statistical analysis software SPSS version 21.

6.7 About the Questionnaire

In order to develop a questionnaire to reach the desired objective a study of **Churchill (1979, 1995)** was followed.In the questionnaire there were nine sections. Section A consisting of demographic profile of the respondents. Section B contains 7 statements related to brand preference of the respondents. Section C contains 3 statements related to intention to re – purchase and recommendation to others. Section D contains 28 statements related to brand experience of the respondents. Section E contains 7 statements related to brand knowledge of respondents. Statements were rated on five-point Likert scale from strongly disagree to strongly agree. The measurement items are adapted from the studies of **Duarte and Raposo, (2010); Hellier et al., (2003), Jamal and AL-Marri, (2010), Overby and Lee, (2006), and Sirgy et al., (1997).**

VII. DATA ANALYSIS AND INTERPRETATION

7.1 Test of Normality

Table 1: Results of K – S test for Normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Brand Knowledge	.135	325	.000	.926	325	.000
Brand Experience	.172	325	.000	.883	325	.000
Brand Preference	.192	325	.000	.804	325	.000
Re-purchase Intentions and Recommendation to others	.144	325	.000	.914	325	.000
a. Lilliefors Significance Correction						

Kolmogorov-Smirnov and Shapiro-Wilk (K-S test) of normality was done to make sure that data is normally distributed or not. From **table 1** it is clear that all the results are found to be insignificant as in all the cases p<.001. Thus, the distribution of data is found to be normal.

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7.2 Reliability Analysis

Table 2: Reliability Statistics

Construct	Cronbach's Alpha	No. of Items
Brand Knowledge(BK)	0.814	7
Brand Experience(BE)	0.713	28
Brand Preference(BP)	0.838	7
Re-purchase and Recommendation (RR)	0.772	3
Whole Questionnaire	0.784	45

In order to check the reliability of the questionnaire, the Cronbach's Alpha test was applied. The value of Cronbach's alpha is found to be 0.814 in brand knowledge, 0.713 in brand experience, 0.838 in brand preference, and 0.772 in re-purchase and recommendation to others of the questionnaire, which is well above than 0.6. Also the overall value of Cronbach's alpha is 0.784. As the value of Cronbach's Alpha is more than 0.6, which considers the instrument to be reliable for the study. Therefore, the high Cronbach's Alpha coefficient in this study represents a high consistency and reliability among statements in questionnaire.

7.3 Validity Analysis

Table 3: KMO and Barlett's test of Sphericity

Brand Knowledge (BK)	KMO Measure of Sampling Adequacy		0.823
	Bartlett's Test of Sphericity	Approx. Chi-Square	8372.136
		Df	255
		Sig.	**0.000**
Brand Experience (BE)	KMO Measure of Sampling Adequacy		0.882
	Bartlett's Test of Sphericity	Approx. Chi-Square	9284.128
		Df	198
		Sig.	**0.000**
Brand Preference (BP)	KMO Measure of Sampling Adequacy		0.811
	Bartlett's Test of Sphericity	Approx. Chi-Square	8812.829
		Df	190
		Sig.	**0.000**
Re-purchase and Recommendation to others (RR)	KMO Measure of Sampling Adequacy.		0.942
	Bartlett's Test of Sphericity	Approx. Chi-Square	8126.228
		Df	195
		Sig.	**0.000**

Kaiser-Meyer-Olkin test was done to measure the homogeneity of variables and Bartlett's test of sphericity was done to test for the correlation among the variables used. From **table 3,** it is found that the value for Kaiser-

Meyer-Olkin Measure of Sampling Adequacy was more than 0.6 in all the parts of questionnaire, as it is 0.823 in brand knowledge, 0.882 in brand experience, 0.811 in brand preference, and .942 in re-purchase and recommendation to others. Also Bartlett's Test of Sphericity has significant value less than 0.05 at 5 % level of significance in all the parts of questionnaire. Thus it is concluded that instrument is accepted for the study.

7.4 Coefficients of Correlation

Karl Pearson Coefficient of correlation was calculated to find the significant relationships between different dimensions.

Table 4: Coefficient of Correlation

		BK	BE	BP	RR
Pearson Correlation Coefficient	**RR**	- 0.027	0.217	0.816	1
Sig. (2 – tailed)		0.821	0.091	**0.000***	**-**
Pearson Correlation Coefficient	**BP**	0.724	0.836	1	0.816
Sig. (2 – tailed)		**0.000***	**0.000***	**-**	**0.000***
Pearson Correlation Coefficient	**BE**	0.758	1	0.836	0.217
Sig. (2 – tailed)		**0.000***	**-**	**0.000***	0.091
Pearson Correlation Coefficient	**BK**	1	0.758	0.724	- 0.027
Sig. (2 – tailed)		**-**	**0.000***	**0.000***	0.821

From Table 4, it is quite clear that Brand Preference is significantly associated with re-purchase and recommendation to others. Brand preference is significantly associated with Brand knowledge, Brand experience and re-purchase and recommendation. However there is some association in some variables while some have no relationship at all.

VIII. HYPOTHESIS TESTING

Hypothesis 1:-

H01: There is no significant relationship between Demographic factors (Age, Gender, Income, Education, and Marital Status) with that of the Brand Preference.

HA1: There is significant relationship between Demographic factors (Age, Gender, Income, Education, and Marital Status) with that of the Brand Preference.

8.1 Relationship between Demographic factors and Brand Preference

Table 5: Relationship between Demographic factors and Brand Preference

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**β**		
(Constant)	1.722	0.031		11.297	**0.000***
Demographic factors	0.724	0.028	0.736	11.582	**0.000***

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Table 5 indicates that the multiple regression analysis identifies that brand preference is positively affected by demographic factors. It is clear that the demographic factors contribute to the brand preference. Since the positive relationship is found between both the variables. Since p – value is less than 0.01 that means it is significant at 1% level of significance so the alternative hypothesis is supported that is there is significant relationship between demographic factors with that of the brand preference.

Table 6: Regression Analysis – demographic factors and brand preference

Model	R	R^2	Adjusted R^2	S.E. of estimates	F	Sig.
1	0.821	0.674	0.651	0.6124	143.28	**0.000***

a: Predictors: (Constant), Demographic factors,   b: Dependent variable: Brand Preference

Table 6 shows the association between the demographic factors and brand preference of customers using mobile phones in Delhi. The coefficient of correlation between demographic factors and the brand preference of customers is 0.821 and the value of R square is 0.674. Thus aroundthree fourth of variation in dependent variable that is brand preference of product is explained by the independent variable demographic factors. Since the Adjusted R square is found to be 0.651 which indicates that 65.1% of the variation in brand preference of customers is explained by the demographic factors. The significant value is found to be 0.000 which is below than 0.05, thus it is significant at 5% level of significance. Thus, null hypothesis is rejected and alternative hypothesis is accepted. So, there is significant relationship between Demographic factors (Age, Gender, Income, Education, and Marital Status) with that of the Brand Preference.

