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USER ENGAGEMENT ATTRIBUTES AND LEVELS IN FACEBOOK

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ABSTRACT

This paper describes our work in performing a Factor Analysis (FA) to measure engagement attributes in *Facebook* and performing a Discriminant Analysis (DA) to determine the relationship between engagement levels and *Facebook* activities. We adapted the measuring user engagement scales from previous works that were performed in an online shopping environment. By using factor analysis, we discovered four attributes of engagement while interacting with social network applications, namely *Focus Attention*, *Novelty & Endurability*, *Perceived Usability*, and *Aesthetics*. We also adapted social networking activity scales from other previous works, in order to connect with engagement levels (recoded from the four engagement attributes) using a discriminant analysis. Results indicated that *Social Connection* was the most engaging activity, followed by *Photographs*, *Status Updates*, *Social Investigation*, *Social Network Surfing*, and *Contents*. Over a two week period, 103 *Facebook* users responded to the administered questionnaires. The findings also showed that respondents preferred using full access devices, compared to limited access devices, to access and interact with social network applications.

Keywords: *User Engagement, Social Networking Application, Factor Analysis, Discriminant Analysis.*

1. INTRODUCTION

Social networking applications serve a number of functions in our lives, by providing social and emotional support information resources [21]. It is an approach for representing the relationship between individuals, groups, or organizations [13]. This study aims to define engagement attributes from the perspective of social networking applications (i.e., *Facebook*). *Facebook* has been categorized as an engaging [11] and fascinating interactive application, withan image laden directory, featuring groups that share lifestyles or attitudes [1]. Social networking applications, like *Facebook*, are expected to have their own engagement attributes that might be different from other application domains.

Previous work indicated that a multidimensional scale may be used to test engagement in other software applications [15]. Using Reliability Analysis and Exploratory Factor Analysis in an online shopping environment, six attributes of engagement were identified, namely; *Perceived Usability*, *Aesthetics*, *Focused Attention*, *Felt Involvement*, *Novelty*, and *Endurability*. The user engagement scale could conceivably be used as a generalised instrument in other environments or applications, such as web digital libraries or task-specific applications [15].

In this work, we chose social networking applications as our domain, in order to discover user engagement attributes, whilst interacting with applications. There are subtle differences between shoppers, gamers, learners, and searchers, in terms of the manifestation of several engagement attributes, particularly those designed for individual versus collaborative use [14]. It may be possible to have different sets of engagement attributes, because format influences the engagement factor [9]. It is believed that a survey instrument is the most appropriate method for collecting user's perception of their level of engagement [15]. Consequently, several researchers have developed survey instruments to evaluate engagement [20-8].

There are two main objectives in this paper. The first is to measure the engagement attributes of social networking applications; particularly *Facebook*. The second is to determine the relationship between engagement levels and *Facebook* activities. Previous work suggested that

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further research on a wider group of participants, or an attempt to identify patterns of usage, was required [10].

2. STUDY BACKGROUND

A conceptual framework for defining user engagement was proposed by O'Brien and Toms (2008). It defined engagement through a multidisciplinary literature review and an exploratory study of users of web searching, online shopping, webcasting, and gaming applications. It identified four stages of engagement (i.e., *Point of engagement*; *Period of engagement*; *Disengagement*; and *Reengagement*). It provided the foundation to test a conceptual model of engagement in various application areas, and to develop methods to measure engaging user experiences for future work.

Previous research indicates a multidimensional scale that may be used to test the engagement in other software applications [15]. This scale is based on an online shopping environment, as the domain of study. They identified six attributes of engagement, using Reliability Analysis and Exploratory Factor Analysis, in an online shopping environment (i.e., *Perceived Usability*; *Aesthetics*; *Focused Attention*; *Felt Involvement*; *Novelty*; and *Endurability*). They believe that these instruments could also be generalized to other environments or applications. This study would be the first step to generalize a multidimensional scale in measuring user engagement in social networking applications, such as *Facebook*.

