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Intentions toward Internet Marketing

Highlights

Economic Feasiobility of Biomass

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Discovering Thoughts, Inventing Future

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Consumer Behavioural Intentions toward Internet Marketing

By Sarbjot Singh
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Abstract- This study demonstrates the adaptation of Unified Theory of acceptance and use of technology (UTAUT) to examine the factors that influence the intention to use internet marketing. This is a comparative study which compares the findings from the studies in Delhi and Chandigarh. This study is carried out by a self-administered questionnaire designed using established scales Statistical Package for the Social Sciences (SPSS) and Partial Least Square (PLS) were used to analyse the data.

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Consumer Behavioural Intentions toward Internet Marketing

Sarbjot Singh

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I. Introduction

Internet marketing is the advertising and marketing efforts that use the internet and email to drive direct sales via electronic commerce. Since the creation of internet, many possibilities that the internet can provide had been explored and internet as a marketing tool is one of the greatest exploration. Internet marketing has become the most exciting and fastest growing branch of marketing nowadays. In this revolutionary era, one of the greatest and the most significant marketing tool for the global marketplace is still internet marketing (Samiee, 1998). In the recent years, many countries have provided internet connection to their citizens and also tried to achieve a high penetration rate, realizing that internet is the facilities which can develop a knowledge-based society (Mohd Fairuz et al., 2008). Though the developments of internet and internet marketing services are occurring in every country, the consumer response towards internet marketing over conventional marketing medium might not be the same across countries due to the different perceptions and also the difference in culture. Therefore to better understand the online consumer behaviour, a cross-cultural study is required as envisaged by Javenpaa and Tractinsky (1999). So, to understand how internet marketing impact on consumers, a cross cultural study is conducted on consumer of various demographic profile across two states (Delhi and Chandigarh). There are very limited comparative studies on consumer behaviour towards internet marketing (Al-Qeisi, 2009). Most of the studies focused on the internet use instead of internet marketing. Therefore this study is conducted to specifically investigate the factors influencing intention to use internet marketing by Delhi and Chandigarh.

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II. Literature Review

a) Unified Theory of Acceptance and use of Technology (UTAUT)

UTAUT proposed by Venkatesh et al. (2003) in researching intention and use behaviour (Abd Latif et al., 2011; Al-Qeisi, 2009; Anderson and Schwager, 2004; Carlsson et al., 2006; Yeow et al., 2009) as UTAUT was identified as the most comprehensive model in overcoming the limitations of the technology acceptance models (TAMs) available (Yeow et al., 2009). There are four dimensions which were identified by Venkatesh et al. (2003) as direct determinants of users' behavioural intention and subsequently technology usage. They are: (1) performance expectancy; (2) effort expectancy; (3) social influence; and (4) facilitating conditions.

Since the UTAUT model was created, there were additional dimensions added to the UTAUT model such as voluntariness of use (Anderson and Schwager, 2004), anxiety and attitudes (Carlsson et al., 2006); self-efficacy and anxiety; and perceived credibility and anxiety (Yeow et al., 2009). UTAUT2 was then formed by Ventakesh et al. (2012) by adding three more dimensions which were hedonic motivation, price value and habit, to the original UTAUT model. Demographic characteristics were hypothesized to moderate the effects of these constructs on behavioural intention and technology use. According to Venkatesh et al. (2012), the UTAUT2 model was tailored to a consumer use context therefore it is suitable for this study. All seven dimensions from the UTAUT2 were used to examine behavioural intention, which is defined in this study as users' intention rather than actual use of internet marketing. Measurement of intention is as good as actual use particularly when the data of actual use is very hard to access (Sun and Xiao, 2006).

b) Performance Expectancy

In the context of this study, performance expectancy refers to the belief that users will gain benefits such as increased productivity, efficiency, and time saving as a result of the availability and customization of information by using internet marketing (Srinivansan et al., 2002). In fact, excessive amount of information and service required are eliminated by customization (Srinivansan et al., 2002), and the interest of users in browsing a site is raised (Ansari and Mela, 2003). Because of the expected benefits perceived from

the use of internet marketing, it is believed that performance expectancy will influence behavioural change towards greater intention to use internet marketing. In this relationship between the performance expectancy and behavioural intention, age however played a moderating role. Age differences have been shown to exist in technology adoption contexts also (Venkatesh et al., 2003). Research on job-related attitudes (Hall and Mansfield, 1975) suggests that younger people may place more importance on extrinsic rewards. Therefore, the following hypotheses are proposed:

H1a. In Delhi, performance expectancy has significant relationship with the behavioural intention to use internet marketing.

H8a. In Delhi, the relationship between performance expectancy with behavioural intention is moderated by age difference.

H1b. In Chandigarh, performance expectancy has significant relationship with the behavioural intention to use internet marketing.

H8b. In Chandigarh, the relationship between performance expectancy with behavioural intention is moderated by age difference.

c) Effort Expectancy

Effort expectancy refers to the degree of ease associated with the use of a particular system (Venkatesh et al., 2003). Adapted from the study of Venkatesh et al. (2003), end-users' direct use experience with the system in terms of changing their perceptions and adoption intentions can be influenced by longer experience in information systems use (Abd Latif et al., 2011). Therefore Szajna (1996) expects effort expectancy to be significant in the early adoption stages of a system, but non-significant in later stages of the system. Besides that, age also moderates the relationship between effort expectancy and behavioural intention. According to Plude and Hoyer (1985), people with older age will have difficulty in processing complex stimuli and allocating attention to information on the job. The following hypotheses are thus suggested:

H2a. In Delhi, effort expectancy has significant relationship with the

behavioural intention to use internet marketing.

H8c. In Delhi, the relationship between effort expectancy with behavioural intention is moderated by age difference.

H2b. In Chandigarh, effort expectancy has significant relationship with the

behavioural intention to use internet marketing.

H8d. In Chandigarh, the relationship between effort expectancy with behavioural intention is moderated by age difference.

d) Social Influence

Social influence is defined by Venkatesh et al. (2003) as the degree to which an individual perceives the importance of others' beliefs that he or she should use the new system. In the context of this study, personal connections have been identified to facilitate behaviour of users (Kim and Tran, 2013) towards intention to use internet marketing. With the popularity of social media, many new functions are introduced by the social media which include providing platform for consumers to share their personal evaluations of the purchased products which facilitate word-of-mouth communication (Brown, 2011). Affiliation needs increase with age, suggesting that older people are more likely to place increased salience on social influence, with the effect declining with experience (Venkatesh, 2003). Hence to determine whether the intention to use internet marketing having a relationship with social influence, moderated by age, the following hypotheses are constructed:

H3a. In Delhi, social influence has significant relationship with the behavioural intention to use internet marketing.

H8e. In Delhi, the relationship between social influence with behavioural intention is moderated by age difference.

H3b. In Chandigarh, social influence has significant relationship with the behavioural intention to use internet marketing.

H8f. In Chandigarh, the relationship between social influence with behavioural intention is moderated by age difference.

e) Facilitating Condition

Facilitating condition is defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the system use (Venkatesh et al., 2003). In the context of this study, the technology stated in the behavioural intention in using technology is internet marketing. The facilitating condition of the internet marketing that should be present includes excellent user interface, and this includes ease of access, navigation and searching (Yang, 2010) to encourage internet marketing use, and with better result if there are proper guidance provided. Besides that, other conditions such as include costs and other resources associated with such use, and the prior knowledge that users must have before use internet marketing could be used by them. Age have a moderating effect on the relationship between facilitating conditions and the intention to use technology. Older people will emphasize more on facilitating conditions compare to the young people. Based on the arguments, the following hypotheses are created:

H4a. In Delhi, facilitating condition has significant relationship with the behavioural intention to use internet marketing.

H8g. In Delhi, the relationship between facilitating condition with behavioural intention is moderated by age difference.

H4b. In Chandigarh, facilitating condition has significant relationship with the behavioural intention to use internet marketing.

H8h. In Chandigarh, the relationship between facilitating condition with behavioural intention is moderated by age difference.

f) Hedonic Motivation

Hedonic motivation is defined as the fun or pleasure derived from using a technology. Hedonic motivation was shown to play an important role in determining technology acceptance and use (Brown and Venkatesh, 2005). In the research, it has been discovered that such hedonic motivation, which is conceptualized as perceived enjoyment, influence technology acceptance and use directly (Thong et al., 2006). In the consumer context, hedonic motivation is found that it is an important determinant for technology acceptance and use (Brown and Venkatesh, 2005). Age is related to the intention to use technology. Young people tend to exhibit a higher tendency to seek novelty and innovativeness during the early stages of using technology (Chau and Hui, 1998). The higher tendency will then increase the relative importance of hedonic motivation in younger people's early technology use decisions, which in the case of this study, the intention to use internet marketing. Therefore different age and gender will create different moderating effect of the experience. Thus, the hypothesis is made:

H5a. In Delhi, hedonic motivation has significant relationship with the behavioural intention to use internet marketing.

H8i. In Delhi, the relationship between hedonic motivation with behavioural intention is moderated by age difference.

H5b. In Chandigarh, hedonic motivation has significant relationship with the behavioural intention to use internet marketing.

H8j. In Chandigarh, the relationship between hedonic motivation with behavioural intention is moderated by age difference.

g) Price Value

There is a difference between the organizational use setting and a consumer use setting is that the consumers usually need to bear the monetary cost whereas employees of an organization do not. Therefore there will be a significant impact on consumers' technology use by the cost and pricing structure. The monetary cost or price is usually conceptualized together with the quality of products or services to determine the perceived value of products or services (Zeithaml, 1988) in marketing research. When the benefits of using a technology are perceived to be greater than the monetary cost, the price value is positive and such price value has a positive impact on intention to use a technology. Similar to other predictor, price value was moderated by the age. The differential importance of price value among younger versus older individuals was theorized with the adaption of theories about social roles (Deaux and Lewis 1984). Younger people are believed to be less price sensitive compared to the old people. Therefore, the following hypothesis was proposed:

H6a. In Delhi, price value has significant relationship with the behavioural intention to use internet marketing.

H8k. In Delhi, the relationship between price value with behavioural intention is moderated by age difference.

H6b. In Chandigarh, price value has significant relationship with the behavioural intention to use internet marketing.

H8l. In Chandigarh, the relationship between price value with behavioural intention is moderated by age difference.

h) Habit

Habit is defined as the extent to which people tend to perform behaviours automatically because of learning (Limayem et al. 2007), while Kim et al. (2005) equate habit with automaticity. Habit was found to have impact on the intention to use technology as the habit of using the technology will cause the consumer to continue using the technology. Or in other way, habit of not using the technology will prevent the person to learn the use of the technology. It has been found that older people tend to rely largely on automatic information processing (Jennings and Jacoby, 1993), with their habits preventing or suppressing new learning (Lustig et al., 2004). Therefore, it is hypothesize that:

H7a. In Delhi, habit has significant relationship with the behavioural intention to use internet marketing.

H8m. In Delhi, the relationship between habit with behavioural intention is moderated by age difference.

H7b. In Chandigarh, habit has significant relationship with the behavioural intention to use internet marketing.

