

A MORPHOLOGICAL EXPERIMENT ON ANTECEDENTS OF SOCIAL MEDIA USAGE: STRUCTURAL EQUATION MODELLING APPROACH

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ABSTRACT--The present study was aimed to conduct morphological experiment on social media usage behaviour of college students through structural equations modelling approach. The samples of 275 were collected from college students of Chennai city to understand the factors significantly predicting the social media usage. The path coefficients for all the four hypotheses were supported in the present study. The smart phone and internet usage variables such as, creativity factor, experience factor, demonstration factor and convenience factor have significant and positive influence on the social media usage factors and life style change is the cause for higher penetration of smart phone and internet usage and social media usage in technological environment.

Key Words--Social Media, Smart Phone, Internet, Usage Behaviour, Students and Structural Equation Model (SEM).

I. INTRODUCTION

Smartphone is considered has an effective communication tool in the era of digitalisation. Smartphone offers not only communication service and it also provides various supportive facilities as a double edged sword. The emergence of mobile application technology and growth of smartphone users is highly penetrating day-by-day. Everyone is connected with smart phone, computers, tablets and social media networking sites and they become part and parcel of their life (Sasikumar & Balaji, 2020; Suresh *et.al.*, 2020). These electronic devices are helps to maintain the interpersonal communication with their friends, family and peers. These devices are constantly engaging the college students to surf in the internet, e-mail checking, social media messages, chats, watching videos, uploading photos, sharing the messages and interacting with friends (Khan *et.al.*, 2013; Astrachan, 2011; Gul & Bano, 2019; Barbu, 2015). The technological platform helps the peoples to stay connected with society and social groups (Kim *et.al.*, 2015). Smart phones emerged as a part of their modern life to work, play, share and enjoy the moments of their lives (Oulasvirta *et.al.*, 2012). The college students like smart phone, internet and social media networking sites rather than knowing the consequences of the addiction in their regular life (Merlo *et.al.*, 2013). Smith *et.al.*, (2009) and Suki, N. M., & Suki, N. M. (2013) reported that maximum number of respondents have smart phones with internet accessibility to use social media networking sites. Tian *et.al.*, (2009) stated that nearly

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50% of global population has smart phone to use. Tossell *et.al.*, (2012) found that every user have different usage purposes and usage behaviour towards smart phone, internet and social media platforms which had witnessed tremendous growth over a period of time in the world (Shantharam et al., 2019). Especially, smart phone with internet connectivity gives global access to information in their hands (Kumar & Vasanth, 2017; Young, 1998; Young, 1996). Majority of the smart phone and internet users have social media networking sites membership to stay connected with vast number of information shared via SNS platforms (Balaji & Murthy, 2019). However, There are many consequences, psychological problems and physiological problems has been faced by users those who are addicted to social media and smart phone (Agostino and Sidorova (2017). The smartphone device is emerged as an imperative aspect of almost every human being life. The use of smartphone and internet is causing many psychological and health problems to its users. Therefore, there are many initiative has been taken by Indian Mobile and Internet Management Association to eradicate excessive usage among citizens of the country. Especially, the youth and college students have shown very high intend to use smartphone in their daily life. On the other hand, the growth social media networking sites such as Facebook, WhatsApp, Twitter, Instagram and many other platforms has been used frequently. The smartphone usage in-turn increases the use of social media via smartphone platforms. There is a need to understand the role of smartphone and internet to make youth and students addicted towards social media networking sites. India has higher than 560 million internet users and it is the second largest country to have higher internet users across the globe. Statistica Research Department predicted in 2021, India will have more than 600 million internet users.