Joinson (2008) investigated the uses of the social networking site *Facebook* and the gratifications that users derived from those uses. The researcher identified seven unique uses and gratifications (i.e., *Social connection*; *Photographs; Shared identities*; *Content; Social investigation*; *Social network surfing*; and *Status updates*). The user engagement scale, which was previously used in an online shopping environment, was adapted into a *Facebook* social network application environment, without changing the meaning of each item.

3. METHODOLOGY

The target participants of this survey are registered *Facebook* users of any age, gender, and occupation. A total of 103 *Facebook* users responded to the administered questionnaires. Participant's data was gathered using two methods, namely an online survey and a direct approach survey. By using a *Joomla* survey, a survey form was created. The survey form web address was sent to the friends lists of two private accounts. Follow-ups were made on users who either did not complete the forms or needed help, because they were confused about completing the questionnaire survey form before the due date. An invitation to participate in the survey was sent via the messenger in *Facebook*. Reminders and assistance was given after a few days, as a follow-up to users, using the same application (i.e., *Facebook* messenger). A direct approach survey was conducted by finding *Facebook* users randomly from university colleges and offices.

The online survey was posted for between March 24 – April 7, 2011, and the direct approach survey was carried throughout this period. Participants were recruited through different methods, namely posting on the 'wall' of two accounts on *Facebook*, and by spreading on the *Facebook* forum. Direct approach recruitment involved visiting undergraduate classes, libraries, and offices. The study was conducted online and a direct approach was used to collect as many respondents as possible, in order to ensure the accuracy of the accumulated data results. The survey was comprised of a series of basic demographic questions, along with several measures of *Facebook* usage in Section A; a five-point Likert scale for *Facebook* activities in Section B; and engagement attributes while using *Facebook* in Section C.

Likert scale is a common method for measuring attitudes [16] and was chosen for this study, due to its fit with the data and because it gave the ability to provide summed ratings. The scale options addressed the intensity of users' attitude to the applications, as follows; 'strongly disagree', 'disagree', 'neutral', 'agree', and 'strongly agree'. In order to prepare the analysis data, 6 of the 32 items were reverse-coded in Section C.

For the purpose of testing the suggested multidimensional scale on engagement [15], the *Facebook* social networking application was selected, based on the phenomenon of '*Facebooking*', which is claimed to be addictive by many students [1], in order to measure engagement, and to increase the statistical power of the findings. Therefore, *Facebook* was deemed to be an appropriate and novel domain for measuring engagement attributes.

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The survey was first pre-tested on four people who observed and responded to the survey. Their reactions, suggestions, and questions, were noted during this exercise, and verbal comments were gathered following completion.

A second pre-test was then conducted on two individuals, in order to further improve the presentation and understanding of the survey. Overall, the two pre-tests reduced the scale in Section C from 32, to 31 items, and the scale in Section B from 28, to 23 items. These were divided into seven activity components (i.e., *Social Connection*, *Shared Identities*, *Photographs*, *Contents*, *Social Investigation*, *Social Network Surfing*, and *Status Updates*). This was then the final version of the survey to be used in this study. Two types of analysis were used to fulfil the objectives of this study, namely Factor Analysis (FA) and Discriminant Analysis (DA). Data from Section C was analysed using FA, whilst data from Section B was analysed using DA in *SPSS* software.

4. RESULT

There were 53 females (51.5%) and 50 males (48.5%) participating in this study. Participant's ages ranged from 18-24 (n=20, 19.4%); 25-34 (n=67, 65.0%); 35-44 (n=14, 13.6%); and 45 and over (n=2, 1.9%). Of these, 103 participants who stated their occupation, only 17.5% were students; 4.9% were unemployed, and the remainder were employed in various fields (77.7%). In terms of the education level of participants, 71.8% were under-graduates (i.e., diploma and degree); 8.7% were post-graduate (i.e., masters, PhD); and 9.7% held high-school and other certifications.