H8n. In Chandigarh, the relationship between habit with behavioural intention is moderated by age difference.

III. Conceptual Framework

As a result, a research framework is developed and shown in Figure 2.1. The framework is adapted and

adopted from the UTAUT2 theory. The dependent variable in this research framework is the behavioural intention or the intention to use internet marketing. There are seven independent variables in this research which are which are performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit. Finally in this research framework, age is the moderator towards all the relationship between the independent variables and the dependent variable. In this study, age is divided into two categories which is group of respondent age from 20 to 29, Generation Y; and another group of respondent age from 30 to 60, Generation X.

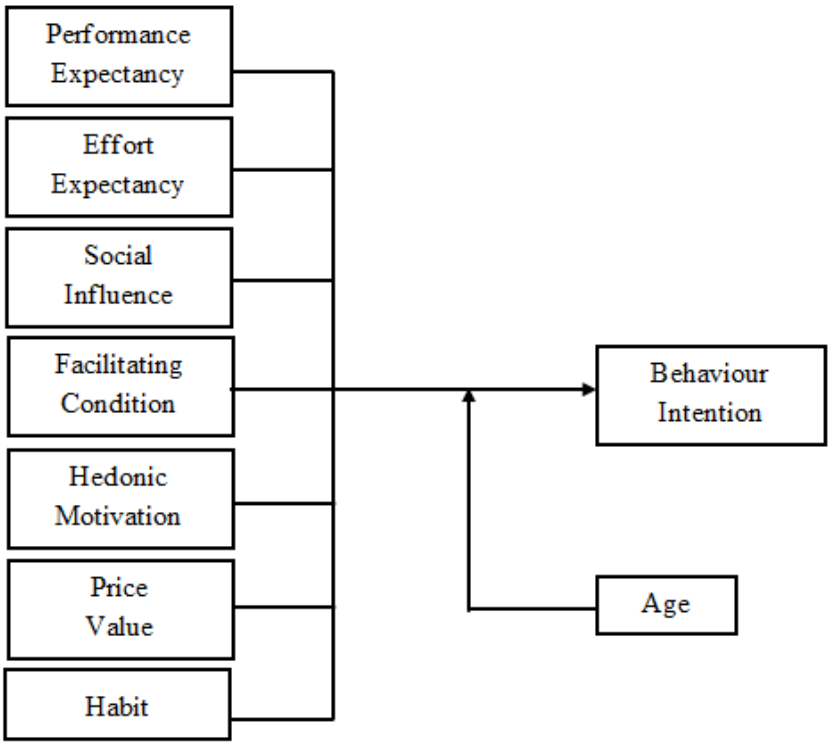

Figure 2.1 : Research framework

IV. Research Methodology

A self-reporting questionnaire was used as the main research instrument. The questionnaires were distributed mainly based on online survey and small portion of the questionnaires were distributed through the traditional method which is the survey forms. Reasons for selecting an online survey as the main distribution of the questionnaires are because efficiencies of comparable importance to the design and administration of self-administered questionnaires can be provided by the online survey. Using online survey is much cost saving and time saving, as no cost will be needed for the questionnaire distribution online, and also eliminates the geographical limit (Dillman, 2000). Besides that, using an online approach to distribute the questionnaire can reach the internet marketing community members directly. People may view online surveys as more interesting and enjoyable than traditional surveys. Moreover, an online survey is consistent with the context of this study, which concerns internet marketing which using an online approach. Therefore the online questionnaire will be distributed mainly towards the online business owner found in the internet trading platform in Delhi and also in Chandigarh. However in this research traditional method of distributing questionnaires were also used as it was important to capture target community which does not have the internet facility. The traditional method of distributing questionnaires also the faster way to get the response from the respondent and also a much higher percentage of getting a response as questionnaires were distributed hand to hand and some of the surveys were done face to face interview. This is because both the states have a city has almost same level of development in internet facility. The respondent characteristics (Table 3. 1) and their internet activities show difference in demographics and behaviour among Delhi and Chandigarh consumers.

Table 3.1 : Demographic Characteristics

Items	Nationality			
	Delhi		Chandigarh	
	Frequency	%	Frequency	%
Gender				
Male	83	55	80	55.6
Female	68	45	64	44.4
Age group				
20-24	19	12.6	43	29.9
25-29	53	35.1	40	27.8
30-34	38	25.2	29	20.1
35-39	23	15.2	20	13.9
40-44	11	7.3	8	5.6
More than 45	7	4.6	4	2.8
Education level				
High school	18	11.9	11	7.6
Diploma/Certificate	16	10.6	11	7.6
Graduation	87	57.6	94	65.3
Master degree	30	19.9	28	19.4
PHD	0	0	0	0
Usage of Facebook				
Yes	151	100	138	95.8
No	0	0	6	4.2
Usage on checking e-mails				
Yes	151	100	141	97.9
No	0	0	3	2.1
Usage on checking for information				
Yes	151	100	140	97.2
No	0	0	4	2.8
Usage on entertainment				
Yes	143	94.7	135	93.8
No	8	5.3	9	6.3
Experience in using internet marketing				
Yes	82	54.3	100	69.4
No	69	45.7	44	30.6

V. Data Analysis and Results

a) *Profile of Respondents*

From the data collected, there were quite evenly responses received from Delhi and Chandigarh for both male and female which is 55.5% and 45.5% respectively in Delhi whereas 55.6% and 44.4% respectively in Chandigarh (Table 3.1). Besides that, the responses from both Delhi and Chandigarh are skewed towards younger people who are younger than 30 years old, with 47.7% of respondents from Delhi are people age fell between 20-30 whereas 57.7% of respondents from Chandigarh are people age fell between 20-30. However, there are only 7 respondents from Delhi and 4 respondents from Chandigarh who are older than 45 years old. Furthermore, the respondents in this sample were relatively highly educated; at least 77.5% respondent from Delhi and 84.8% respondents from Chandigarh had at least bachelor degrees or higher level. Both respondents from Delhi and Chandigarh who own a personal web site have the same percentage which is 14.6%. All respondents from Delhi do have an account registered in Facebook, use internet to check their emails, check information and for entertainment. Whereas in Chandigarh, high percentage of the respondent do have an account registered in Facebook, use internet to check their emails, check information and for entertainment, which is more than 90%. 54.3% of the Delhi respondents have experience in using internet marketing whereas 69.4% of the Chandigarh respondents have experience in using internet marketing which is higher than Delhi.

b) *Goodness of Measures*

Confirmatory Factor Analysis (CFA) was analyzed in this study; the two main criteria used for testing goodness of measures are validity and reliability. Reliability is a test of how consistently a measuring instrument measures whatever concept it is measuring, whereas validity is a test of how well an instrument that

is developed measures the particular concept it is intended to measure (Sekaran and Bougie; 2010). Based on the theoretical background presented in chapter 2, Figure 4.1 shows the model proposed and submitted to empirical test using Smart PLS 2.0 software (Rigle et al., 2012).

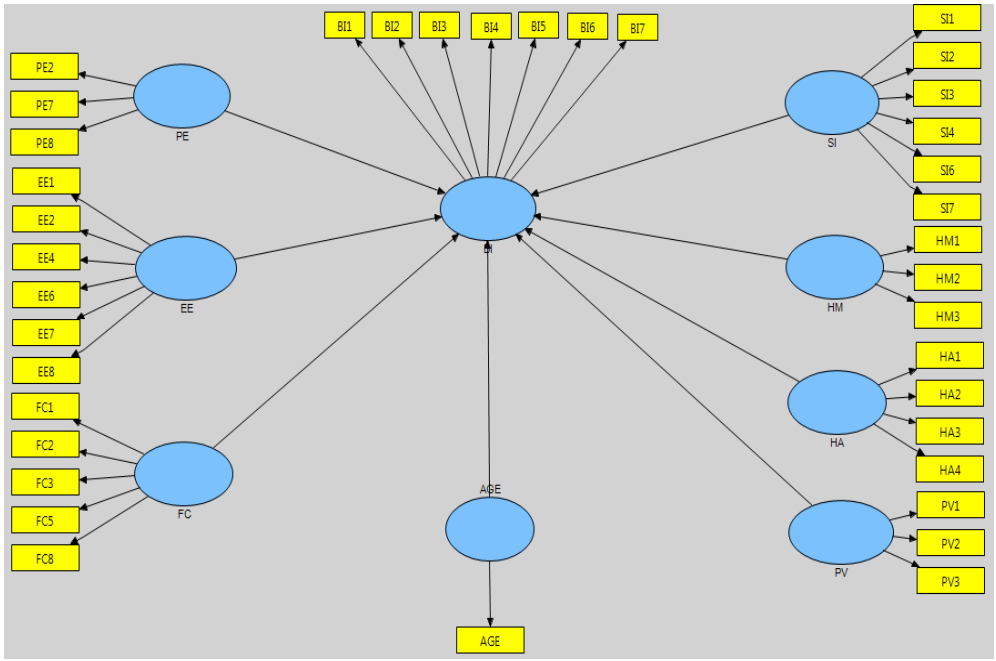

Figure 4.1 : Reflective research model

c) Construct Validity

Construct validity is used to provide further prove that item measures taken from a sample represent the actual true score in the population (Hair et al., 2013). It tests how well the results obtained from the use of the measure the theories which the test is designed (Sekaran and Bougie, 2010). Construct validity can be examined through convergent and discriminant validity. This study started with the testing of the convergent validity by examined the respective outer loadings and cross loadings as showed in Table 4.2 in order to assess any problem occurs with any particular items. According to Hair et al. 2013, outer loading above 0.50 is considered significant, item should remain. However, items with lowest outer loadings (below 0.50) should be eliminated from the scale with the condition the deleted item does not reduce the average variance extracted (AVE) value (Hair et al., 2013). Moreover, AVE value should be at least 0.50 which indicates the construct explained more than half of the variance of its indicators. If AVE value is less than 0.50, more errors are remaining in the items which may not gave accurate analysis result at the later stage.

Results presented in Table 4.2a showed the PLS Result of Main Loadings and Cross Loadings of the analysis of the data collected from the Delhi respondents whereas Table 4.2b showed the PLS Result of Main Loadings and Cross Loadings of the analysis of the data collected from the Chandigarh respondents. The bold values were loadings for items which are above 0.50. However, there were few items which were deleted due to weaker outer loadings (less than 0.50). This has affected the AVE value for product and place variables were less than 0.50. After dropped these items, all AVE values for all constructs were above 0.50.

d) Convergent Validity

Convergent validity is the degree to which scale item is close to others that it should theoretically be related to each other. Accordingly to Hair et al. (2013), in order to establish convergent validity, the main factor loadings, composite reliability (CR) and AVE is used.