Hypothesis 2:-

H02: There is no significant relationship between Brand Knowledge with that of the Brand Preference.

HA2: There is significant relationship between Brand Knowledge with that of the Brand Preference.

8.2 Relationship between Brand Knowledge and Brand Preference

Table 7: Relationship between Brand Knowledge and Brand Preference

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	β		
(Constant)	1.247	0.214		13.726	**0.000***
Brand Knowledge	0.658	0.084	0.636	13.226	**0.000***

Table 7 indicates that the multiple regression analysis identifies that brand preference is positively affected by brand knowledge. It is clear that the brand knowledge contribute to the brand preference. Since p – value is less than 0.01 that means it is significant at 1% level of significance so the alternative hypothesis is supported that is there is significant relationship between brand knowledge with that of the brand preference.

Table 8: Regression Analysis – brand knowledge and brand preference

Model	R	R^2	Adjusted R^2	S.E. of estimates	F	Sig.
1	0.724	0.524	0.518	0.5242	136.82	**0.000***

a: Predictors: (Constant), Brand Knowledge,   b: Dependent variable: Brand Preference

Table 8 shows the association between the brand knowledge and brand preference of customers using mobile phones in Delhi. The coefficient of correlation between brand knowledge and the brand preference of customers is 0.724 and the value of R square is 0.524. Thus more than half of variation in dependent variable that is brand preference of products is explained by the independent variable brand knowledge. Since the Adjusted R square is found to be 0.518 which indicates that 51.8% of the variation in brand preference of customers is explained by the brand knowledge. The significant value is found to be 0.000 which is below than 0.05, thus it is significant at 5% level of significance. Thus, null hypothesis is rejected and alternative hypothesis is accepted. So, there is significant relationship between brand knowledge with that of the Brand Preference.

Hypothesis 3:-

H03: There is no significant relationship between Brand Knowledge with that of the re – purchase intentions and recommendation to others.

HA3: There is significant relationship between Brand Knowledge with that of the re – purchase intentions and recommendation to others.

8.3 Relationship between Brand Knowledge and Re-purchase Intentions and Recommendation to others

Table 9: Relationship between Brand Knowledge and Re-purchase Intentions and Recommendation to others

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	β		
(Constant)	1.427	0.416		28.626	**0.881**
Brand Knowledge	- 0.026	0.041	0.061	28.618	**0.826**

Table 9 indicates that the multiple regression analysis identifies that re-purchase intentions and recommendation to others is negatively affected by brand knowledge. It is clear that the brand knowledge did not contribute to the re-purchase intentions and recommendation to others. Since p – value is more than 0.01 that means it is not significant at 1% level of significance so the null hypothesis is supported that is there is no significant relationship between brand knowledge with that of the re-purchase intentions and recommendation to others.

Table 10: Regression Analysis – brand knowledge and re-purchase intentions and recommendation to others

Model	R	R^2	Adjusted R^2	S.E. of estimates	F	Sig.
1	- 0.027	0.001	- 0.082	0.2421	146.22	**0.837**

a: Predictors: (Constant), Brand Knowledge,   b: Dependent variable: re-purchase intentions and recommendation to others

Table 10 shows the association between the brand knowledge and re-purchases intentions and recommendation to others using mobile phones in Delhi. The coefficient of correlation between brand knowledge and re-purchase intentions and recommendation to others is – 0.027 and the value of R square is 0.001. Since the Adjusted R square is found to be - 0.082 which indicates that the negative variation in re-purchase intentions and

recommendation to othersis explained by the brand knowledge. The significant value is found to be 0.837 which is above than 0.05, thus it is insignificant at 5% level of significance. Thus, null hypothesis is accepted and alternative hypothesis is rejected. So, there is no significant relationship between brand knowledge with that of the re-purchase intentions and recommendation to others.

Hypothesis 4:-

H04: There is no significant relationship between Brand Experience with that of the Brand Preference.

HA4: There is significant relationship between Brand Experience with that of the Brand Preference.

8.4 Relationship between Brand Experience and Brand Preference

Table 11: Relationship between Brand Experience and Brand Preference

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**β**		
(Constant)	1.718	0.621		11.262	**0.000***
Brand Experience	0.738	0.012	0.733	11.684	**0.000***

Table 11 indicates that the multiple regression analysis identifies that brand preference is positively affected by brand experience. It is clear that the brand experience contributes to the brand preference of customers. Since p – value is less than 0.01 that means it is significant at 1% level of significance so the null hypothesis is rejectedand can be concluded that is there is significant relationship between brand experiences with that of the brand preference of customers.

Table 12: Regression Analysis – brand experience and brand preference

Model	R	R^2	Adjusted R^2	S.E. of estimates	F	Sig.
1	0.836	0.699	0.682	0.2162	136.26	**0.000***

a: Predictors: (Constant), Brand Experience, b: Dependent variable: Brand Preference

Table 12 shows the association between the brand experience and brand preference of customers using mobile phones in Delhi. The coefficient of correlation between brand experience and brand preference is 0.836 and the value of R square is 0.699. Since the Adjusted R square is found to be 0.682 which indicates that the 68.2% variation in brand preference of customers is explained by the brand experience. The significant value is found to be 0.000 which is below than 0.05, thus it is significant at 5% level of significance. Thus, null hypothesis is rejected and alternative hypothesis is accepted. So, there issignificant relationship between brand experiences with that of the brand preference of customers.

Hypothesis 5:-

H05: There is no significant relationship between Brand Experience with that of the re – purchase intentions and recommendation to others.

HA5: There is significant relationship between Brand Experience with that of the re – purchase intentions and recommendation to others.

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8.5 Relationship between Brand Experience and Re-purchase Intentions and Recommendation to others

Table 13: Relationship between Brand Experience and Re-purchase Intentions and Recommendation to others

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	β		
(Constant)	2.714	0.031		27.682	**0.813**
Brand Experience	0.264	0.018	0.288	29.816	**0.081**

Table 13 indicates that the multiple regression analysis identifies that re-purchase intentions and recommendation to others is not affected by brand experience. It is clear that the brand experience did not contribute much to the re-purchase intentions and recommendation to others. Since p – value is more than 0.01 that means it is not significant at 1% level of significance so the null hypothesis is supported that is there is no significant relationship between brand experience with that of the re-purchase intentions and recommendation to others.