The number of friends linked to participant's *Facebook* profiles, wereas follows; less than 100 friends (9.7%); between 101 and 250 friends (28.2%); between 251 and 500 friends (32.0%), and more than 500 friends (30.1%). Participants that were registered on the application between one and two years (45.6%) indicated a slightly higher number than those who were registered for more than two years (38.8%). Meanwhile, the remainder were only registered for less than six months (2.9%); and between six months and almost one year (12.6%). The majority of participants visited the site almost daily, at 63.1%; every one or two days (13.6%); every three or four days (9.7%); and every five or six days (13.6%). Amongst all of the respondents, the most common response for the time spent on the site each day, was almost one hour (43.7%), followed by between one and three hours (30.1%). A relatively small proportion of users claimed to spend either between three and five hours (12.6%), or more than five hours (13.6%) each day.

Internet access was available to 88.3% of the participants in their homes or residence. For internet usage activities, social networking (i.e., *Facebook*) indicated the highest score, at 21.68%; followed by emailing (20.42%) and learning purposes (20.05%). These findings helped us to reaffirm our objective of measuring user engagement on social networking applications. They also indicate the preference for usage amongst different platform devices, with full access devices (i.e., desktop and laptop) (n=57, 55.3%); limited access and full access devices (n=42, 40.8%); and limited access devices (i.e., smartphone, tablet, or desktop) (n=9, 3.9%). Of these, 85.4% of the participants agreed that limited access devices made users feel more engaged whilst interacting with the *Facebook* application, compared to full access devices (14.6%).

Engagement attributes of social networking applications

The sample of 103 is deemed adequate to proceed with data analysis, as the recommended minimum is 100 [12]. Analysis of the results includes performing a Factor Analysis (FA) to assess the construct validity and the nature of the factors.

Factor Analysis (FA) was selected in order to examine the construct validity and multidimensionality of the instrument. The Kaiser Meyer-Olkin (KMO) Measure of Sampling Adequacy (KMO=0.819) indicated that factor analysis should result in distinct, reliable factors [7]; and the Bartlett's Test of Sphericity verified that relationships existed amongst the items (χ^2 =2686.88, df = 496, sig. = 0.000). The significant value is lower than 0.05; therefore, the variables in the population correlation matrix, are uncorrelated. As a result, it is necessary to process the factor analysis for the data, due to the strength between the variables, which is strong [4].

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Table 1. Principle Component Factor Analysis with Varimax Rotation.

Items	Items	1	2	3	4
C1FA4	I lost track of time, everytime I am on Facebook.	0.886	0.00	0.00	0.00
C1FA3	I lost focus on time during this Facebook session.	0.850	0.00	0.00	0.00
C1FA2	I lost attention whilst Facebook socializing.	0.836	0.00	0.00	0.00
C1FA8	I am so absorbed in online interactions.	0.819	0.00	0.00	0.00
C1FA6	I am so focused on Facebook that I cannot sense my surroundings.	0.804	0.00	0.00	0.00
C1FA1	I forgot my immediate surroundings whilst interacting on Facebook.	0.789	0.00	0.00	0.00
C1FA5	I do not bother about my other responsibilities whilst on Facebook.	0.787	0.00	0.00	0.00
C1FA7	I waste a lot of time on Facebook every day.	0.786	0.00	0.00	0.00
C1FA9	During this Facebook socializing experience, I let myself go.	0.779	0.00	0.00	0.00
C5N2	The content of Facebook incited my curiosity.	0.00	0.834	0.00	0.00
C4E5	I would strongly recommend virtual socializing on Facebook to my friends and family.	0.00	0.791	0.00	0.00
C5N1	I continue using Facebook out of curiosity.	0.00	0.766	0.00	0.00
C5N3	I felt excited during my Facebook session.	0.00	0.754	0.00	0.00
C4E4	My Facebook socializing experience was rewarding (personal satisfaction).	0.00	0.738	0.00	0.00
C4E2	I consider my Facebook socializing experience a success.	0.00	0.645	0.00	0.00
C4E1	Virtual socializing on Facebook is worthwhile.	0.00	0.608	0.00	0.00
C6I3	Facebook socializing experience is fun.	0.00	0.526	0.00	0.00
C3A1	Facebook is attractive.	0.00	0.513	0.00	0.00
C2PU3	I felt annoyed while visiting Facebook.	0.00	0.00	0.886	0.00
C2PU4	I felt demoralized whilst socializing on Facebook.	0.00	0.00	0.842	0.00
C2PU2	I find Facebook links confusing.	0.00	0.00	0.790	0.00
C2PU1	I felt frustrated while using Facebook.	0.00	0.00	0.749	0.00
C3A3	I like the graphics and images used on Facebook.	0.00	0.00	0.00	0.866
C3A4	Facebook website appealed to my visual senses.	0.00	0.00	0.00	0.799
C3A5	The layout of Facebook is interesting.	0.00	0.00	0.00	0.791
C3A2	Facebook website was aesthetically appealing.	0.00	0.00	0.00	0.598
	Amount of variance explained	6.742	5.114	3.44	3.249
Total	**Percentage of variance explained**	20.070	15.982	10.761	10.152