The loadings for all items exceeded the recommended value of greater than 0.50 (Hair et al., 2013). Composite reliability measures of internal consistency reliability and should be above 0.70. From Table 4.3a which showed the Convergent Validity from the analysis of data collected from the Delhi respondents, the constructs indicators were ranged from 0.818 to 0.938 which had exceeded the recommended value of 0.70 by Hair et al. (2013). Besides, the average variance extracted (AVE) extracted were in the range of 0.431 to 0.827. Whereas for the Convergent Validity from the analysis of data collected from the Chandigarh respondents, the constructs indicators were ranged from 0.886 to 0.949 which had exceeded the recommended value of 0.70 by Hair et al. (2013). The average variance extracted (AVE) extracted were in the range of 0.571 to 0.843. Hence, the constructs explain more than half of the variance of its indicators and less error were remains in the items than

the variance explained by the construct. Consequences, the overall measurement model of this study demonstrated an adequate convergent validity.

Table 4.2a:

PLS Main Loadings & Cross Loadings of Delhi data

	BI	EE	FC	HA	HM	PE	PV	SI
BI1	**0.93**	0.644	0.746	0.633	0.52	0.692	0.611	0.717
BI2	**0.88**	0.581	0.607	0.533	0.534	0.591	0.571	0.668
BI3	**0.92**	0.551	0.67	0.445	0.522	0.55	0.547	0.672
BI4	**0.73**	0.527	0.472	0.613	0.5	0.484	0.254	0.652
BI5	**0.83**	0.635	0.685	0.632	0.373	0.584	0.575	0.48
BI6	**0.74**	0.323	0.634	0.255	0.319	0.469	0.685	0.412
BI7	**0.73**	0.726	0.483	0.487	0.114	0.474	0.451	0.388
EE1	0.562	**0.84**	0.583	0.646	0.314	0.5	0.509	0.736
EE2	0.69	**0.8**	0.734	0.549	0.356	0.717	0.461	0.587
EE4	0.379	**0.69**	0.461	0.429	0.137	0.441	0.434	0.236
EE6	0.599	**0.83**	0.663	0.517	0.273	0.538	0.527	0.642
EE7	0.495	**0.84**	0.477	0.579	0.195	0.451	0.565	0.361
EE8	0.441	**0.73**	0.498	0.497	0.319	0.434	0.192	0.334
FC1	0.598	0.759	**0.82**	0.714	0.222	0.519	0.473	0.552
FC2	0.614	0.482	**0.79**	0.386	0.414	0.461	0.356	0.703
FC3	0.496	0.429	**0.7**	0.399	0.386	0.372	0.531	0.522
FC5	0.716	0.567	**0.89**	0.466	0.47	0.645	0.548	0.592
FC8	0.476	0.676	**0.7**	0.507	0.36	0.65	0.516	0.577
HA1	0.606	0.619	0.518	**0.94**	0.366	0.505	0.557	0.6
HA2	0.325	0.376	0.313	**0.74**	0.288	0.09	0.342	0.3
HA3	0.361	0.381	0.401	**0.76**	0.442	0.434	0.151	0.43
HA4	0.643	0.741	0.717	**0.85**	0.634	0.602	0.631	0.665
HM1	0.567	0.38	0.45	0.503	**0.955**	0.382	0.428	0.51
HM2	0.027	0.029	0.055	0.344	**0.582**	-0.031	-0.025	0.139
HM3	0.324	0.23	0.434	0.493	**0.868**	0.473	0.218	0.459
PE2	0.573	0.458	0.588	0.312	0.416	**0.79**	0.395	0.685
PE7	0.492	0.475	0.441	0.431	0.269	**0.744**	0.54	0.377
PE8	0.489	0.63	0.536	0.533	0.328	**0.796**	0.337	0.326
PV1	0.41	0.341	0.376	0.546	0.402	0.358	**0.861**	0.319
PV2	0.681	0.58	0.621	0.427	0.337	0.567	**0.911**	0.428
PV3	0.606	0.587	0.614	0.578	0.304	0.512	**0.954**	0.483
SI1	0.506	0.622	0.502	0.397	0.219	0.557	0.38	**0.71**
SI2	0.439	0.393	0.472	0.473	0.324	0.196	0.217	**0.75**
SI3	0.53	0.512	0.657	0.639	0.476	0.587	0.348	**0.77**
SI4	0.585	0.502	0.689	0.547	0.509	0.55	0.489	**0.8**
SI6	0.581	0.377	0.509	0.323	0.455	0.444	0.359	**0.78**
SI7	0.599	0.591	0.652	0.612	0.446	0.48	0.334	**0.86**

e) Discriminant Validity

Discriminant validity is the extent to which a construct is truly distinct from other constructs and determines whether the measurement is unrelated, as well as how many

Table 4.2b:

PLS Main Loadings & Cross Loadings of Chandigarh data

	BI	EE	FC	HA	HM	PE	PV	SI
BI1	**0.92**	0.629	0.595	0.744	0.463	0.556	0.59	0.623
BI2	**0.93**	0.663	0.587	0.736	0.533	0.612	0.607	0.622
BI3	**0.91**	0.622	0.527	0.633	0.458	0.501	0.563	0.639
BI4	**0.76**	0.682	0.618	0.57	0.573	0.525	0.533	0.727
BI5	**0.89**	0.68	0.642	0.724	0.528	0.592	0.673	0.623
BI6	**0.86**	0.575	0.639	0.55	0.452	0.595	0.688	0.604
BI7	**0.68**	0.471	0.472	0.504	0.315	0.658	0.478	0.414
EE1	0.437	**0.68**	0.509	0.447	0.439	0.495	0.556	0.631
EE2	0.754	**0.91**	0.717	0.628	0.592	0.692	0.656	0.67
EE3	0.371	**0.67**	0.449	0.44	0.328	0.481	0.449	0.342
EE6	0.704	**0.92**	0.681	0.606	0.546	0.67	0.699	0.735
EE7	0.571	**0.84**	0.593	0.564	0.553	0.644	0.728	0.588
EE8	0.627	**0.86**	0.652	0.645	0.677	0.641	0.61	0.54
FC1	0.529	0.614	**0.84**	0.549	0.509	0.645	0.618	0.576
FC3	0.446	0.494	**0.77**	0.476	0.494	0.602	0.605	0.553
FC4	0.408	0.467	**0.81**	0.389	0.532	0.561	0.68	0.505
FC5	0.572	0.618	**0.84**	0.397	0.532	0.485	0.648	0.689
FC6	0.388	0.448	**0.71**	0.443	0.492	0.456	0.525	0.406
FC7	0.718	0.719	**0.73**	0.684	0.539	0.635	0.66	0.701
HA1	0.684	0.57	0.572	**0.92**	0.506	0.533	0.58	0.508
HA2	0.46	0.472	0.405	**0.79**	0.528	0.509	0.504	0.375
HA3	0.639	0.57	0.456	**0.87**	0.592	0.588	0.429	0.418
HA4	0.769	0.719	0.749	**0.88**	0.669	0.709	0.714	0.689
HM1	0.581	0.618	0.645	0.61	**0.925**	0.635	0.688	0.621
HM2	0.407	0.546	0.546	0.614	**0.883**	0.625	0.513	0.389
HM3	0.514	0.599	0.606	0.595	**0.916**	0.685	0.61	0.611
PE1	0.472	0.534	0.484	0.494	0.608	**0.81**	0.479	0.516
PE2	0.635	0.693	0.676	0.587	0.713	**0.86**	0.657	0.715
PE3	0.602	0.634	0.567	0.682	0.582	**0.87**	0.679	0.548
PE4	0.4	0.471	0.481	0.514	0.584	**0.79**	0.438	0.436
PE5	0.261	0.388	0.361	0.2	0.3	**0.51**	0.372	0.381
PE6	0.56	0.675	0.613	0.525	0.592	**0.86**	0.627	0.687
PE7	0.681	0.635	0.643	0.65	0.602	**0.87**	0.713	0.647
PE8	0.568	0.602	0.643	0.548	0.537	**0.73**	0.614	0.55
PE9	0.313	0.53	0.649	0.433	0.384	**0.71**	0.544	0.435
PV1	0.544	0.66	0.642	0.611	0.732	0.699	**0.89**	0.601
PV2	0.722	0.72	0.814	0.572	0.57	0.717	**0.92**	0.712
PV3	0.622	0.698	0.738	0.621	0.578	0.632	**0.94**	0.697
SI1	0.391	0.486	0.471	0.326	0.34	0.418	0.453	**0.67**
SI4	0.397	0.406	0.458	0.402	0.421	0.342	0.466	**0.7**
SI5	0.661	0.733	0.756	0.481	0.485	0.7	0.755	**0.86**
SI6	0.664	0.52	0.674	0.532	0.563	0.67	0.593	**0.86**
SI7	0.647	0.684	0.596	0.569	0.574	0.612	0.607	**0.88**

indicators represent only a single construct (Hair et al., 2013). The discriminant validity was assessed by determining the correlations between the measures of potentially overlapping constructs. Items should load more strongly on their own constructs in the model, and the square root of average variance shared between each construct and its measures should be greater than the variance shared between the construct and other constructs (Fornell and Larcker, 1981; Hair et al., 2013). Result of discriminant validity for the Delhi data is presented in Table 4.4a whereas the result of discriminant validity for the Chandigarh data is presented in Table 4.4b. It describes the inter-correlations among Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Condition (FC), Hedonic Motivation (HM), Price Value (PV), Habit (HA) and Behavioural Intention (BI) and the square root of the AVE value which represented as diagonal elements. The discriminant validity for the data analysis of both Delhi and Chandigarh is confirmed and highly sufficient as the square root of AVE for each construct is higher than 0.707 and also higher than the inter-correlation between constructs. (Fornell and Larcker, 1981; Hair et al., 2013).