Table 14: Regression Analysis – brand experience and re-purchase intentions and recommendation to others

Model	R	R^2	Adjusted R^2	S.E. of estimates	F	Sig.
1	0.217	0.047	0.042	0.2186	138.21	**0.528**

a: Predictors: (Constant), Brand Experience,   b: Dependent variable: re-purchase intentions and recommendation to others

Table 14 shows the association between the brand experience and re-purchase intentions and recommendation to others using mobile phones in Delhi. The coefficient of correlation between brand experience and re-purchase intentions and recommendation to others is 0.217 and the value of R square is 0.047. Since the Adjusted R square is found to be 0.042 which indicates that only the 4.7% variation in re-purchase intentions and recommendation to others is explained by the brand experience. The significant value is found to be 0.528 which is above than 0.05, thus it is insignificant at 5% level of significance. Thus, null hypothesis is accepted and alternative hypothesis is rejected. So, there is no significant relationship between brand experience with that of the re-purchase intentions and recommendation to others.

Hypothesis 6:-

H06: There is no significant relationship between Brand Preference with that of the re – purchase intentions and recommendation to others.

HA6: There is significant relationship between Brand Preference with that of the re – purchase intentions and recommendation to others.

8.6 Relationship between Brand Preference and re-purchase intentions and recommendation to others

Table 15: Relationship between Brand Preference and re-purchase intentions and recommendation to others

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	β		
(Constant)	3.726	0.041		11.615	**0.000***
Brand Preference	0.812	0.046	0.862	11.264	**0.000***

Table 15 indicates that the multiple regression analysis identifies that re-purchase intentions and recommendation to others is positively affected by brand preference. It is clear that the brand preference contribute to the re-purchase intentions and recommendation to others. Since p – value is less than 0.01 that means it is significant at 1% level of significance so the alternative hypothesis is supported that is there is significant relationship between brand experience with that of the re-purchase intentions and recommendation to others.

Table 16: Regression Analysis – brand preference and re-purchase intentions and recommendation to others

Model	R	R^2	Adjusted R^2	S.E. of estimates	F	Sig.
1	0.816	0.666	0.662	0.4216	146.21	**0.000***

a: Predictors: (Constant), Brand preference,   b: Dependent variable: re-purchase intentions and recommendations to others

Table 16 shows the association between the brand preference of customers using mobile phones in Delhi and re-purchase intentions and recommendation to others. The coefficient of correlation between the brand preference of customers and re-purchase intentions and recommendation to others is 0.816 and the value of R square is 0.666. Thus 66.6% of variation in dependent variable that isre-purchases intentions and recommendation to others is explained by the independent variable brand preference. Since the Adjusted R square is found to be 0.662 which indicates that around three fourth of the variation in re-purchase intentions and recommendation to others is explained by the brand preference. The significant value is found to be 0.000 which is below than 0.05, thus it is significant at 5% level of significance. Thus, null hypothesis is rejected and alternative hypothesis is accepted. So, there is significant relationship between re-purchase intentions and recommendation to others with that of the Brand Preference.

IX. CONCLUSION

1. The study reveals the brand preference determinants. This study concentrates on multiple factors that constitute customer knowledge and experience of the brand which enables the determination of salient factors in preference formation. Thus, the study highlights the importance of experiential responses besides the cognitive component of brand knowledge in predicting consumer preferences.

2. It is observed from statistical analysis that brand experiences directly affect the customer brand preferences.

3. The brand experience plays a significant role in delivering the value created by the brand attributes that shape consumer preferences.

4. The findings reveal the full mediating role of brand experience in terms of the relationship between brand personality and brand preferences.

5. The research defines the components of brand experience: sensory, emotional, intellectual and behavioural. These are evoked by contacting the brand at different levels of involvement.

6. The study reveals the determinants of re-purchase intentions and recommendation of brand to others.

7. The study reveals that demographic factors play a vital role in the brand preference.

X. RECOMMENDATIONS

1. As far as the technological products are concerned like mobile phones, building the brand preference is not so easy. Customers using technological products are rational and irrational in their preferences. In such kind of products brand experience plays very important role in the preferences of brand. Customers using the brands can advertise the product through word of mouth to non-users through their experience.

2. Price is critical, it is important in terms of developing consumer preferences for technological brands. Pricing of technological products is one of the company's important decisions. The rapid technological advancement and innovation makes the product life short and volatile; therefore, companies place great emphasis on the pricing decision.

3. To position the brand based on symbolic associations, practitioners need to differentiate between the construct of self-congruity and brand personality. The findings did not support the direct impact of brand personality on either brand preference or repurchase intention.

4. The objective of branding strategy is to frame consumer perceptions and preferences for certain brands. Through this study, managers can develop an experiential branding strategy; position, build, and conceive the brand in consumers' mind aligning the brand experience.

5. Managers need to take advantage of consumer responses induced from the technological product examined characteristics and affecting their preferences. They need to put emphasis on building strong hedonic experiences for consumers.

6. Managers can benefit from other types of experiences unperceived by the consumers but created by the company itself. Thus, broadening its experiential appeal from sense and feel to think and explore relate and act appeal. Taking advantage of enhancing consumer preferences and purchasing decisions using multiple experiential dimensions.

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QUANTUM CRYPTOGRAPHY

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ABSTRACT

Quantum cryptography is a technology that ensures ultimate security. Compared to current cryptography that could be defeated by the development of an ultra-high-speed computer, quantum cryptography ensures secure communication because it is based on the fundamental physical laws. It is an emerging technology in which two parties may simultaneously generate shared, secret cryptographic key material using the transmission of quantum states of light. Quantum cryptography is a new method for secret communications offering the ultimate security assurance of the inviolability of a Law of Nature. The quantum cryptography relies on two important elements of quantum mechanics-the Heisenberg Uncertainty principle and the principle of photon polarization. This research paper concentrates on the principle of quantum cryptography, and how this technology contributes to the network security. This paper outlines the real world application implementation of this technology and the future direction in which quantum cryptography accelerates. The discovery of the content of such data could lead to very serious consequences. These include the misuse of bank account numbers, identity information, items relating to military security and other sensitive information. Without quantum-safe encryption, everything that has been transmitted, or will ever be transmitted, over a network is vulnerable to eavesdropping and public disclosure.

Keywords: Quantum Cryptography, Network Security, Quantum Key Distribution (QKD)

I. INTRODUCTION

Cryptography is literally the art of "secret writing". It is used to secure communication by protecting the confidentiality and integrity of messages and sensitive data. Without it, anyone could read a message or forge a private conversation. Messages are made secret by transforming them from "plaintext" into "cipher text" using a cipher and performing the process of encryption. Decryption turns scrambled and unreadable cipher text back into plaintext. When cryptographers talk about a "key", they are referring to a shared secret that controls the ability to hide and unhide information. There are two types of cryptography that are often referred to as "symmetric key" and "public key"

cryptography:

1. In symmetric key cryptography, the same key is used for both encryption and decryption, and that key needs to be kept a secret by everyone who is sending and receiving private messages. The major difficulty of symmetric key cryptography is to provide the secret keys to legitimate parties without divulging the keys to eavesdroppers. 2. Public key cryptographyis more involved and complex. There are two keys, one for encrypting and another key for decrypting. The two keys are mathematically related, and only one key is intended to be kept a secret. Public key cryptography allows anyone to send an encrypted message, but only one

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person, with the private key, can decrypt the message. Public key cryptography can also be used for digital signatures where someone with a private key can sign a message that anyone can verify with the public key [1].