Principle component extraction was used to maximize the variance extracted, and because the outcome of this analysis was to identify the most parsimonious set of items [17]. Varimax rotation, the most common of the rotational techniques, was used to simplify the factors with Kaizer Normalization. The cut-off value of 0.50 was selected to be conservative. Eleven iterations of factor analysis were converged. During each iteration, items that were loaded on multiple factors were eliminated [17]; as shown in Table 1. Factors were interpreted based on their make-up and labelled accordingly. The four factors, namely *Focused Attention, Novelty & Endurability, Perceived Usability,* and *Aesthetics,* are described in the following section according to the amount of variance explained by each factor; alpha values, the resulting number of items and item loadings. The obtained alpha score was 0.8676, which indicates that the scale is high in internal consistency.

1) *Factor 1: Focused Attention*: This factor accounted for 20.07% of the variance and consisted of nine items (i.e., C1FA4, C1FA3, C1FA2, C1FA8, C1FA6, C1FA1, C1FA5, C1FA7, and C1FA9). These items were related to the user's perceptions of time passing, and their degree of awareness of what was taking place outside of their interaction with *Facebook*. The remaining items pertained to the user's ability to become absorbed whilst socializing on *Facebook*. Item loadings on this factor ranged from 0.78 to 0.88.

2) *Factor 2: Novelty & Endurability:* This factor was defined by nine items (i.e., C5N2, C4E5,

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C5N1, C5N3, C4E4, C4E2, C4E1, C6I3, and C3A1) and accounted for 15.982% of the total variance. Item loadings ranged from 0.51 to 0.83. Based on the previous findings of six engagement attributes[15], this new factor was a combination of items from *Novelty* and *Endurability*. Even though it also included two items from *Aesthetics* and *Felt Involvement*, the name of the factor i.e., *Novelty & Endurability*, was used.

3) *Factor 3: Perceived Usability:* This factor consisted 10.761% of the total variance and was comprised of four items (i.e., C2PU3, C2PU4, C2PU2, and C2PU1) with loadings ranging from 0.75 to 0.88. Items for this factor pertained to the emotions experienced by respondents when completing their *Facebook* socializing, i.e., 'confusing', 'frustrated', 'demoralized', and 'annoyed' [15].

4) Factor 4: Aesthetics: This factor was comprised of four items (i.e., C3A3, C3A4, C3A5, and C3A2) and accounted for 10.152% of the total variance. Item loadings ranged from 0.60 to 0.86. This set of items pertained to specific interface features, such as graphics/images and screen layout, and to respondents' overall aesthetic impressions of Facebook's attractiveness and sensory appeal.