Table 4.3a:

Convergent Validity Measures from Delhi data

Latent Variable	Indicator	Main Loading	AVE	CR
Behavioural Intention	BI1	0.925	0.684	0.938
	BI2	0.883		
	BI3	0.918		
	BI4	0.733		
	BI5	0.829		
	BI6	0.742		
	BI7	0.733		
Effort Expectancy	EE1	0.843	0.541	0.902
	EE2	0.8		
	EE4	0.688		
	EE6	0.833		
	EE7	0.843		
	EE8	0.727		
Facilitating Condition	FC1	0.814	0.506	0.89
	FC2	0.794		
	FC3	0.704		
	FC5	0.89		
	FC8	0.701		
Habit	HA1	0.94	0.682	0.895
	HA2	0.737		
	HA3	0.762		
	HA4	0.85		
Hedonic Motivation	HM1	0.955	0.668	0.853
	HM2	0.582		
	HM3	0.868		
Performance Expectancy	PE2	0.79	0.431	0.818
	PE7	0.744		
	PE8	0.796		
Price Value	PV1	0.861	0.827	0.935
	PV2	0.911		
	PV3	0.954		
Social Influence	SI1	0.71	0.576	0.904
	SI2	0.745		
	SI3	0.774		
	SI4	0.801		
	SI6	0.784		
	SI7	0.857		

Table 4.3b:

Convergent Validity Measures from Chandigarh data

Latent Variable	Indicator	Main Loading	AVE	CR
Behavioural Intention	BI1	0.92	0.728	0.949
	BI2	0.926		
	BI3	0.911		
	BI4	0.759		
	BI5	0.886		
	BI6	0.859		
	BI7	0.684		
Effort Expectancy	EE1	0.679	0.672	0.924
	EE2	0.914		
	EE3	0.672		
	EE6	0.916		
	EE7	0.839		
	EE8	0.86		
Facilitating Condition	FC1	0.837	0.612	0.904
	FC3	0.768		
	FC4	0.807		
	FC5	0.835		
	FC6	0.71		
	FC7	0.73		
Habit	HA1	0.922	0.752	0.924
	HA2	0.794		
	HA3	0.867		
	HA4	0.879		
Hedonic Motivation	HM1	0.925	0.825	0.934
	HM2	0.883		
	HM3	0.916		
Performance Expectancy	PE1	0.808	0.616	0.934
	PE2	0.856		
	PE3	0.873		
	PE4	0.785		
	PE5	0.511		
	PE6	0.858		
	PE7	0.866		
	PE8	0.726		
	PE9	0.708		
Price Value	PV1	0.892	0.843	0.941
	PV2	0.921		
	PV3	0.94		
Social Influence	SI1	0.665	0.571	0.886
	SI4	0.696		
	SI5	0.855		
	SI6	0.86		
	SI7	0.88		
	BI1	0.92	0.728	0.949

f) Reliability Test Analysis

Composite reliability (CR) values and Cronbach's alpha are using to evaluate and to measure the internal consistency in this study. However, composite reliability (CR) value is preferable due to the limitations of Cronbach's alpha found which include that it assumes that all items are equally reliable or having equal main loadings on the construct. Secondly, it tends to underestimate when the internal consistency reliability is being measured. Thirdly, Cronbach's alpha value is sensitive to the number of items in the scale. Hence, CR value is more appropriate to apply the measure of composite reliability method (Hair et al., 2013).

Table 4.4a:

PLS Result of Discriminant Validity Measures (Delhi)

Model Construct	BI	EE	FC	HA	HM	PE	PV	SI
BI	**0.827**							
EE	0.687	**0.792**						
FC	0.75	0.737	**0.784**					
HA	0.624	0.681	0.627	**0.826**				
HM	0.51	0.346	0.473	0.542	**0.817**			
PE	0.67	0.666	0.675	0.539	0.44	**0.777**		
PV	0.644	0.574	0.612	0.558	0.373	0.544	**0.91**	
SI	0.698	0.641	0.749	0.64	0.527	0.61	0.46	**0.78**

Note: Bold values represent the square root of average variance extracted (AVE) while the other entries represent the squared correlations using Fornell-Larcker criterion (Fornell and Larcker, 1981).

Table 4.4b:

PLS Result of Discriminant Validity Measures (Chandigarh)

Model Construct	BI	EE	FC	HA	HM	PE	PV	SI
BI	**0.853**							
EE	0.728	**0.82**						
FC	0.685	0.744	**0.783**					
HA	0.754	0.685	0.649	**0.867**				
HM	0.561	0.65	0.664	0.665	**0.908**			
PE	0.671	0.744	0.732	0.682	0.713	**0.785**		
PV	0.694	0.757	0.804	0.652	0.674	0.744	**0.918**	
SI	0.717	0.724	0.758	0.592	0.609	0.715	0.735	**0.796**

Note: Bold values represent the square root of average variance extracted (AVE) while the other entries represent the squared correlations using Fornell-Larcker criterion (Fornell and Larcker, 1981).

The result of reliability test of this study is described in Table 4.3a for Delhi data and Table 4.3b for Chandigarh data that given the composite reliability values ranged from 0.818 to 0.938 for Delhi case and ranged from 0.886 to 0.949 for Chandigarh case, which is greater than the suggested value of 0.708 by Hair et al. (2013). The Cronbach's alpha value for this study was ranged 0.673 to 0.921 for the Delhi case and ranged 0.875 to 0.954 for the Chandigarh case which is greater than the recommended value of 0.6 by Nunnally and Berstein (1994). Therefore, the reliability of the brand switching model in this study is highly sufficient.

g) Goodness-of-fit Measures

Goodness-of-fit (GoF) is the geometric mean of the average variance extracted (AVE) or average communality and the average of R square of endogenous latent variables, represents an index for validating the overall fit of the model. GoF index is being developed to take into account the model performance in both the measurement and the structural model. Thus, it provides a single measure for the overall prediction performance of the model. GoF is formed between 0 and 1, where a higher value represents better path model estimation (Tenenhaus, Amato and Esposito Vinzi, 2005). Global validation of PLS models use cut-off values to determine the entire model goodness-of-fit measure such as GoF small than 0.10 indicate poor-fit, and GoF large than 0.36, which mean the model is good-fit (Wetzels et al., 2009). Result stated in Table 4.6a indicates that the GoF index in the analysis of Delhi case was 0.677 and for the analysis of Chandigarh case the GoF index is 0.709. This means that both the models had acceptable predictive relevance and the overall fit of the model is in good-fit (GoF greater than 0.36).

h) Hypothesis Testing

In this study, bootstrapping of smart PLS was used to assess the statistics significance and according to Hair et. al. (2013). In order to examined the result of hypotheses tests, the bootstrapping was used and the minimum number of bootstrap samples of 500 were selected, critical values for a one-tailed test was applied where 1.65 (significance level = 5%), and 2.33 (significance level = 1%) (Hair et al., 2013). Refer to Figures 4.3a, Figure 4.3b and Table 4.10, the result of bootstrap indicates that the coefficient value and t value suggested H1a, H2a, H2b, H3a, H3b, H4a, H5b, H6a, H7b were statistical significance.

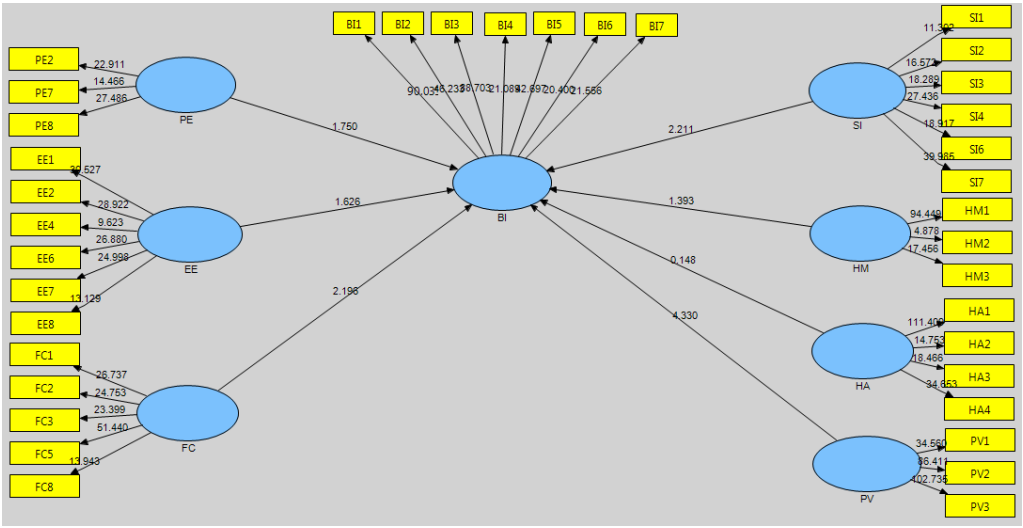

Figure 4.4a : Results of Bootstrapping (Delhi)

Note: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Condition (FC), Hedonic Motivation (HM), Price Value (PV), Habit (HA), Behavioural Intention of using Internet Marketing (BI)

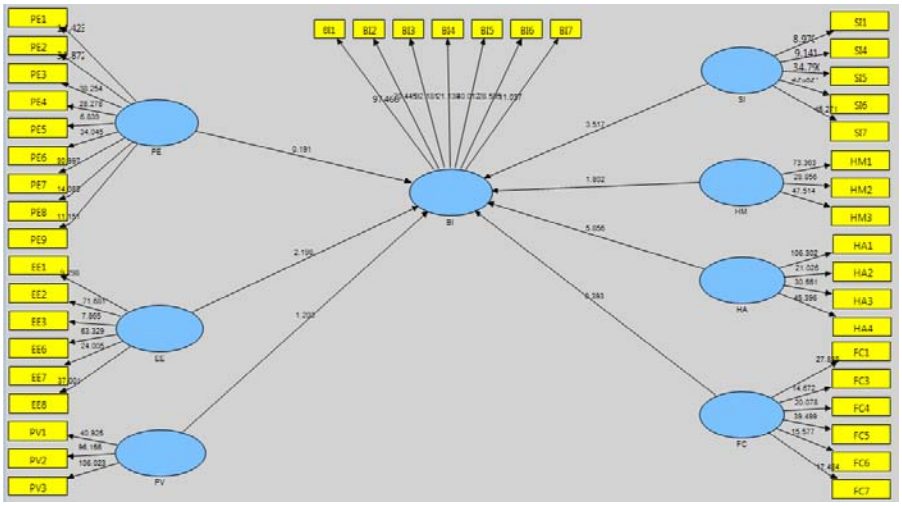

Figure 4.4b : Results of Bootstrapping (Chandigarh)

Note: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Condition (FC), Hedonic Motivation (HM), Price Value (PV), Habit (HA), Behavioural Intention of using Internet Marketing (BI)

Table 4.10:

PLS Results of Hypothesis Testing

Hypothesis	Relationship		T-value	Result
H1a	Performance Expectancy (PE) ->	Delhi	1.750*	Supported
H1b	Behavioural Intention (BI)	Chandigarh	0.191	Not Supported
H2a	Effort Expectancy (EE) ->	Delhi	1.656*	Supported
H2b	Behavioural Intention (BI)	Chandigarh	2.198*	Supported
H3a	Social Influence (SI) ->	Delhi	2.211*	Supported
H3b	Behavioural Intention (BI)	Chandigarh	3.517**	Supported
H4a	Facilitating Condition (FC) ->	Delhi	2.196*	Supported
H4b	Behavioural Intention (BI)	Chandigarh	0.393	Not Supported
H5a	Hedonic Motivation (HM) ->	Delhi	1.393	Not Supported
H5b	Behavioural Intention (BI)	Chandigarh	1.802*	Supported
H6a	Price Value (PV) ->	Delhi	4.330**	Supported
H6b	Behavioural Intention (BI)	Chandigarh	1.203	Not Supported
H7a	Habit (HA) ->	Delhi	0.148	Not Supported
H7b	Behavioural Intention (BI)	Chandigarh	5.856**	Supported

Note: **p < .05. *** p< .01.