II. LITERATURE REVIEW

The systematic review of literature has been carried to understand the existing body of knowledge pertaining to the smart phone usage, internet usage and social media usage in the realm of different socio-economic conditions across the globe. Balaji and Sreenivasa Murthy (2019) examined the social media networking sites preference among employed youth and results proved that they given higher preference to use Facebook, Whatsapp and Instagram to share their information. Alosaimi *et.al.*, (2016) found that students are spending more than eight hours per day on smart phone and social media usage in Saudi Arabia. Hauget *et.al.*, (2015) carried a study among adolescents and result proves that they have excessive addiction to smart phone and social media usage as compared to adult students. Sharma et al., (2014) made an exploratory study among Madhya Pradesh students to measure their addiction towards social media and results proves that professional course students have higher social media usage. Young, K. S. (2007) reveals that middle aged people are exposed to higher internet addiction in comparison with aged users. Kibona, L., & Mgaya, G. (2015) found the effects of smart phone usage on the academic performance of university students and result proves that higher the smart phone usage lesser the academic performance and vice-versa. Nayak, J. K. (2018) found that gender is the moderating variable for influence of smart phone usage on academic performance of university level students. Andreassen *et.al.*, (2017) conducted a confirmatory study to test the relationship among social media addiction, self-esteem and vanity among Norwegians and results proves that females have higher usage to use social media as compared to males and there is a cognitive strong relationship among self-esteem, vanity and social media usage of Norwegians. Masthiet *et.al.*, (2017) studied the comparison of social media addiction between government and private school

students in Bengaluru city of Karnataka and result supports that private school students have more social media addiction in comparison with Government school students. Jaclyn Cabral (2008) made an attempt to study the Generation Y behavior and addiction towards social media networking sites and result indicates that university students are suffers in tolerance, salience and relapse components in social media usage. ImadeIdubor (2015) investigated the social media addiction behavior among university students of Nigeria and stated that social media usage and addiction are highly correlated to each other. NoaAharony (2017) stated extroversion, openness, self-disclosure, loneliness and motivation are the underlying dimensions for the individual intention to use smart phone. Mohammed Said IbrahimAlshuabiet.al, (2018) examined social media usage purpose and academic performance among Malaysian students and found that cognitive engagement have significant and positive influence on academic performance whereas, behavioural engagement and emotional engagement do not have influence on academic performance of Malaysian students. GuidaHelalet.al, (2018) studied the imperative role of social media for brand building activities among millennial and found that social identify theory have significant applicability among millennial for brand perception on apparel and fashion accessories industry. IshaGhosh and Vivek Singh (2018) examined the attitude and perception of in USA to explore phone usage and found that mobile data explicit the user's privacy metadata through the multiple phone signals. ShohanaNowvin and David Bawden (2018) studies university student's behaviour in Bangladesh with respect to Information security behaviour and result shows that the Bangladesh university students have moderate secure behaviour on information available in their smart phones. Archana and Balaji (2019) stated that communication, curiosity, attention, time and up gradation factors are the major key drivers of social media usage. Similarly, Archana and Balaji (2019);proved that cognitive confinement factor, usage supremacy factor and laxness factor are the major dimensions of internet and smart phone addiction among college students.

III. STATEMENT OF THE PROBLEM

Many questions need to answer to explore the factors contributing the addiction towards social media especially, among college students due to the proliferation across the globe. It is a very difficult question to answer because; there are several factors acts as antecedents to social media usage among college students. Smart phone, internet and social media have emerged as an imperative aspect of college students' life. Due to excessive usage and addiction many youngsters and adults are exposed to many psychological and physical problems. This study aims to answer the significant influencers of social media usage through structural equation modelling approach.

IV. SCOPE OF THE STUDY

The present study was limited to college students affiliated to University of Madras, Chennai and those who are pursuing under-graduation and post-graduation are alone participated in the primary survey. The age of the respondents ranges from 17 years to 22 years only. The perception of college students towards the usage of smart phone, internet and social media usage were measured using five point Likert scale adopted in the previous studies.

V. RESEARCH OBJECTIVES

1. To explore the demographic characteristics of the college students in Chennai city of Tamil Nadu
2. To identify the factors of smart phone, internet and social media usage purposes.
3. To develop a structural equation model to determine the influence of smart phone and internet usage on social media usage of college students

VI. RESEARCH METHODOLOGY

Research Design and Study Period: This empirical study was adopted hypothetical research design to examine the usage of social media and smartphone internet adoption among the college students in their day to day regular life. The sample for the study constitute students of college affiliated to University of Madras, Chennai and the primary data was collected during march 2020 to April 2020 by adoption of online survey.

Sampling Method and Technique: The non-probability convenience sampling technique was adopted to gather the primary respondents from college students residing in Chennai city of Tamil Nadu. The sample size of 275 were finalised after the elimination of incomplete responses and data contains extreme values.