The fifth factor, consisting of one item, with a loading of 0.82 (6.799% of variance); the sixth factor, consisting of two items with loadings of 0.77 to 0.78 (6.529% of variance), and the seventh factor, consisting of one item with a loading of 0.65 (3.993% of variance), were eliminated from the scale. Even though most of item loadings were high and moderate for the loading condition [18], they were considered as weak and unstable factors, as the results were fewer than three items [2].

Relationship between engagement levels and activities

The *Facebook* activities' instrument was adapted from previous work [10]. The obtained alpha score was 0.8876, which indicates that the scale is high in internal consistency. Each component of activities reliability index was also found to be relatively high, namely *Social Connection* (0.7264), *Shared Identities* (0.7978), *Photographs* (0.7991), *Contents* (0.7033), *Social Investigation* (0.7713), *Social Network Surfing* (0.8273), and *Status Updates* (0.8383). Therefore, the scale of *Facebook* activities is consistent and reliable to be used in this study.

Discriminant analysis is a parametric technique used to determine the weights of the best predictors for distinguishing two or more groups [6]. It was used to answer the question of how engagement measurement can be located into levels based on the seven components of *Facebook* activities. We selected items that contributed to the four factors of engagement, and combined them into the engagement variable.

We classified engagement into three levels, which are slightly engaged (less than 2.67), moderately engaged (2.68 to 3.44), and highly engaged (more than 3.45). The moderate range was set to the shortest range of all, because the main concern is to get the rigid engagement level, of either slightly or highly engaged. This range was used for discriminant analysis in previous research [22]. The sample size is large enough to enable the normal distribution assumptions to be fulfilled according to the central Limit Theorem. The second assumption, related to the discriminant analysis of variance, was tested using Box's M Homogeneity statistics. The results were as follows: Box's M = 72.607; F = 1.070; p-value > 0.05. The homogeneity of variance assumption was fulfilled.

There are three levels of engagement, which are divided as slightly engaged, moderately engaged, and highly engaged. Moderately engaged (54%), followed by highly engaged (34%), and slightly engaged (12%). Based on the three levels of engagement, a comparison of mean and standard deviations for each activity is presented in Table 2. The results show that the highly engaged engagement level has the highest score of all activities, whilst moderately engaged provides the middle scores, and slightly engaged is the lowest. The *Facebook* activities instrument indicates engagement intensity from highest to the lowest, by defining the mean scores, as follows *Social Connection* (3.5777), *Photographs* (3.484), *Status Updates* (3.3139), *Shared Identities* (2.9385), *Social Investigation* (2.8252), *Social Network Surfing* (2.8026), and *Contents* (2.4628).

Table 3 provides the results of the mean equality test for the seven components of *Facebook* activity. Results show that there are significant differences in activity components for each level of engagement, except for that of *Shared Identities*. Therefore, only six components of activity will be compared in the subsequent analysis.

Table 4 shows a comparison of Eigenvalues for the variance between groups to variance within groups. Eigenvalue is a statistic for evaluating the

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magnitude of a discriminant analysis. A large Eigenvalue is associated with a strong function. The results show that the first discriminant function indicates a greater effect than the second function. The first discriminate function explains 83.7% of the total of variance of engagement level towards *Facebook* activities, and 16.3% for the second function. Since both functions contribute to 100% of variance of engagement, function 1 through function 2 must be performed together in the functions test.

Table 5 shows the significance of discriminant function, based on Wilks Lambda value. Wilks Lambda indicates how good the discriminating power of the model is. Both functions 1 and 2 are significant; if they are being perform as a unit. However, if only function 2 is accounted for (by removing the first discriminant function), the second function is not significant, because its significance value is more than 0.05.