Table 4.10 showed the result of the PLS and hypothesis testing, the result indicated that the first hypothesis has a different result between Delhi and Chandigarh. Delhi hypothesis H1a was supported by the result whereas Chandigarh hypothesis H1b was not supported by the result. The second hypothesis and third hypothesis had the same result, where hypothesis of both Delhi and Chandigarh (H2a, H2b, H3a and H3b) were supported by the result. For the fourth hypothesis, H4a of Delhi was supported whereas H4b of Chandigarh was not supported by the result. For the fifth hypothesis, H5a of Delhi was not supported whereas H5b of Chandigarh was supported by the result. For the sixth hypothesis, H6a of Delhi was supported whereas H6b of Chandigarh was not supported by the result. For the seventh hypothesis, H7a of Delhi was not supported whereas H7b of Chandigarh was supported by the result. In the nutshell, hypothesis two and third which investigate the relationship between effort expectancy and social influence towards behavioural intention had the same result between Delhi and Chandigarh, which were both supported. On the other hand, other hypothesis, first, fourth, fifth, sixth and seventh hypothesis had different results between Delhi and Chandigarh.

i) Moderating Testing

Moderation is the relationship between two variables which depends on a third variable. In this study, the moderating effect was analysed using SPSS. The moderator in this study is the age difference, the respondents were categorized into two age group which is from age 20 to age 29 and from age 30 onwards. The age category was decided based on the consideration of generation Y and X. There is no significant effect by the age moderator towards the relationship between the independent variables and the dependent variable which is the intention to use internet marketing in both Delhi and Chandigarh. Table 4.12 shows the summary hypothesis of the age moderating effect, with all hypotheses regarding age moderator rejected.

VI. Discussions and Conclusion

a) Performance Expectancy towards Behavioural Intention (H1a and H1b)

Performance expectancy was found to have positive relationship with behavioural intention of using internet marketing in the case of Delhi, but this relationship was not significant for the Chandigarh. One possible reason is that Chandigarh are so used to internet marketing as it has been introduced and been a trend quite a long period of time, they no

Table 4.12:

Hypothesis Testing on Age Moderating

Hypothesis	Relationship		T-value	Result
H8a	Performance Expectancy (PE) ->	Delhi	0.147	Not Supported
H8b	Behavioural Intention (BI)	Chandigarh	1.091	Not Supported
H8c	Effort Expectancy (EE) ->	Delhi	0.181	Not Supported
H8d	Behavioural Intention (BI)	Chandigarh	1.347	Not Supported
H8e	Social Influence (SI) ->	Delhi	0.191	Not Supported
H8f	Behavioural Intention (BI)	Chandigarh	0.053	Not Supported
H8g	Facilitating Condition (FC) ->	Delhi	0.227	Not Supported
H8h	Behavioural Intention (BI)	Chandigarh	0.259	Not Supported
H8i	Hedonic Motivation (HM) ->	Delhi	0.359	Not Supported
H8j	Behavioural Intention (BI)	Chandigarh	0.791	Not Supported
H8k	Price Value (PV) ->	Delhi	0.087	Not Supported
H8l	Behavioural Intention (BI)	Chandigarh	1.405	Not Supported
H8m	Habit (HA) ->	Delhi	0.001	Not Supported
H8n	Behavioural Intention (BI)	Chandigarh	0.573	Not Supported

Note: **p < .05. *** p< .01.

longer feel the better performance and efficiency brought by the internet marketing. On the other hand, in Delhi where internet marketing is still considered new compared to Chandigarh, performance improvement and better efficiency brought by the internet marketing is appreciated by the Delhi, which is consistent with the findings of Tan et al. (2013), where performance expectancy shows a positive relationship with intention to use internet marketing for Delhi. This result also shows that the Delhi is already aware that the importance of internet marketing in improving the task performance and efficiency, and the Delhi is ready for further acceptance of more internet marketing tools.

b) Effort Expectancy towards Behavioural Intention (H2a and H2b)

Effort expectancy shows a positive relationship with intention to use internet marketing in both Delhi and Chandigarh. This result is contradicting with the findings of Tan et al. (2013), stating in Delhi effort expectancy shows no significant relationship with the intention to use internet marketing. In the study, it is mentioned that Delhi are still in the early stages of internet marketing use, and as such, they perceive that more efforts are required. However now, Delhi has a much better experience in internet marketing therefore having a different result Tan et al. (2013). Therefore the ease of use of the internet marketing is important factor to affect the intention to use internet marketing for both Delhi and also Chandigarh currently. Based on the result of this study, it is then show the importance of having the internet marketing tools to be user friendly and easy to use to capture the interest of the consumer in both Delhi and Chandigarh.

c) Social Influence towards Behavioural Intention (H3a and H3b)

Social influence is found to have positive relationship with the intention to use internet marketing for both Delhi and Chandigarh. The result is contradicting with the findings of Tan et al. (2013) for the case of Delhi, where in that study the relationship between social influence and behavioural intention is not significant. The reason of the findings of Tan et al. (2013) different from the result in this study might be due to the study of Tan et al. (2013) targeted mostly on the respondent age from 19 to 35 which are the Generation Y. However in this study, the targeted respondents were from all age therefore having a much average result throughout the population. Based on the result from this study, it is believed that social influence may affect the use of internet marketing for both Delhi and Chandigarh. Therefore any effort to improve the use of internet marketing in both Delhi and Chandigarh should be started by instilling awareness of the importance of using internet marketing, for example through the education or seminar.

d) Facilitating Condition towards Behavioural Intention (H4a and H4b)

Facilitating condition shows a different result for Delhi and Chandigarh. For the Delhi case, facilitating condition shows positive relationship with the intention to use internet marketing; whereas there is no significant relationship between facilitating condition and intention to use internet marketing for the Chandigarh. The result is consistent with the findings of Tan et al. (2013) for the Delhi. Facilitating condition do not have a significant relationship towards intention to use internet marketing by the Chandigarh might be due to the Chandigarh is so used to and dependent on the internet marketing that even though the internet facility or infrastructure will not

affect their intention to use internet marketing. The intention to use internet marketing by the Delhi is still very dependent on the facility and infrastructure provided such as internet connection. Without the facility the Delhi might choose to use the traditional channel of marketing. Therefore to encourage the Delhi to use internet marketing, the internet facility must be improved. Chandigarh already completed these suggestion of improvement might be the reason the facilitating condition have no significant relationship with the intention to use internet marketing.

e) Hedonic Motivation towards Behavioural Intention (H5a and H5b)

Hedonic Motivation was found to have different result for Delhi and Chandigarh. The hedonic motivation shows no significant relationship between hedonic motivation and the intention to use internet marketing; whereas in Chandigarh, the hedonic motivation shows a negative relationship with the intention to use internet marketing. The hedonic motivation does not affect the intention to use internet marketing in the Delhi might be due to the Delhi still in the early stage of internet marketing, there are just a simple tool with internet marketing functions without any element of creativity and innovativeness. On the other hand, the Chandigarh are not attracted to the interesting features in the internet marketing, instead they are more keen to use the internet marketing without the interesting features. This prove that in terms of using internet marketing, the Chandigarh prefer a much formal and professional internet marketing tool rather than internet marketing that has too much of complicated unwanted functions.

f) Price Value towards Behavioural Intention (H6a and H6b)

Price value also shows a different result for Delhi and Chandigarh. Price value shows a positive relationship towards behavioural intention of using internet marketing for Delhi. This proves that the intention of the Delhi to use internet marketing is strongly dependent on the price of the internet marketing. The Delhi is still not taking the internet marketing as the core marketing channels. If the cost of internet marketing is higher than the traditional marketing channel, the Delhi might switch back to use the traditional internet marketing channel. Therefore the cost of internet marketing must be lowered to make more competitive compare to the traditional marketing channels. In contrast price value shows no significant relationship towards the intention to use internet marketing for the Chandigarh. The reason of this might be Chandigarh already accepted internet marketing as the core marketing channel and the norm of practise, and they are so used to and dependent on internet marketing, they find it hard to switch back to the traditional marketing channel.

g) Habit towards Behavioural Intention (H7a and H7b)

Based on the result of this study, habit shows a different relationship towards the intention to use internet marketing for Delhi and Chandigarh. The intention to use internet marketing of the Delhi is not affected by the habit. As mentioned in the previous section, the Delhi is still in the early stage of internet marketing, they are still adapting the norm of using internet marketing. Therefore internet marketing hasn't become the habit for the Delhi. On the other hand, habit shows a positive relationship towards the intention of using internet marketing for the Chandigarh. Chandigarh is a very advance state with very advance internet facilities available throughout the state; Chandigarh has been introduced to internet marketing for a very long time. Therefore it is not surprise to see the use of internet marketing by Chandigarh becoming a habit or a trend.

h) Age Effect Moderator (All hypotheses 8)

Based on the findings of this study, age does not significantly moderate any relationship between determinants in the UTAUT model towards the intention to use internet marketing for both Delhi and Chandigarh. The possible reason of this might be the acceptance of internet marketing throughout all age range for both Delhi and Chandigarh. Even though both state shows that age moderating effect is insignificant, the Chandigarh case shows that age moderate the relationship more compared to the Delhi case (Table 4.12) where the t-values are much higher. Both states shows that age is not a deciding factor for the intention to use internet marketing, therefore effort of increasing the number of people using internet marketing can be done generally without to worry about different strategy needed for people of different age.

i) Implication of the Study

Based on the information gathered from this study, it would imply some implications to organizations and policy makers in terms of the strategies to increase internet marketing use among the Delhi and Chandigarh. The significance of performance expectancy for the Delhi suggests that the advantages of using internet marketing should continue to be promoted by the organizations. Studies can be conducted to find out whether consumers prefer certain benefits of internet marketing. These internet marketing tools can be improved and modified to increase the efficiency of user who is using it.

Effort expectancy which shows significant relationship towards intention to use internet marketing for both Delhi and Chandigarh give an idea that the ease of the use of internet marketing is important to maintain the users of internet marketing. This means that organizations must make sure that the internet marketing channels are user friendly, easy to learn and use, clear and comprehensible, flexible, and adaptable. Based on the findings in this study, businesses should

be encouraged by the policy makers to promote their products through the internet such as Facebook (Hutton, 2012) and some popular social networking sites frequently visited by the young citizens of the respective states.

The importance of facilitating conditions is reflected in its significance in influencing intention to use internet marketing for Delhi but not for the Chandigarh. However without doubt, facilitating condition is important to maintain the interest of the consumer to use internet marketing. This implies that social, organizational and technical infrastructure support must be provided by the organizations to users in order to increase internet marketing use. This requires internet connection which the policy makers must provide to their citizens.

Hedonic motivation showing a negative relationship towards the intention of use internet marketing for the Chandigarh suggests that the internet marketing tools should be made to be more formal and professional as the Chandigarh does not like the internet marketing to be too complicated with extra functions. Whereas the Delhi has no preference on the hedonic motivation suggests that new approaches of internet marketing can be tried out in Delhi to see the response of the internet marketing users in Delhi.

The significance of price value for the Delhi suggests that the Delhi is very sensitive towards the cost of internet marketing. Therefore to maintain the use of internet marketing by the Delhi, the direct way to do is to lower the cost of internet marketing so it will have a better competitive edge compare to the traditional marketing channels.

Age does not significantly moderate any relationship between determinants in the UTAUT model towards the intention to use internet marketing for both Delhi and Chandigarh. Both states shows that age is not a deciding factor for the intention to use internet marketing, therefore effort of increasing the number of people using internet marketing can be done generally without to worry about different strategy needed for people of different age. Strategy can be focus on population of all ages therefore saving cost.