II. MECHANICS OF QUANTUM CRYPTOGRAPHY

The quantum cryptography depends on two important components of quantum mechanics-the Heisenberg Uncertainty principle and the principle of photon polarization. The Heisenberg Uncertainty principle states that, it is impossible to determine the quantum state of any system without distributing that system. The theory of photon polarization states that, an eavesdropper cannot copy unknown qubits i.e. unknown quantum states, due to no-cloning theorem which was first introduced by Wootters and Zurek in 1982.
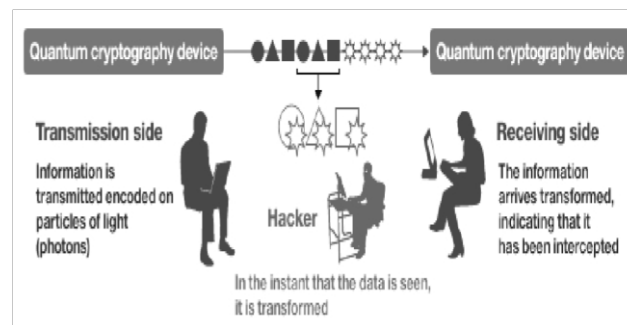
Figure 1: Mechanics of Quantum Cryptography

Depending on the theory of physics, quantum cryptography does not make it possible to eavesdrop on transmitted information. It is attracting considerable attention as a

replacement for other contemporary cryptographic methods, which are based on computational security. Quantum cryptographic transmission encrypts the 0s and 1s of a digital signal on individual particles of light called photons. By contrast, modern optical transmission expresses the 0s and 1s of the digital signal as the strength and weakness of light respectively. Because the strong and weak light are made up of tens of thousands of photons which each convey the same information, if several photons are stolen (i.e., the signal is eavesdropped on) during transmission, it is not detected. On the other hand, in the case of quantum cryptography, if a third party detects (eavesdrops on) the signal, the information on the photons is suddenly transformed, meaning both that it is immediately noticeable that eavesdropping has appeared and that the third party is not able to decrypt the information[2].

III. HOW DOES QUANTUM COMPUTING IMPACT CRYPTOGRAPHY AND SECURITY?

Cryptography plays a very important role in most secure electronic communication systems today because it ensures that only authentic parties can read each other's exchanged messages. Quantum computing threatens the basic goal of secure, authentic communication because in being able to do certain kinds of computations that conventional computers cannot, cryptographic keys can be broken quickly by a quantum computer and this allows an eavesdropper to listen into private communications and pretend to be someone whom they are not. Quantum computers accomplish this by quickly reverse calculating or guessing secret cryptographic keys, a task that is considered very hard and improbable for a conventional computer. A quantum computer cannot break all types of cryptographic keys and some cryptographic algorithms in use today are also safe to use in a world of

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widespread quantum computing. The following sections will describe which types of cryptography are safe from quantum attacks and which ciphers, protocols and security systems are most vulnerable.

IV. TECHNOLOGY SURVEY – CURRENT STATE OF THE ART

Some of the most important people responsible for the ongoing strength of our security tools are the people who try to break them. At the network level this includes approaches such as penetration testing, or sometimes security research, and at the cryptography level it is called cryptanalysis. The researchers that perform this level of testing are exceptionally creative when it comes to circumventing security systems or compromising ciphers and it is directly because of their research and efforts that state-of-the-art tools and ciphers are constantly improved. Security research and cryptanalysis is a long practiced art form. The designers of security products are so accustomed to people trying to break their security systems that they build in redundant controls and layer these controls so that, over time, if a particular safeguard fails then the security of the system may still be recovered. With regards to cryptography, security architects will also design in recoverable security features, for instance, if a cipher is broken or discovered to be weak then the system can accommodate with a change in key size, parameter, or possibly even a new cipher or cipher suite combination. Many generic security protocols have some form of cryptographic agility, but in most cases, the only public key cryptography options designed into these protocols are variants of RSA or ECC, as well as Diffie Hellman for key exchange, which from the perspective of quantum computing are not resilient against quantum attacks. Even if the protocols support other algorithms, RSA and ECC are the most widely deployed in practice. RSA and ECC are the most popular and pervasive public key cryptographic algorithms in use today due to their historical precedent as well as their efficiencies. RSA was the first practical public-key cryptosystem discovered and was built into early versions of the Secure Sockets Layer (SSL) protocol; ECC was the first algorithm discovered after RSA to offer considerably smaller keys and comparable-speed operations. Unfortunately, due to Shor's algorithms and the progressing maturity of quantum computing, ECC and RSA will become increasingly vulnerable to quantum attacks over time. Changing from classical algorithms to quantum safe algorithms is not a simple task. It takes a long time for a particular algorithm to be accepted by security practitioners, researchers and standards bodies. Classical algorithms like ECC and RSA are widely studied and well accepted by the security community. Quantum safe algorithms have been around for a long time, but have not benefited from nearly as much public scrutiny and cryptanalysis, so they are less prevalent in standards and a difficult feature to find in security products.

V. QUANTUM KEY DISTRIBUTION

One of the proposed solutions to the key distribution problem is known as Quantum Key Distribution (QKD). There do exist alternative key distribution algorithms using public key schemes that are not RSA or ECC. However, in contrast to these public key schemes, QKD as a cryptographic primitive offers security that is guaranteed by the laws of physics. QKD as a method for secure key establishment [GIS02] is proven to be information theoretically secure against arbitrary attacks, including quantum attacks. This means that even assuming an adversary to have unlimited computational resources, including unlimited classical and quantum computing resources, QKD is secure now and always will be. By enabling provable security based on

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fundamental laws of quantum physics, QKD remains resilient even to future advances in cryptanalysis or in quantum computing. Consequently, quantum key distribution provides the means to securely distribute secret keys that can be used with quantum safe symmetric key algorithms like Advanced Encryption Standard (AES), or one-time pad encryption. Conceptually, the security of QKD is achieved by encoding information in quantum states of light. Using quantum states allows security to be based on fundamental laws in quantum physics and quantum information theory. There are three deeply related notions from quantum physics that illustrate the source of the unique security properties of QKD:

1. The Heisenberg uncertainty principle implies that by measuring an unknown quantum-mechanical state, it is physically changed. In the context of QKD, this means that an eavesdropper observing the data stream will physically change the values of some of the bits in a detectable way.