The first two columns of Table 6 describe the components that make up each discriminant function. It shows that the seven components of *Social Connection*, *Shared Identities*, *Photographs*, *Contents*, *Social Investigation*, *Social Network Surfing*, and *Status Updates*, have formed the first discriminate function. The last four columns in Table 6 show the correlation between each variable with each discriminant function. The value of non-standard coefficient is used to create the discriminate function equation, as follows:

Discriminant function I = -6.238 + .211 (Social Connection) + 0.253 (Photographs) + 0.287 (Contents) + 0.203 (Social Investigation) + 0.172 (Social Network Surfing) + 0.771 (Status Updates)

Discriminant function II = -1.211 + 1.145 (Social Connection) + -0.963 (Photographs) + 0.624 (Contents) + 0.563 (Social Investigation) + -0.304 (Social Network Surfing) + -0.701(Status Updates)

Table 2. Mean and Standard Deviation Scores.

Engagement Level	Slightly Engaged		Moderately Engaged		Highly Engaged		Total	
Activities	Mean	Std.dev.	Mean	Std.dev.	Mean	Std.dev.	Mean	Std.dev.
Social Connection	3.3958	0.69461	3.4732	0.50829	3.8071	0.69949	3.5777	0.61838
Photographs	2.9167	0.50377	3.4420	0.68256	3.7000	0.66088	3.4684	0.69193
Status Updates	2.5833	0.57075	3.2440	0.74533	3.6762	0.72077	3.3139	0.78636
Shared Identities	2.6667	1.09175	2.8214	0.94059	3.2190	0.96319	2.9385	0.97880
Social Investigation	2.5000	0.50252	2.7024	0.83769	3.1333	0.69640	2.8252	0.78777
Social Network Surfing	2.4167	0.69812	2.7083	0.80670	3.0857	0.71557	2.8026	0.78997
Contents	2.0278	0.83434	2.3155	0.74514	2.8476	0.90150	2.4628	0.85461

Table 3. Test of Equality of Means.

Factor	Wilks Lambda	F	df1	df2	Sig.
Status Updates	0.821	10.880	2	100	0.000
Photographs	0.886	6.436	2	100	0.002
Contents	0.884	6.585	2	100	0.002
Social Investigation	0.914	4.698	2	100	0.011
Social Network Surfing	0.920	4.346	2	100	0.015
Social Connection	0.927	3.943	2	100	0.022
Shared Identities	0.955	2.362	2	100	0.099

Table 4. Eigenvalue for Discriminant Function.

Function	EigenValue	% of Variance	Cumulative %	Canonical Correlation
1	0.285	83.7	83.7	0.471
2	0.055	16.3	100.0	0.229

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Table 5. Significance for Discriminant Function.

Function Test	Wilks Lambda	Chi-Square	df	Sig.
1 through 2	0.737	29.565	14	0.009
2	0.948	5.230	6	0.515

Table 6. Structure Metric and Canonical Coefficient.

Factor	Structure Metric		Standard Coefficient		Non-standard Coefficient	
Function	1	2	1	2	1	2
Social Connection	.864	-.286	.127	.688	.211	1.145
Photographs	.651	-.381	.166	-.633	.253	-.963
Contents	.557	.317	.233	.506	.287	.624
Social Investigation	.549	.130	.154	.428	.203	.563
Social Network Surfing	.489	.440	.131	-.233	.172	-.304
Status Updates	.390	.263	.555	-.504	.771	-.701
Constant	-	-	-	-	-6.238	-1.211

5. DISCUSSION

The engagement attributes (identified from previous research) and an exploratory study formed a multidimensional scale to measure engaging user experiences with a technology [15]. We evaluated the instrument's reliability and validity, which was adapted from a user engagement scale in an online shopping environment, to a social network environment. The product is a reliable and valid scale, comprised of four distinct factors, namely *Focused Attention*, *Novelty & Endurability*, *Perceived Usability*, and *Aesthetics*. From these findings, we identified that the engagement attributes in social networking are slightly different to the attributes of engagement that have been found in previous work.