VII. Limitation and Future Directions

Along with the processes of this study, there is a few limitations have been encountered and worthy of improvement in this study. Initially, due to the comparative nature of this study, there are factors that are not measured in this study such as culture and state policy.The future studies can include the investigation on the effect of culture difference and policy difference towards the intention to use internet marketing. Comparison can be made to discover the effect of culture and policy difference. Besides that, other demographic profile such as gender, education level, occupation and experience of using internet marketing can be included in the future studies as moderator.

VIII. Conclusion

As a conclusion, this study has demonstrated the effect of determinants in the UTAUT model, which is performance expectancy, effort expectancy, social influence, facilitating condition, hedonic motivation, price value and habit, towards the intention to use internet marketing. It is also proved that age do not moderate the relationship between determinants and the intention to use internet marketing. It has therefore made both important theoretical and practical contributions to the body of knowledge in the area of study. Despite the limitation of the study, the findings presented will be useful for the reference of the organization or policy maker. It is expected that future research can contribute substantially to more understanding of the intention to use internet marketing.

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Modern Physics for High School Students

By Romualdo S. Silva Jr.
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Abstract- This paper presents a brief modern physics teaching proposal for high school students, with a view to the importance of the use of experiments and simulations. With this is expected to facilitate the teaching and learning of students with respect to modern physics subject, which is not very well seen in high school, is of great importance to the education of the student. I also hope that this work will serve as an aid for teachers in order to view and teaching of modern physics in secondary level schools.

Keywords: *learning, modern physics, high school.*

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I. Introduction

After the scientific and technological advancement, Modern Physics aroused immense curiosity in the population, especially young people. This fact is related to the improvement in quality of life felt the same, arising through the use of electronic objects, and these are based on the Modern Physics.

However, modern physics teaching in high school has not kept satisfactorily this development. According to Leonel and Souza (2009) this fact is unacceptable as it undermines the scientific and technological literacy breaking the connection between physics and everyday life of the student.

Some authors such as Terrazzan and Dominguini struggled and somehow inserted collections of modern physics content in high school. But the teaching and use of these materials differ from other materials, so unsatisfactorily addressed. In this regard, contained in the National Curriculum Parameters for Secondary Education (PCNEM) the following question:

> *You need to revisit which teach Physics to enable a better understanding of the world and the most appropriate training for citizenship. We all know that, therefore, there are no simple or unique solutions, or ready-made recipes that guarantee success. That is the question to be faced by teachers of each school, each social reality, seeking to meet the wishes and hopes of all participants in the educational process, meeting with a clear pedagogical proposal.*
>
> *It is always possible, however, to signal those aspects that drive the development of education in the desired direction (BRAZIL, 2000, p. 23).*

Therefore, it is important to worry about this issue, which leads us to think and innovate in the face of difficulty to enter the modern physics in high school simply and significantly. In physics, it is natural to think that because of the complexity of certain issues, we have to break them gradually when taught to "lower" levels, and that the "higher" steps will deepen the problems and solutions thereof. In a way is idea is correct, but to a certain point of view. It is appropriate that these issues be given, not in a “higher” manner with great depth, but more simple and interesting way, what can be done, with a good methodology and effort from teachers.

However, we arrive at a situation we think of as modern physics teaching in high school with a targeted approach to meaningful learning? This is no easy task, but not impossible. I see you think of a condition related to the trial can be no doubt a major initiative to do so, it is always very easy to take students' attention when using simple and catchy experiments.

It is notable that high school students, even more current, that are fully connected to the technologies will learn better with the theoretical part of physics, which is essential if seek relationship with educational experiments, and are stimulable to learners for meaningful learning. When we talk about modern physics is impossible not to remember Albert Einstein, quantum mechanics, Schrödinger, particle physics and more. But what to say or show experiments on these subjects in high school?

You can teach through simple experiments and low cost, which are used as a methodological proposal for the Modern Physics teaching, for example: 1- emission spectrum, where you can use an old CD, a simple laser and a magnifying glass, where you can observe radiation wave as well as interference rings. 2- experiment to determine Planck constant, where you can use an LED, a pot and the meter requires a little more attention and can be observed emission band Led by determining the Planck constant. 3- experiment the photoelectric effect using a device LDR (light dependent resistor), where it depends on the light to vary the electricity that runs through it, and you can observe the photoelectric effect.

In addition to teaching experiments, an alternative is the computational resources of the Internet, which are often great teaching opportunities learning, such as computer simulations, animations or even educational games involving many particles, interactions of atoms, showing the constituents of the atom, among others.

The animations are able to refine a concept giving freedom to the visual need for us, to relate what

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we see with what we hear and try to understand. An animation provides freedom to the imagination, makes it more real, tangible, being able to give form to thought, being conducive to teaching and learning. A simulation is able to translate what is "impossible" to be done by words, and when it comes to modern physics, which deals with issues differentiated or difficult both for many, the simulations can reproduce what can not be done in lab. Thus, the high school student even being unable to make or understand the mathematical difficulties involved in a given experiment or phenomenon, can use computer simulation and understand significantly Physical submitted for the same.

Given the difficulty in teaching Modern Physics for high school students, it is expected that the experimental environment with simple equipment, but also the environment of computer simulations, with animations and fun games, is a way of creating own imagination and reasoning , which come from understanding the needs of modern physics teaching. It is important to note that this type of methodology to be followed to the letter, and in order to meaningful learning, on the contrary this will become just a simple fun for with students.

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Economic Feasibility of Biomass Gasification for Electricity Generation in Pakistan

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Abstract- Due to increase in energy demands and depletion of conventional and fossil fuels in Pakistan, search has been started for alternative reliable and abundant available fuel, therefore demand of renewable sources has increased. Biomass is renewable and efficient source and very helpful for overcoming the current situation of energy crisis in Pakistan. It is promising fuel for future as it is effective enough to be applied on small and medium industrial scale. The major motivation of this research is to analyze the economic feasibility of a Biomass gasifier for the production of electricity. Biomass gasification is the most reliable and promising method now a days for generation of electricity because this process provides sustainable & affordable alternative to fossil fuel based process plants at small and medium levels. From economic analysis it is concluded that biomass gasification technology is the most feasible technology if it is implemented in rural areas with an average population of 200 houses and in small industries.

Keywords: biomass gasification; rice husk; waste wood; diesel; producer gas, economic analysis.

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I. Introduction

The energy crisis in Pakistan is going to increase day by day. Current govt. of Pakistan has a bigger challenge ahead to overcome this huge electricity short fall [1]. The demand and supply gap of electricity is increasing chronologically. Current electricity resources are not capable enough to manage twenty four hours electricity supply to all the areas in Pakistan [2]. The grid electricity supply contributes to only 59% of the total population and 21% of the energy is supplied through natural gas. These supplies are not enough to reduce the demand and supply gap in current situation. Due to increase in population and depletion of resources a big danger of obsoleting of electricity is coming in next thirty to forty years. Besides this harmful threat the economic growth of Pakistan is adversely effected and Industries are shutting down due to electricity deficit [3]. These supplies are also unable to fulfill the domestic needs especially in rural areas. Another important aspect of Pakistan's economy is that 39% of the population is under the fifteen years of age group [4]. In coming five years this age group will be added in the mainstream of electricity consumers which ultimately creates a burden on electricity resources. Due to above mentioned situation of electricity in Pakistan it is very important to take initiative towards alternate energy resources and support the Govt. of Pakistan in this regard. Pakistan is an agricultural country and most of its economics depends upon crops cultivation, therefore recognizing the fact that biomass supplies will be abundant and continuous. Agriculture sector of Pakistan contributes greatly to GDP growth [5]. Objective of this research is to adopt the modern technology of Biomass gasification for generation of electricity in rural areas and in industrial sector as well.

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II. An Overview of Biomass Gasification Technology

Biomass gasification is the technology which coverts agricultural residue (biomass) into energy which then further used to generate electricity. The technology includes stoker boilers, fixed bed boilers, fluidized bed gasifiers, fixed bed gasifiers and anaerobic digesters. Biomass gasification technology has capacity of 50 MW [6]. In comparison with coal fired plants it is very low in capacity. Coal fired plants ranges from 100 to 1000 MW. Now a day the direct fired gasification technology is mostly used. High pressure steam is produced by burning biomass in a boiler; the steam so produced is then used to drive a steam turbine for power generation [7]. Biomass gasification system operates by the application of heat in such a way that all the biomass is converted to a flammable gas. This gas is known as synthesis gas (syn gas) which is then cleaned and filtered before using in different gasifiers [8]. This technology can also be used in a combination with coal power generation technology and is called as co-firing technology. It is more economical if used with existing power plant capacity in comparison with constructing entire new biomass power plant. In comparison with pure coal power plants it has less emissions of sulfur oxides (SOx), nitrogen oxides (NOx), carbon dioxide and other harmful gaseous emissions [9].

The production of flammable gas from biomass fuels became very popular in many countries like Germany, India, and Malaysia. The use of wood gasifier to generate power replaces the use of furnace oil in thermal applications in many industries [10]. Biomass is systematically combusted under controlled conduction, results in cost reduction which ultimately increases the profitability and hence growth of the country. The gasifier systems basically consist of a reactor in which

gaseous mixture is produced comprised of different components these components are cleaned and filtered before application. This gaseous mixture collectively known as producer gas, having combustible components known as carbon monoxide, methane, hydrogen and hydrocarbons whereas non-combustible components include nitrogen and carbon dioxide. The energy released by this producer gas is 4 to 6 MJ per normal cubic meter with exit temperature at about 400°C [11]. The producer gas so produced is then used to drive internal combustible engines similar to LPG gas driven motor vehicles. This technology can be used in two ways i.e. pure producer gas mode and dual fuel mode. In pure producer gas mode 100% producer gas is used for driving IC engines while in dual fuel mode 20% diesel is used in combustion chamber. Biomass fuels are rich in carbon percentage and also have high yield of calorific value [12]. This gasification process start with combustion reaction in the reactor and then drying and vitalization occurs in the upper zone of the reaction chamber leaving behind burnt wood residue i.e. char. The volatile components of biomass undergo oxidation reaction; large amount of air is supplied through nozzles for this purpose. Air to fuel ratio is normally taken as 1.5:1 to 1.8:1. Following table shows the composition of producer gas [13].

Table 1 : Producer Gas composition

Carbon monoxide	18% - 20%
Hydrogen	15% - 20%
Methane	1% - 5%
Carbon dioxide	9% - 12%
Nitrogen	45% - 55%
Calorific value	1000 - 1200 kCal/m^3

Biomass gasification technology became more advance and more applicable day by day because of advancement in research level in this area. Biomass technology is a good alternative to current energy resources like fossil fuels; it is environmental friendly and lies in the category of renewable energy resources.