2. The no cloning theorem states that it is physically impossible to make a perfect copy of an unknown quantum state. This means that it is impossible for an adversary to make a copy of a bit in the data stream to only measure one of the copies in hopes of hiding their eavesdropping.

3. There exist properties of quantum entanglement that set fundamental limits on the information leaked to unauthorized third parties.
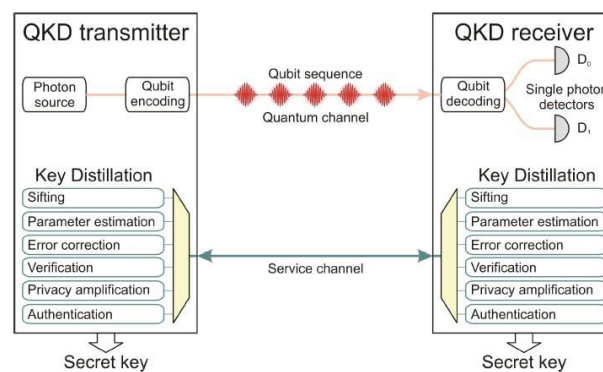

Figure 5 - Illustration of a typical prepare-and measurement QKD setup.

Importantly, these are not technological limitations that can be overcome by clever advances in engineering, but rather are fundamental and irrefutable laws of quantum physics. Interestingly, due to the laws of quantum mechanics, it is physically impossible for an adversary to invisibly eavesdrop on quantum key distribution. Looking at the information encoded in quantum states actually changes the information in ways that can be detected by the legitimate parties. The mere act of her observing the data in transmission will physically change the bits of information in the data stream and introduce errors in ways that the sender and recipient can readily detect and quantify. The percentage of errors which an eavesdropper necessarily introduces allow the sender and recipient to calculate not only whether an eavesdropper was present, but also precisely how much of the information about the key the adversary could have gained in the worst possible case with the most powerful algorithms and hardware. This allows them to use well-studied post- processing methods to remove any information an eavesdropper could have gained about the shared key. An important characteristic of quantum key distribution is that any attack (e.g. any attempt to exploit a flaw in an implementation of transmitters or receivers) must be carried out in real time. Contrary to classical cryptographic schemes, in QKD there is no way to save the information for later decryption by more powerful technologies. This greatly reduces the window of opportunity for performing an attack against QKD; the window is much wider for conventional cryptography.

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The security of QKD has been proven in a number of frameworks including the universal composability [BHL05, Sca09], the abstract cryptography framework [MAU11], or the authenticated key exchange framework [MSU13]. The composability of QKD as a cryptographic primitive allows safely combining the distributed keys with other provably secure schemes such as Wegman-Carter authentication or onetime pad encryption while maintaining quantifiable long term security [3].

VI. BENEFITS OF QUANTUM SAFE SECURITY

Agency which decoded foreign diplomatic codes; the work performed by British GCHQ to solve World War II era ciphers, leading to breakthroughs in computation and machine computing; the advent of wide scale commercial use of cryptography starting in the 1970's with the invention of DES through research performed at IBM. Popular documentaries are broadcast on television that glamorize encryption systems that have come and gone over past decades, and when these cryptographic systems fade, they are always replaced with stronger, faster algorithms and technologies because the global research community is forever redefining the state of the art. If history can be used to accurately predict events yet to come, then breaking a cryptographic cipher can have catastrophic repercussions for anyone using a cipher who is ignorant of its compromise. And great advantages are bestowed upon anyone who takes advantage of their adversary's ignorance. If history can be used to accurately predict events yet to come, then breaking a cryptographic cipher can have catastrophic repercussions for anyone using a cipher who is ignorant of its compromise. And great advantages are bestowed upon anyone who takes advantage of their adversary's ignorance.

VII.CHALLENGES FOR QUANTUM SAFE SECURITY

Many of the challenges for the adoption of quantum safe security are rooted in common best practices within the security industry. Very early in their careers security practitioners are taught to avoid new cryptographic algorithms that have not received years of public scrutiny, to not design their own security protocols, and rely on well-established security standards.

1. **Confidence in Algorithms**. There are many well-studied public key based cryptographic algorithm options that could be used as a substitute for RSA or ECC, however, many of these substitutes do not have the benefit of wide spread practical use.

2. **Rigidity of Security Protocols**. Quantum safe ciphers may not fit into an established protocol because of historical protocol design assumptions, key size choices and tolerance for message expansion. Earlier sections in this whitepaper give examples of common security protocols that demonstrate the varying degree to which quantum safe cryptography can be used effectively. Many protocols were not designed with cryptographic agility in mind, and may not easily accommodate a change of cipher.

3. **Perception of non-urgency.** An exact date for the arrival of general purpose quantum computing cannot be given, however, global interest is growing and steady progress is being made. As quantum computing matures, computer security weakens. Some businesses require their security to have medium longevity in the sense that confidential information that is worth protecting now, will also remain sensitive and should be kept private a year or two in the future. Other businesses require their security to have greater longevity, keeping information private for decades. Quantum safety is "not urgent" only for those with short term

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security needs but any business that requires its secrets to remain secret will need to consider their quantum safe transition strategy now. A quantum attack is just as effective at divulging all past communications, i.e. encrypted military information residing on physical storage medium.

VIII. APPLICATION OF QUANTUM CRYPTOGRAPHY

The most infamous and developed application of quantum cryptography is quantum key distribution (QKD). Quantum key distribution [3] is a method used in the framework of quantum cryptography in order to produce a perfectly random key which is shared by a sender and a receiver while making sure that nobody else has a chance to learn about the key, e.g. by capturing the communication channel used during the process. The best known and popular scheme of quantum key distribution is based on the Bennet–Brassard protocol (i.e. BB84), which was invented in 1984. It depends on the no-cloning theorem [4], for non-orthogonal quantum states. Briefly, the Bennet–Brassard protocol works as follows:

- The sender (usually called Alice) sends out a series of single photons. For each photon, it arbitrarily selects one of two possible base states, with one of them having the possible polarization directions up/down and left/right, and the other one polarization directions which are angled by 45°. In each case, the actual polarization direction is also arbitrarily selects.
- The receiver (called Bob) detects the polarizations of the incoming photons, also randomly selecting the base sates.
  This means that on average half of the photons will be determined with the "wrong" base states, i.e. with states not corresponding to those of the sender.
- Later, Alice and Bob use a public communication channel to talk about the states used for each photon (but not on the chosen polarization directions). In this way, they can find out which of the photons were by chance preserved with the same base states on both sides.
- Then they reject all photons with a "wrong" basis, and the others signify a sequence of bits which should be identical for Alice and Bob and should be known only to them, provided that the transmission has not been influenced by anybody. Whether or not this happened they can test by comparing some number of the obtained bits via the public information channel. If these bits agree, they know that the other ones are also correct and can finally be used for the actual data transmission.