In this research, we found four attributes of engagement (i.e., *Focused Attention*, *Novelty & Endurability*, *Perceived Usability*, and *Aesthetics*) in a social networking environment. Meanwhile, previous research by O'Brien and Toms (2010) found six attributes of engagement (i.e., *Focused Attention*, *Perceived Usability*, *Aesthetics*, *Novelty*, *Endurability*, and *Felt Involvement*) in an online shopping environment. This finding proved the previous research statement that format influences engagement [9], and this is why similar attributes are not retained and are slightly different for both researches. Engagement attributes in online shopping may be driven by shopping experiences, which involve money, anonymity, transactions, and natural satisfaction. The *Focused Attention* attribute, represents the element of getting absorbed with an activity or application, and associates relatively with other engagement attributes. This is because the main purpose of *Facebook* is socializing; to fulfil the human nature of connecting with people, to share excitement and enjoyment with family and friends. Basically, the *Novelty & Endurability* attribute represents the eagerness to know content, an endurance to keep on using the application, and satisfaction; because *Facebook* socializing involves emotional connection with friends (e.g. self-expression on the wall, photo sharing, or seeking advice), personal satisfaction (e.g. viewing other users by accessing their profiles or conversations), and experience (e.g. getting to know new people). *Perceived Usability* represents the element of user-friendliness, usefulness, and easiness, which can be considered as other options for face to face communication and fulfilling expectations. One of the most important elements to get people satisfied with a product is *Aesthetic*s. In social networking applications, the design should be informative, reasonable, eye-catching, and simple - just like a room for meeting people. *Facebook* users expect the application to be more relaxed, less concentrated on commercialization, market value, and others.

From the four distinct attributes of engagement, we recoded them into engagement levels, represented by slightly engaged, moderately engaged, and highly engaged. The results showed that 54% of *Facebook* users were moderately engaged, 34% were highly engaged, and 12% were slightly engaged. All *Facebook* activities at the highly engaged level scored the highest, followed by the moderately engaged level, and the slightly engaged as the lowest. One of the activities (i.e., *Shared Identities*), which was proposed by previous

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research, was eliminated from the function, because its value showed no significant difference for its level of engagement.

The results indicated that *Social Connection* is the most engaging activity, followed by *Photographs*, *Status Updates*, *Social Investigations*, *Social Network Surfing*, and *Contents* (as the least engaging activity). All activities, with the exception of *Contents*, were associated with social capital building gratification; where *Facebook* is used to build, invest in, and maintain, ties with distant friends and contacts [3-5]. Evidence exists, that *Facebook* profiles serve as an important self-presentation tool [19], which keeps users engaged. *Contents*, which contained instruments (i.e., 'use applications within *Facebook'*, 'play *Facebook* games', and 'do *Facebook* quizzes'), is considered as a less engaging element in *Facebook* usage as its mean scores were relatively low in previous researches [10].

6. CONCLUSION

In our study, we have identified four engagement attributes by using factor analysis based on a multidimensional scale in a social network application. We conducted a Factor Analysis (FA) to construct the validity and nature of the factors. We re-coded four engagement attributes into engagement levels (i.e., slightly engaged, moderately engaged, and highly engaged). We conducted Discriminant Analysis (DA) to determine the level of engagement for each *Facebook* activity, which we also did in our previous work.

In addition to the proposed four engagement attributes, this paper also provides a discriminate function that can be used to predict the level of engagement by using the scores of *Facebook* activities, which are *Social Connection*, *Photographs*, *Content*, *Social Investigation*, *Social Network Surfing*, and *Status Updates*. By conducting this work, we have generalized the ideas on user engagement attributes towards interacting with social networking applications. Suggestions for future work include testing discriminate functions within a focus group (e.g., full access devices' users and limited access devices' users, in a social networking environment), by using the same multidimensional scale.

This research has demonstrated that engagement attributes are applicable in social network applications. Further study needs to be carried out with more respondents and an increased variety of categories, such as gender, occupation, education level, and other demographic factors.

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