III. Gasification Parameters and Factors Affecting Gasification Process

Important parameters relevant to biomass gasification are given below [14]

- Equivalence Ratio
- Superficial velocity and hearth load
- Turn-down ratio
- Gas Heating Value
- Gas low rate and gas production
- Fuel Consumption

Table 2 : Values of gasification parameters

Parameter	Unit	Value (typical/average)
Specific gas production	Nm3 /kg	2 – 3
Specific gas production	Nm3/kWe	2 – 3
Specific fuel consumption	kg/kWe	1 – 1.3
Gasifier cold gas efficiency	%	70 – 80
Gasifier hot gas efficiency	%	85 – 95
Equivalence ratio	-	0.35
Specific load	kg/m2.hr	500 – 2000
Turndown ratio	-	3 - 10

Important factors which affect biomass gasification process are fuel calorific value, moisture content in fuel, fuel size distribution and operating parameters of reactor like temperature and pressure.

IV. Economics for Electricity Generation

For economic evaluation type of biomass used is Rice husk and waste wood. This type of biomass is abundantly and locally available in Pakistan. In rural areas rice husk is easily available while in northern areas and some places under District Attock and Mianwali, waste wood is easily available. This economic calculation is based on the data taken from small and medium scale industries. Both kinds of fuel modes that are dual fuel mode and pure producer gas mode are used for economic analysis.

a) Electricity cost for Dual fuel mode

In this case gasifier and diesel generator are connected by some suitable technical modifications. According to the data taken from small scale industries (Premiere Industrial Chemicals Sheikhupura and Phonex Chemicals Sheikhupura), one unit of electricity requires 0.09 litre of diesel, 1 kg of wood or 1.5 kg of rice husk. On the basis of cost of above mentioned biomasses cost of electricity.

Table 3 : Economic analysis rice husk and waste wood in dual fuel mode

Description	Amount of fuel required per unit of electricity	Price of fuel in PKR	Total Cost per unit of electricity in PKR
Fuel	----------	----------	----------
Diesel	0.09 litre	80.61/litre	7.2549
Wood	1kg	6/kg	6
Rice husk	1.5kg	3.5/kg	5.25
Total fuel cost when diesel and wood used together	----------	----------	13.2549
Total fuel cost when diesel and rice husk used together	----------	----------	12.5049
Cost of unit of electricity when only diesel used (1 litre of diesel is equal to 3.5 units of electricity)	----------	----------	23.0314

From the above calculation obvious difference in the cost per unit of electricity generation can be observed. The price of diesel can be varied according to the current diesel price commercially available in Pakistan. Similarly the price of waste wood and rice husk mentioned in above calculation may be varied with different localities. Both wood and rice husk available in this price in Sheikhupura region.

b) Electricity Cost for pure producer gas mode

In pure producer gas mode gasifier is connected to gas engine with suitable modification. In this mode no diesel is required at all. According to the data collected from the industries (Premiere Industrical Chemicals and Phonex Chemicals Sheikhupura), for the generation of 1 unit of electricity 1.5 kg of wood and 2 kg of rice husk required.

Table 4 : Economic analysis of waste wood and rice husk in pure producer gas mode

Description	Amount of fuel required per unit of electricity	Price of fuel in PKR/Kg	Total Cost per unit of electricity in PKR
Fuel			
Wood in kg	1.5	6	9
Rice husk in kg	2	3.5	7

The selection of fuel mode varies with circumstances. It depends upon the economic feasibility of the process and the availability of biomass fuel in certain locations. Dual fuel mode is the more established technology but the cost of electricity is higher while in pure producer gas mode cost of electricity is low but installation and capital cost is high.

c) Detailed Economic analysis for electricity generation

For detailed economic study for cost estimation, following assumptions are made.

Table 5 : Assumptions for detailed economic analysis

Electricity Consumption (Gross)	1250 kW
Electricity Consumption (Net)	1150 kW
Capacity Factor	87%
High Heating Value efficiency -From biomass to clean gas	54%
Net efficiency of power generation in dual fuel	25%
Input energy fraction in dual fuel	15%
Ash content of biomass	6%
Char concentration	34%
Fraction of heat recovered	51%
Sale price of heat	3.5pkr/kwh
Interest rate on debit reserve	2% per year
General Inflation rate	7% per year
Biomass fuel inflation rate	5% per year

Inflation for dual fuel mode	5.15% per year
Heat sales inflation	5% per year
Char/ Ash sales inflation	6% per year
Debit Ratio	80% per year
Equity Ratio	20% per year
Interest Rate on Debit	12% per year
Estimated Plant life	20 years
Payback period	10 years
Cost of Equity	17%

The Equity is taken as 17% because if the project developer shares the equity portion then his investment should be on power project based on commercial basis. In this case return on investment is guaranteed. In the above calculations no assumptions are made that this project replaces the grid power supply. Heating component and heat recovery is included because the economic review is more justified and it gives additional incentives to industrialist for their mental makeup towards biomass gasification projects. In this regard 3.5 PKR value is assumed as monetary value to heat sales. Similarly in above calculations plant is assumed to operate on both diesel and producer gas (dual fuel) therefore energy input fraction of diesel is taken as 15%. The current price of diesel Pakistan now a day is 80.61 PKR per liter. Based on above calculations the cost of electricity in Pakistan through Biomass gasification technology based on dual fuel mode is 19.19 PKR/kWh.

V. Conclusion

From the above calculation it is concluded that biomass gasification is the most economical source of electricity generation in Pakistan for medium and small scale industries. Other than industries this technology can also be applied in rural areas, especially in villages having average population. However there is a draw back in this technology is that it cannot be compared to grid power supply because of some voltage fluctuation problems. Similarly producer gas is not environmental friendly so it must be recovered or treated before releasing in atmosphere. Therefore from technical aspects this technology has some drawbacks but from economic point of view this technology is very effective and due to current economic recession in Pakistan and due to high diesel, petrol and electricity prices this technology has more importance especially in industrial sector of Pakistan.

VI. Recommendations

On the basis of some technical disadvantages discussed above, research is required especially for complete removal of voltage fluctuation. Installation cost for biomass gasification plant is high therefore some technical research is also recommended in installation of this technology so that it becomes also economically feasible in this regard. This technology should be effective enough so that it is applied in large scale industries like oil refineries and fertilizer industries so research is also required for competency of this technology on large scale industries. Similarly some research is required for its use in dual mode with coal as well. Because of large reserves and cheap price of coal in Pakistan, this technology can be more economically feasible if it is used as dual fuel mode with coal.

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Using Urban Sewage Filtration Sludge for Producing Construction Material

By Shayan Pirouz & Seyed Mostafa Khezri
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Abstract- Management of sludge produced in urban sewage filtration plants is essential and inevitable due to great volume of water, contamination with pathogens, organic material and high expenses of such filtrations. Purpose of this research is to evaluate the possibility of using urban sewage sludge in producing light concrete.

In order to conduct this study, mouldswith dimensions of 15 x 15 x 15 cm were prepared. In each series of production of light concrete samples, dry sludge was taken from Ghods filtration plant and lime was added to the sludge 24 hours before making concrete samples, in order to increase its pH to 12 and destroy microorganisms. Sludge was used at the weight percentages of 0. 10, 20, 30, 40 and 50 of the cement , and the produced concretes were tested for pressure resistance after being processed with the moisture caused from perspiration of the blocks at the ages of 7, 28 and 90 days and determination of the specific gravity.

Keywords: *urban sewage sludge, light concrete, concrete pressure resistance.*

GJSFR-E Classification : *FOR Code : 870199, 870399*

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Using Urban Sewage Filtration Sludge for Producing Construction Material

Shayan Pirouz [α] & Seyed Mostafa Khezri [σ]

Abstract- Management of sludge produced in urban sewage filtration plants is essential and inevitable due to great volume of water, contamination with pathogens, organic material and high expenses of such filtrations. Purpose of this research is to evaluate the possibility of using urban sewage sludge in producing light concrete.

In order to conduct this study, mouldswith dimensions of 15 x 15 x 15 cm were prepared. In each series of production of light concrete samples, dry sludge was taken from Ghods filtration plant and lime was added to the sludge 24 hours before making concrete samples, in order to increase its pH to 12 and destroy microorganisms. Sludge was used at the weight percentages of 0. 10, 20, 30, 40 and 50 of the cement , and the produced concretes were tested for pressure resistance after being processed with the moisture caused from perspiration of the blocks at the ages of 7, 28 and 90 days and determination of the specific gravity.

Evaluating average pressure resistance of the samples shows that up to 30%, sewage sludge works as a fine granular material or filler and the pressure resistance of the samples increases with the increase in sludge percentage compared to control group. Nevertheless, we observe a decrease in pressure resistance of the samples with the increase in dry urban sewage sludge percentage at 30, 40 and 50 percents of sludge compared to control group, which is due to higher water absorption of the dry sludge and its increased impurity (particularly, organic impurities)resulting in inappropriate hydration operation.

Keywords: urban sewage sludge, light concrete, concrete pressure resistance.

I. Introduction

Considering the great volume of waste production in recent years, using different types of waste for producing construction material ha gained a specific importance. With regard to increased level of health of people, establishing filtration plants for urban sewage has become a requirement of today's human society.

Sludge is an inevitable product of sewage filtration plants, and high water content of sludge and its contamination to pathogens, presence of unstable material in it, and production of bad odor, has rendered sludge filtration and disposal as a principal dilemma in sludge management.(1)

With respect to application of urban and industrial sewage filtration sludge, different investigations have taken place worldwide. The results acquired from these investigations show that using these wastes in production of building material is possible. (2)

On the other hand, construction enjoys an increasing trend in the world. Meanwhile, concrete, being the most important and the most used building material, should be taken into consideration. Regarding the industrialization trend of construction and promotion in light concrete production technology, which results in lighter buildings, replacement of material used in construction of light concrete with urban sewage filtration sludge can provide a great help to environment protection.

In this study, using dry sludge of urban sewage filtration plants for producing light concrete was investigated.

II. Material and Methods

a) Sewage sludge preparation and concrete production

Sewage sludge needed for production of concrete samples, was taken as dry sludge from Ghods town filtration plant and used for making concrete. In each series of production, about 10 grams of lime was added to the sludge 24 hours before making concrete samples, in order to increase its pH up to 12-13 and consequently, destroy microorganisms present in it.

The cement used, was of the black type 2 kind and since no specific resistance of concrete was expected and the results were only for comparison, the resistance of 450 kg per cubic meter of concrete was selected. Proportion of water to cement was also considered a 0.60. A liquid special foam light cement at a 1/20 proportion of water volume was also added to the mixture.

Concrete cubes of 150 mm dimension were used for studying the effect of urban sewage sludge on specifications of light concrete.

b) Foam producing liquid for light concrete

One of the most important parameter in producing light concrete is using a suitable and good quality foam producing liquid. Foam producing liquid is mixed with air, after being diluted with a specific proportion of water, and produces a very resistant foam. Produced foam bubbles should enjoy a suitable resistance and keep their stability against physical and

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chemical forces caused from mixing with concrete and being poured into mould, and also stay resistant until the preliminary hardening of the concrete.(3)`

In general, foams are divided into two classes of protein foams and chemical foams.(4)

In this study, the basic foam used was a protein foam from Azarkavin company with the name of AK-350.`

The plan of mixing light concrete samples produced from urban sewage sludge:

The plan of mixing light concrete samples is as follows:

Table 1 : The concrete mix design

Plan of mixing	(Kg) cement	water (Lit)	foam (Lit)	sewage sludge (Kg)
control sample A	450	270	13	0
Sample B With 10% sewage sludge of the cement weight	450	270	13	45
Sample C With20% sewage sludge of the cement weight	450	270	13	90
Sample DWith30% sewage sludge of the cement weight	450	270	13	135
Sample EWith 40% sewage sludge of the cement weight	450	270	13	180
Sample F With 50% sewage sludge of the cement weight	450	270	13	225

III. Result

After performing different examinations over the samples of light concrete produced from urban sewage sludge, following result were acquired. The measured parameters have been provided in tables and diagrams. In this study, standards of the Iranian Standards and Industrial Research Institute and American Cement Institute (ACI) were used in production and testing the concrete samples.