IX. CONCLUSIONS AND OPPORTUNITIES FOR FURTHER WORK

We presented an aspect of the workings of quantum cryptography and quantum key distribution technology. This technology is basically depends upon the polarization of photons, which is not a well regulated quantity over long distances and in multi-channel networks. Quantum cryptography could be the first attention of quantum mechanics at the single quanta level. Quantum cryptography promises to reform secure communication by providing security based on the elementary laws of physics, instead of the current state of mathematical algorithms or computing technology. The devices for implementing such methods exist and the performance of demonstration systems is being continuously improved. Within the next few years, such systems could start encrypting some of the most valuable and important secrets of government and industry. For now, non-quantum cryptography is very secure, because it depends on algorithms that can't be broken in less than the lifetime of the

universe by all the currently existing computers. So in theory, there is not much demand for quantum cryptography yet; thus, we don't know when this technology will take a step forward and quantum cryptography techniques will become essential to protect our information. When quantum computers will come into play, the computational speeds will increase considerably, so the mathematical complexity of algorithms will become less of a challenge. It is still arguable whether or not it will be possible to simply increase the numbers use in the algorithms and thus increase the complexity enough to outrun even quantum computer. Yet there is no question about the fact that quantum cryptography is a true invention in the field. It is still being refined and developed further. However, already it had been clear that even with its current defectiveness, it is many steps above everything that was settled before it. All we need is some years, or maybe decades or even centuries, to renew this method and make it feasible in the real world.

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APPLICATION OF QUALITY BY DESIGN: SUPREMACYOVERTRADITIONAL ROBUSTNESS STUDY

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ABSTRACT

Applications of Quality by Design (QbD) are emerging and infinite in numerous different fields. Applying Quality by Design (QbD) principles to traditional robustness study opens up a new paradigm in separation science. ICH and FDA Guidelines are keeping emphasis on this approach by including "design space" in their recent concept papers. There are finite variables affect separation, retention time and selectivity in case of High performance liquid chromatography (HPLC). Stationary phases are varied with phase selection (Polar to non-polar phases), carbon loading, purity of silica, end capping, etc. whereas pH of mobile phase, buffer concentration, gradient time, selection of organic modifier, column temperature are variables associated with mobile phase selection.QbD give scientific rationale to select stationary phase, mobile phase and chromatographic conditions. Scope of this paper is restricted to application of QbD in robustness study. Union of factors affected in both phases by Design Space can define robust, unbiased and better scientific method than traditional trial and error approach. Multivariate analysis is not only statistical tool for robustness study but it is helpful to choose best method among numerous others.

I. INTRODUCTION

Robustness of an analytical procedure is integral part of method validation. Robustness testing is nowadays best known and most widely applied in the pharmaceutical world because of the strict regulations set by regulatory authorities who require extensively validated methods. Robustness is method reproducibility in different laboratory, different instruments or different analyst where chances of differences in results are more from expected. Robustness study were introduced to identify potential factors affecting the method and to achieve reproducible results among inter-laboratory studies. Few guidelines have incorporated robustness in to validation protocol whereas few suggest performing prior to validation study as in method development stage. However, performing a robustness test late in the validation procedure involves the risk that when a method is found not to be robust, it should be redeveloped and optimized. One can save money and efforts spent atthat pointtherefore the performance of a robustness test has been shifting to earlier points of time in the life of the method[1-5]. According to USP general chapter <1225>, "the robustness of an analytical procedure is a measure

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of its capacity to remain unaffected by small but deliberate variations in procedural parameters listed in the procedure documentation and provides an indication of its suitability during normal usage**[6]**.” USP suggests robustness study should be done during method development and measurements susceptible to variations should be either controlled or specified as precautionary statement in procedure. There are fixed method variables, which are associated with Stationary phase, mobile phase and chromatographic conditions. Stationary phases or selection of column is depends up on phase selection (Polar to non-polar phases), carbon loading, purity of silica, end capping, surface area of material. pH of mobile phase, buffer concentration, gradient time, selection of organic modifier and column temperature are common variables associated with mobile phase selection.

II. REGULATORY PERSPECTIVE ABOUT ROBUSTNESS STUDY

According to ICH Q8 (R2), “QbD is a systematic approach to development that begins with predefined objectives and emphasizes product and process understanding and process control, based on sound science and quality risk management.” Advantage of Qbd is a high level of assurance of product quality. Moreover, ICH guidelines impose use of QbD in manufacturing process. It talks about challenges after implementation of QbD and advantages as process improvement tool and quality assurance tool**[7]**. According to USP general chapter <1225>, USP suggests robustness study should be done during method development and measurements susceptible to variations should be either controlled or specified as precautionary statement in procedure.USP does not specify any note on Quality by design**[6]**.

QbD is a concept first outlined by well-known quality expert Joseph M Juran on most of his publications, notably “Juran on Quality by Design”. While QbD principles have been used to advance product and process quality in every industry, it has been adopted by automotive industry. US FDA has incorporated later in its “Pharmaceutical cGMP for twentieth-first century” and later on, Quality by design has become an important concept for pharmaceutical industry. United States Food and Drug Administration (USFDA) suggest for industry that robustness of method should be evaluated during early phase of method development because it may helpful to understand characteristics before submission for approval. FDA imposes the use of design of experiments (DOE) with method parameters because it is useful to understand the effect of changes in parameters.Knowledge gained during this study of identifying the source of method variation can help to access method performance and can be submitted as a part of validation data**[8]**.

III. STEPS INVOLVED IN DESIGN OF EXPERIMENTS

General Robustness study was done by doing deliberate but small change in method such as ±0.2mLmin^{-1} flow rate, ±0.2 pH, ±10% Buffer concentration, ±2% Organic Modifier, ±10°C column temperature. These are commonly identified quantitative process variables followed by most of industry. Apart from that, different batch of column is one of qualitative factors to check robustness of study**[9]**. This general approach is termed as COST (Changing one separate factor at a time) as we are changing single variable and keeping others constant. We never come to know about interaction effect of variables by this approach.

For planning of robustness study by QbD, we should gather below information: (a) Identification of factors to be examined and different levels for factors, (b) selection of appropriate experimental design, (c) definition of the

responses to be determined, (d) performance of the experiments and tabulation of the responses of the method, (e) statistical and graphical tool to find effects of variables on process.