Questionnaire Design, Scaling Pattern and Pre-Testing: The structured questionnaire was three sections were finalized for the data collection after the pilot study and pre-testing with samples. The results of the pilot study helped to eliminate the variables secured less Cornbach's Alpha Values (i.e. < 0.500). The measurement scale such as nominal, interval and five point Likert scale ranges from strongly agree to strongly disagree. The scales adopted were selected from previous studies related to smartphone and social media usage.

Application of Statistical Software and Tools: The primary data collected were subjected to data analysis and interpretation using JAMOV version 1.2.19 for discriminant validity and AMOS version 22.0 was applied to develop the structural equation model with maximum likelihood. The statistical tools such as, percentage analysis, test of normality, discriminant validity and structural equation model has been applied to explore the unidentified research phenomenon in the present study.

VII. DATA ANALYSIS AND RESULTS

The primary data collected were subjected to analysis using JAMOV Version 1.2.19 and AMOS Version 22.0. The statistical tools such as, percentage analysis, test of normality, discriminant validity has been applied to identify the structural influence of smart phone and internet usage on social media usage among the respondents.

Demographic Characteristics of the Respondents

The survey method was adopted to circulate structured questionnaire to the respondents. The college students residing in Chennai and using smart phone, internet and social media are considered to be the population for the study. The demographic profiles of the college youth such as gender, nature of family, monthly family income, survival without smart phone, source of internet, marital status has been collected, analyzed and tabulated in Table 1.

Table 1: Demographic Profiles of the Respondents

Demographic Profiles (N = 275)	Frequency	Percentage (%)
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Gender		
Male	153	55.64
Female	122	44.36
Nature of Family		
Joint Family	60	21.82
Nuclear Family	215	78.18
Monthly Family Income (In Rs.)		
Below 20K	145	52.73
Between 20K-40K	115	41.82
Above 40K	15	5.45
Are you Survive Without Smartphone and Social Media?		
Yes	163	59.27
No	112	40.73
Source of Internet		
Data Card	213	77.45
Wifi	62	22.55
Marital Status		
Single	261	94.90
Married	14	05.10

Source: Primary Data

Table 1 indicates that demographic characteristics of the respondents of the study selected through non-probability convenience sampling and they are subjected to percentage analysis to explore results. The result indicates that that majority of the respondents are males (55.64%), hailing from nuclear families (78.18%), singles (94.90%), using data card as a source for internet (77.45%) and opined that it's difficult to survive without smart phone and social media (59.27%) in their regular life. Majority of the respondents' monthly family income was less than Rs. 20, 000 (52.73%).

VIII. EXPLORATORY FACTOR ANALYSIS

The exploratory factor analysis has been applied to twenty two smart phone and internet usage variables and eighteen social media usage variables to reduce them into meaningful and manageable factors. The Extraction Method of Principal Component Analysis and Rotation Method of Varimax with Kaiser Normalization have been applied to perform exploratory factor analysis in SPSS version 23.0. The results indicates that KMO measure of Sampling Adequacy Value of 0.962 and Chi-Square value of 1690.025 at degrees of freedom of 153 with P-Value of <0.001 in Barlett's Test of Sphericity proves that factor analysis can be applied for all the eighteen internet and smart phone usage variables. Three factors have been extracted out of eighteen variables and they explain 65.312% of the variance in the internet and smart phone usage variables. Thus, all the internet and smart phone usage variables have been reduced to four independent factors and the most dominant factor is Convenience (CF) followed by Demonstration Factor (DF), Experience Factor (EF) and Creativity Factor (CF) in their order of

dominance. Similarly, Second exploratory factor analysis has been applied to social media usage variables and results shows that KMO measure of Sampling Adequacy Value of 0.890 and Chi-Square value of 2673.839 at degrees of freedom of 231 with P-Value of <0.001 in Barlett's Test of Sphericity proves that factor analysis can be applied for all twenty-two social media usage variables. Three factors have been extracted out of eighteen variables and they explain 62.350% of the variance in the social media usage variables. Thus, all the social media usage variables have been reduced to three independent factors and the most dominant factor is followed by, Emotions Factor (EMF), Information Factor (IF) and Commitment Factor (CMF) in their order of dominance.