Measurement of specific gravity and pressure resistance:

For measuring specific gravity, produced concrete samples were taken out of the nylon cover package of processing and they were weighed with a scale after 1 to 2 hours.

And for measuring pressure resistance of the samples, after measuring specific gravity, they were placed on the pressure testing device. The time of appearance of the first crack on the sample is determined as the maximum resistance.

The average specific gravity and pressure resistance of the samples have been provided in tables 2 to 4.

Table 2 : 7-day compressive strength of concrete made from sewage sludge

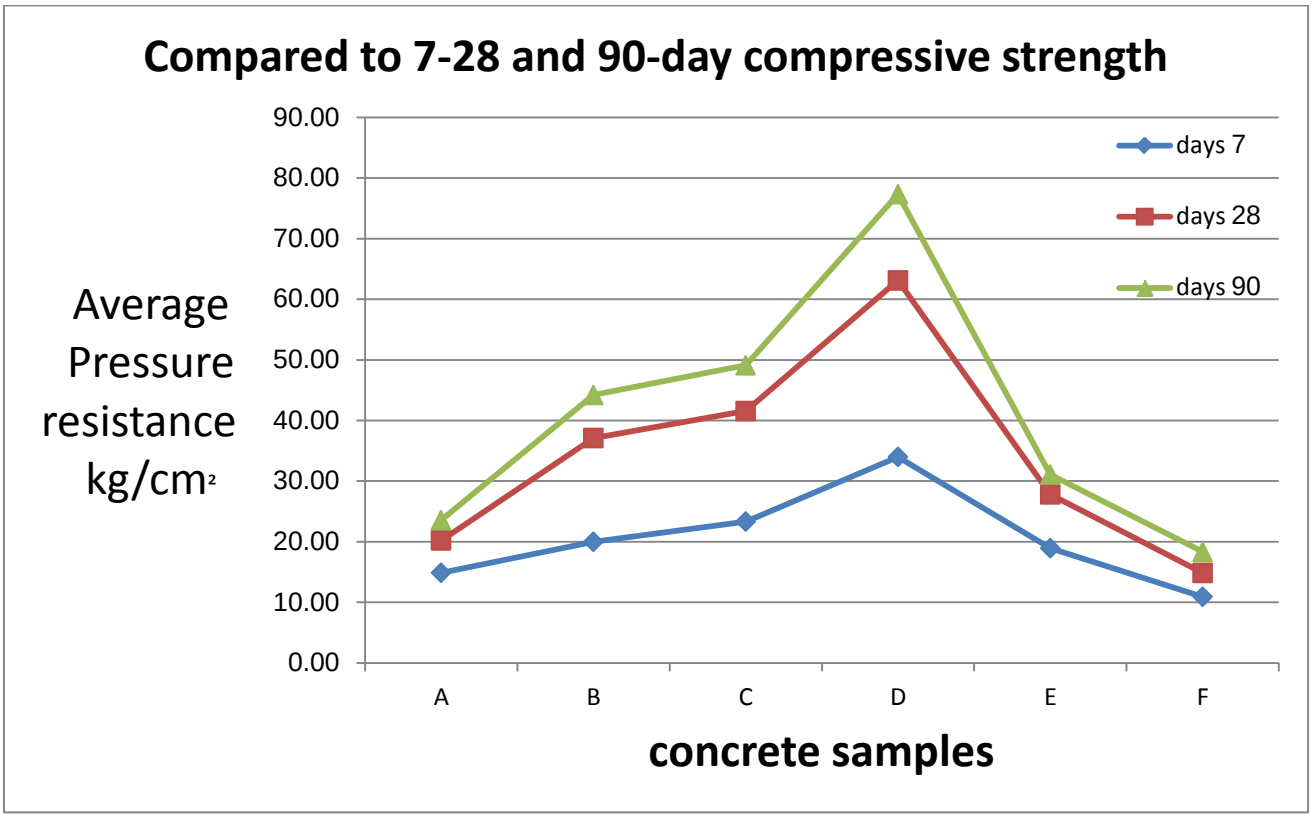
concrete samples	Weight (gr)	Average Weight (gr)	Force (kg)	Dimensions (cm)	Pressure resistance (Kg/cm²)	Average Pressure resistance (Kg/cm²)
control sample A	2195	2200	3300	15x15x14.9	14.67	14.89
control sample A	2205		3400	15x15x14.9	15.11	
Sample B With %10 sewage sludge of the cement weight	2332	2338.5	4500	15x15x14.9	20	20
Sample B With %10 sewage sludge of the cement weight	2345		4500	15x15x14.9	20	
Sample C With 20% sewage sludge of the cement weight	2468	2480.5	5200	15x15x14.8	23.11	23.33
Sample C With 20% sewage sludge of the cement weight	2493		5300	15x15x14.9	23.56	
Sample D With 30% sewage sludge of the cement weight	2632	2643.5	7600	15x15x14.7	33.78	34
Sample DWith30%sewage sludge of the cement weight	2655		7700	15x15x14.8	34.22	
Sample E With 40%sewage sludgeof the cement weight	2760	2778.5	4000	14.7x14.6x14.2	18.64	18.94
Sample E With 40% sewage sludge of the cement weight	2797		4100	14.7x14.5x14.3	19.24	
Sample F With %50 sewage sludge of the cement weight	2843	2855	2100	14x14.1x13.7	10.64	10.93
Sample F With %50 sewage sludge of the cement weight	2867		2200	14x14x13.6	11.22	

Table 3 : 28-day compressive strength of concrete made from sewage sludge

concrete samples	Weight (gr)	Average Weight (gr)	Force (kg)	Dimensions (cm)	Pressure resistance (Kg/cm²)	Average Pressure resistance (Kg/cm²)
control sample A	2212	2202.5	4600	15x15x15	20.44	20.22
control sample A	2193		4500	15x15x14.9	20	
Sample B With %10 sewage sludge of the cement weight	2346	2349.5	8300	15x15x15	36.89	37.11
Sample B With %10 sewage sludge of the cement weight	2353		8400	15x15x14.8	37.33	
Sample C With 20% sewage sludge of the cement weight	2474	2488.5	9300	15x15x14.8	41.33	41.56
Sample C With 20% sewage sludge of the cement weight	2503		9400	15x15x14.8	41.78	
Sample D With 30% sewage sludge of the cement weight	2647	2643.5	14300	15x15x14.9	63.56	63.11
Sample D With 30% sewage sludge of the cement weight	2640		14100	15x15x14.7	62.67	
Sample E With 40% sewage sludge of the cement weight	2772	2779	5900	14.7x14.6x14	27.49	27.82
Sample E With 40%sewage sludge of the cement weight	2786		6000	14.7x14.5x14.1	28.15	
Sample F With %50 sewage sludge of the cement weight	2822	2829.5	2900	13.6x14.1x13.5	15.12	14.86
Sample F With %50 sewage sludge of the cement weight	2837		2700	13.4x13.8x13.4	14.6	

Table 4 : 90-day compressive strength of concrete made from sewage sludge

concrete samples	Weight(gr)	Average Weight (gr)	Force(kg)	Dimensions(cm)	Pressure resistance (kg/cm²)	Average Pressure resistance (Kg/cm²)
control sample A	2218	2210.5	5200	15x15x14.9	23.11	23.56
control sample A	2203		5400	15x15x15	24	
Sample B With %10 sewage sludge of the cement weight	2352	2357	9900	15x15x14.9	44	44.22
Sample B With %10 sewage sludge of the cement weight	2362		10000	15x15x14.8	44.44	
Sample C With20%sewage sludge of the cement weight	2478	2494	11100	15x15x14.8	49.33	49.11
Sample C With 20% sewage sludge of the cement weight	2510		11000	15x15x14.7	48.89	
Sample DWith30%sewage sludge of the cement weight	2650	2656	17300	15x15x14.7	76.89	77.33
Sample D With 30% sewage sludge of the cement weight	2662		17500	15x15x14.7	77.78	
Sample E With 40% sewage sludge of the cement weight	2780	2787	6600	14.7x14.6x14.1	30.75	31.09
Sample E With 40% sewage sludge of the cement weight	2794		6700	14.7x14.5x14	31.43	
Sample F With %50 sewage sludge of the cement weight	2847	2850	3300	13.5x14.2x13.4	17.21	18.35
Sample F With %50 sewage sludge of the cement weight	2853		3500	13.3x13.5x13.6	19.49	



IV. Discussion and Conclusion

With evaluation of the result provided from measurement of pressure resistance of the samples produced from dry urban sewage sludge, it was observed that up to around 40% of the dry sludge to cement weight, the pressure resistance of the samples increases with the increase in sludge percentage compared to control group, with the peak increase at 30%. This was evident at all measurements of pressure resistance at the ages of 7, 28 and 90 days of the light concrete samples. With the increase of dry urban sewage sludge to 50% of the cement weight, a decrease in pressure resistance of the samples is observed compared to control group.

Evaluation of the increasing trend of the pressure resistance of the samples made from urban sewage sludge up to 30% of the cement weight, shows that sewage sludge works as a fine granular material or filler and the pressure resistance of the samples increases with the increase in sludge percentage compared to control group, although, with the increase in sludge percentage from 30 to 40 and 50, we observe a decrease in pressure resistance of the samples, which is due to higher water absorption of the dry sludge and its increased impurity (particularly, organic impurities) and prevents appropriate hydration operation.

Comparison of the pressure resistance of the samples at the ages of 7, 28 and 90 days of the light concrete samples show that resistance of the samples at the age 90 days is higher than that of the 28 and resistance of the samples at the ages of 28 and 90 days are higher than that of the 7 days, and therefore, increasing the duration of processing time is one of the effective factors in increasing the pressure resistance.

Hereby, it is suggested that in case of mass and industrial production of light concrete using sewage sludge, in order to achieve a faster retrieval of the moulds and economic privilege, processing of the concrete be done with steam.

Considering difficult access to clay in northern and southern parts of Iran, and high expenses of transporting clay or its products like bricks and blocks, one can consider production of light concrete block and panel, which is completely economic.

Light concrete made of urban sewage sludge can also be used as building material for making floors and slope of roofs instead of light pellets and cement. In case of replacement of such concrete with specific gravity of around 800 kg per cubic meter, usual dead weight of floors of different stories of a building can be reduced from 1300 to 800 kg per cubic meter.

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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