Identification of factors to be examined and different level for factors would be similar to COST approach. For example, for factor 3.0 pH, three levels like 2.8, 3.0 and 3.2 pH (Lower, Middle and Higher point) would be selected. There are different kinds of design of experiments methods but ideal method would extract maximum information with minimum number of experiments[10].Plackett-Burman (PB) designs are most commonly used in robustness study for construction of very economical designs with the run number a multiple of four (rather than a power of 2 in factorial design). PB designs are very efficient screening designs when only main effects are of interest. PB designs provide information with just mere12 experiments for up to 11 factors[11]. Those 12 experiments need to be performed and outcome of those experiments should be measured. Generally critical pair resolution, tailing factor or plate counts are considered as system suitability parameters and these are considered as outcome of those experiments called as responses. Reproducibility of critical responses would be enough to certify method as robust. There are numerous statistical toolsto quantify effect of variables. One can find out most influential factors by prediction profiler graph. Analysis of Variance (ANOVA) is highly recommended tool for analysis of variables and it suggests effect of variables is significant or not.

IV. ADVANTAGE OF DOE OVER COST

COST approach does not quantify interaction of factors as it is changing one factor at a time. For study of single factor, two experiments need to be done: one higher point and one lower point.In case of DOE, 12 experiments would be sufficient to get information about affecting factors. It provides quantification of interaction of factors. Graphical representation and/or statistical p value provide easy and better understanding of significant variables. DOE is better scientific logical technique than COST and moreover, consumption of resources would be comparatively less for DOE. Objective of Robustness study by DOE is to identify response which are robust to small factor changes, to identify response which are sensitive to small factor changes and to understand which factors that need to be controlled to achieve robustness. DOE is helpful for identification of critical quality attributes (CQA)which is part of system suitability requirement.[12].

V. CONCLUSION

Robustness study is interesting and influential part of method development and validation. Information available with robustness study by QbD is useful throughout life cycle of method. Introduction of novel impurity can be included in method by performing minimum validation parameters if it comes in design space. Robustness window implies information about best suitable factor among range selected for robustness study.

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BLUE OCEAN STRATEGY: A SOLUTION FOR INDIAN IT INDUSTRY

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ABSTRACT

IT industry in India is witnessing a sea change in last one decade. The industry has witnessed growth, recession and revival in the same tenure. One of the key challenges in front of IT industry today is matching the pace with their global competitors. Globally a number of mergers and acquisitions took place in last one decade and the trend seems to be more robust in coming decade. These challenges convert in the form of how an IT firm can increase their turnover, number of customers, number of services; expand geographically across the borders and maintaining the double digit growth in terms of profits. To handle this challenge company has to develop a strong strategy and one of the viable options for the company is implementing blue ocean strategy. Many of the organizations in India like HCL, Bharti, Reliance has implemented blue ocean strategy and witnessing the transformation to meet out the desired objectives.

Keywords: Blue Ocean Strategy, CIO, Governance, Market Space, Value Innovation.

I. INTRODUCTION

Application of years old Blue Ocean strategy with its own nascent strength fits almost in all the areas of an organization. IT and Telecom organization cannot be an exception. It cannot stay out of its influence under a competent CIO and CEOs. In fact the way technology is moving and the challenges that an org. is facing in terms of many like global competition, technology advancement , domestic compulsion , resources and finally commitment to profitability & growth . Present day financial crisis visa vise management commitment are forcing CEOs and CIOs to venture out for other alternatives to meet the challenges and to provide some platform to fight it out to maintain the growth and year end commitment. In fact it is the reality of the many industries today except a few. To shield the organization from all these eventualities and to protect once livelihood (job), proactive intelligence is must and CEO, CIOs have to opt new avenues for their growth w/o getting into competitions with the existing players for an insignificant growth and revenues which is far below their yearly target. Application of Blue Ocean strategy can be an answer for them to get rid of these entire crises. One key point of Blue Ocean Strategy is how to create value and how to make customer happy and comfortable to pay extra for it. Innovation has a key role on this matter, but it must be aligned with end user requirement and affordability.

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The cornerstone of blue ocean strategy (Kim and Mauborgne, 1999) is Value Innovation, is to focus on making competition irrelevant by creating a leap in value for consumers and the organization. The result of the initiative is the creation of a new market place. It seems that this is the only option open to keep floating in the market. With lessons from BOS, organizations have started overhauling and redefining their years old strategies for better growth and profitability.

II. STRATEGIC GOVERNANCE

Strategic leadership gives a vision for the success of a company. It also creates strategic thinking to generate future growth. Strategic leadership develops a multiplicity of appropriate strategies depending on the context in order to create value.

Strategic leadership is the ability of a manager to suggest his/her vision to an organization but also persuades and empowers all employees. It is a strategy for managing employees. The main goals of strategic leadership are productivity and efficiency. However, empowering employees is very important too.

Employees have to understand the vision, adopt it and share it so that they can abreast themselves with the organization need and react consequently. Employees will forecast the needs and will follow their ideas according to the organization's vision.

Rewards and incentive system are generally used by strategic leaders. It helps employees to be focus, more productive and empower them. Leaders have to take care of their employees if they want reciprocity. Leaders have to help employees to realize their objectives. That's why they need good perception and planning skills. They also need, like a chess player to foresee and understand a broader picture.

These are some of the skills required by a strategic leadership team to enhance performance:

- To be loyal to their vision. Leaders have to stick to their vision by their action and discourse.

- To be in sync with the day to day happening in the organization, Leaders have to by constantly updated on what is happening in their companies. It will help them to react appropriately and timely keeping employee's reaction in mind.

- To listen employees, Leaders have to understand their employee's point of views. Should have a common platform to spread and share his /her own vision and then listen employees to see if they well understand it.

- A good leader should have many alternatives as solutions for a single problem to share and forecast among fellow employees.

- A good leader shouldn't be master of technology and management but he to be able to understand the feeling of the fellow colleagues and should speak about every job aspect in his company and convince.

- To motivate. Leaders have to set the example. They have to motivate and be an inspiration.

Strategic leaders must be social. Their social skills are important. They also need a good self-control to think before making a move. Strategic leaders must be able to do their introspection. A good leader must know his employees but himself better.

An empowering leader knows when to delegate to be more efficient and productive.

The important of BOS is it provides a true alternative and challenge to the traditional normal business strategic thinking.

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III. KEY ISSUES IN BLUE OCEAN STRATEGY

3.1 Creating New Market Space

It was studied how innovative companies break free from the competitive pack by staking out fundamentally new market space (Kim and Mauborgne, 1999). It was a set of ideals encompassing tools and methodologies to help companies gain a competitive edge by creating uncontested market space or blue oceans. It is about building a business around a market demand that other people have not identified and if a company is able to do well, it will not have serious competition

3.2 Value Innovation

The cornerstone of BOS is a concept called value innovation that is to align its cost structure and its value proposition to its customers. Here I refer Kim and Mauborgne (1999) that described how companies can systematically pursue value innovation by looking across the conventionally defined boundaries of competition and how value innovation is created, where it affect both its cost structure and its value proposition to buyers. In fact value innovation is possible only when a company works towards achieving a balance among utility, price and cost structures of the product and services.

This whole system approach makes the creation of blue oceans sustainable because it integrates all the firm's functional and operational activities. So, value innovation has a positive impact on companies' cost structure and its offer.
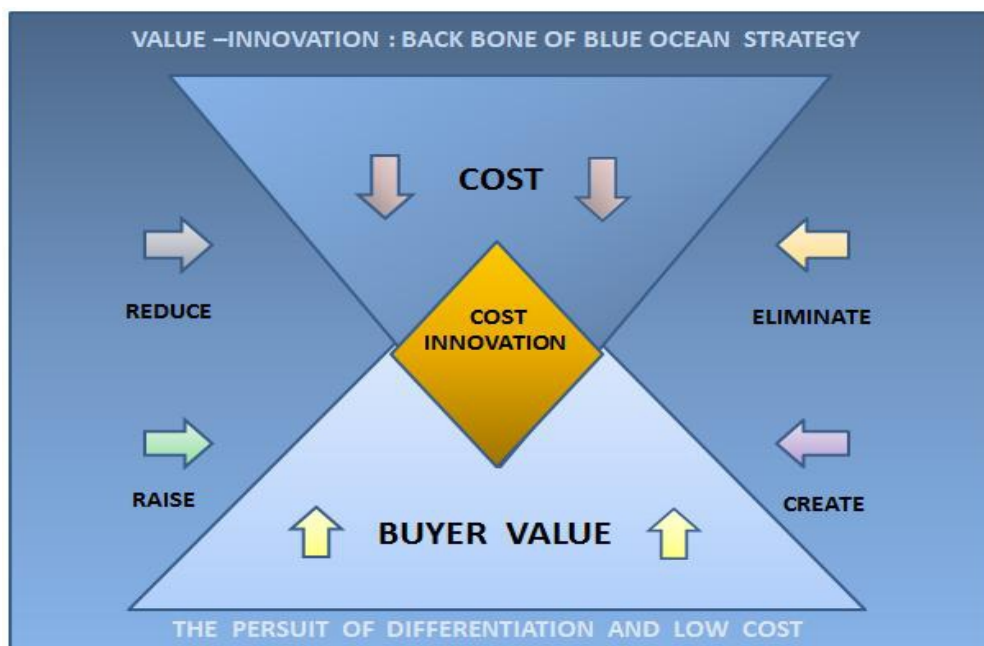
3.3 The nature of Blue Ocean and Red Ocean:

The traditional theories of strategy emerge as a way to shape market forces and affect the competitive environment and this competitive environment influences the dynamics of strategy. The early notion of strategy theories center around its competitive environment.

Boston matrix is another, which shows the rate of market growth and the relative market share in the competitive market environment. Similarly Porter Five Forces also involve the rivalry amongst existing firms. The competitive benchmarking tries to make comparison with direct competitors. Porter's generic competitive

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model tries to analyze the competitive position of rivals and take the appropriate competitive strategy for the firm.

The early notion of competitive strategy has been referred to as "Red Ocean" strategy.

The "Red Ocean", can be referred to as a bear garden where fierce competition exists and is already crowded with peoples and companies providing the same types of services or products. The companies fight for competitive advantage and survival in the same limited terrain. On the other hand, "Blue Ocean" refers to untapped and uncontested markets that provide little or no competition for anyone as the markets are not in existence or opened up yet.

To work on Blue Ocean Strategy and to develop a successful one, one should know and understand the importance of market space.

According to Porter (1979) "Five forces analysis is a good tool to describe the structure of industry".

It helps to know the profitability of an industry and its impact on strategy development.

Concept offive forces theory figure out the following.

THE FIVE COMPETITIVE FORCES THAT SHAPES STRATEGY (PORTER , 2008)

Although this tool is extremely helpful in analyzing competition surroundings, there also are several limitations integral around it. Technical innovation, new business model yet as client satisfaction   programs haven't been taken into Porter's thought.

IV. BLUE OCEAN STRATEGY & IT INDUSTRY

In IT sector ,Information technology is continually evolving associated needs that an IT organization follow to be in line with the rules & regulations, software and hardware needs and talent sets. Additionally, it should adequately address its company's evolving business needs and rising technologies that may facilitate the corporate keep step with its competitors and move forward. One in all the best challenges facing associate IT organization is fulfilling its mission while not breaking the company's bank.

Keeping the above in mind, a number of the key challenges facing our IT sector these days and their relevant remedies are available. Here are some of the major areas for remedial action in IT Industry where revamping is needed for growth and revenues.

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4.1 Data Flow Information a Priority

Customers now a days uses mobile telephony mainly to access data over voice but incidentally very few telco operators provides this OTT (Over the TOP services like Skype and whatapps) services. However to be in competition in the market place , they are to still supply superior user experience and performance once the subscribers use these OTT services like Skype, whatapps etc. Since the end users are seeking and opting for additional features like OTT while selecting a hand set etc., it has become a challenge to the service providers as they do not get any revenue sharing from the OTT service providers instead they are to ensure proper services to end users to avoid lose in market share and final extinction. This has made service provider compelled to shift from inheritance voice-centric ways to data-driven plans. Together with this, operators ought to check out increasing their data-carrying capability to supply superior service to each existing and new subscribers.

4.2 Importance for New Services

Since customers are over demanding and there is hardly any brand loyalty left telecom service providers cannot afford to lose focus from OTT services. They have to enhance their services with additional features coupled with quality and utility to meet consumers' ever-increasing demand for information. HD video conferencing or mobile workplace environments are few of them. Telecom service providers should deliver these services as quickly as possible to be at the forefront of innovation in the minds of consumers. This will also help the shoppers to promote the brand to the end users till the next competitor arrives in the market.

4.3 Building a Difference

A key to success in developing these new services is building a difference that's known for innovation. To stay relevant, telephone company operators cannot merely supply equivalent things as each alternative service providers. They need to differentiate themselves by involving within the business intelligence necessary to grasp shopper needs before their competitors and based on the customer need and market expectation to develop applications ,packages and delivery models that customers need to get. A part of this can be adding options that alternative players cannot match, like increased performance and period and exclusive content.

V. SCOPE OF FUTURE RESEARCH

The number of companies all over world including HCL have benefitted with Blue Ocean Strategy initiatives in their organization. Gradually the understanding of blue ocean strategy in IT industry in India is growing and we will witness number of initiatives in the direction of blue ocean strategy. There is a huge scope of study and research in future on blue ocean strategy initiatives in other industries.

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