Table 2: Descriptive Statistics and Test of Normality

Constructs		Mean		Std. Deviation	Variance	Skewness	Kurtosis	Kolmogorov-Smirnov		Shapiro-Wilk		Internal Item Reliability	Consistency
		Statistic	Std. Error	Statistic	Statistic	Statistic (Std. Error = 0.147)	Statistic (Std. Error = 0.293)	Statistic (df = 275)	Sig.	Statistic (df = 275)	Sig.	Corrected Item-Total Correlation	Reliability
Smartphone Addiction	Internet												
	Convenience Factor (CF)	25.549	0.535	8.866	78.613	0.679	0.277	0.086	0.000	0.962	0.000	0.803	0.799
	Demonstration Factor (DF)	12.524	0.225	3.737	13.966	-0.044	-0.450	0.089	0.000	0.982	0.002	0.578	
	Experience Factor (EF)	11.204	0.252	4.174	17.418	0.255	-0.606	0.079	0.000	0.972	0.000	0.662	
	Creativity Factor (CRF)	16.858	0.421	6.978	48.691	0.524	-0.459	0.081	0.000	0.956	0.000	0.764	
Social Media Usage													
	Emotions Factor (EMF)	17.393	0.332	5.501	30.261	0.074	-0.516	0.052	0.065	0.988	0.019	0.765	0.789
	Commitment Factor (CMF)	12.996	0.292	4.834	23.369	0.359	-0.611	0.100	0.000	0.970	0.000	0.753	
	Information Factor (IF)	12.615	0.231	3.829	14.661	-0.147	-0.680	0.090	0.000	0.980	0.001	0.599	

Table 2 indicates that Smart Phone and Internet Usage factors namely, CF, EF and CRF have slight positive skewness whereas, DF have slight negative skewness. Kurtosis for Smart Phone and Internet Usage factors are less than 3 (< 3) proves that data have normal distribution in it. The mean values of CF, DF, EF and CRF are higher than the standard deviation proves there is robustness in the distribution. Social Media Usage factors namely, EMF and DEF have slight positive skewness whereas, IF have slight negative skewness. Kurtosis for Social Media Usage factors are less than 3 (< 3) proves that data have normal distribution in it. The mean values of EMF, CMF, IF are higher than the standard deviation proves there is robustness in the distribution.

IX. DEVELOPMENT OF STRUCTURAL EQUATION MODEL FOR SOCIAL MEDIA USAGE:

The structural equation model has been applied based on exploratory factor analysis to test the hypothesised model of the present study. The result indicates an acceptable overall model fit with all the fit indices. The calculated values are within the acceptable levels as recommended by previous research studies. The measurement model exhibited in this study is fairly good fit with the data collected from college students in the study area. The

psychometric properties of the model in terms of reliability, convergent validity and discriminant validity were explored. The results of confirmatory factor analysis, Reliability, Average Variance Extracted and Discriminant Validity were presented in Table 3 and Table 4.

Table 3: Results of Confirmatory Factor Analysis

Constructs	Std. Loadings	Item Reliability	Item delta	AVE	Construct Reliability (CR)
Social Media Usage (SOMU)					
EMF←SOMU	0.812	0.659	0.341	0.568	0.796
IF←SOMU	0.635	0.403	0.597		
CMF←SOMU	0.801	0.642	0.358		
Smartphone and Internet Usage (SMIU)					
CRF←SMIU	0.838	0.702	0.298	0.578	0.844
EF←SMIU	0.691	0.477	0.523		
DF←SMIU	0.641	0.411	0.589		
CF←SMIU	0.850	0.723	0.278		

Table 4: Reliability, Average Variance Extracted and Discriminant Validity

Construct	AVE	CR	Squared Inter-Item Correlation of other Construct	
			SOMU	SMIU
Social Media Usage (SOMU)	0.568	0.796	***	0.956
Smart Phone& Internet Usage (SMIU)	0.578	0.844	0.956	***

Table 3 and Table 4 indicate that intended latent construct was clearly represented by good convergent validity. Average Variance Explained for each construct is higher than the squared correlation between constructs, thus fulfilling the criteria. At the outset, the measurement model has goodness of fit, appropriate reliability, adequate convergent validity and discriminant validity for the data.

X. STRUCTURAL MODEL

The establishment of goodness of fit for the data supported to proceed for the test of hypothesised model for the study. Table 5 indicates the results pertaining to estimated path co-efficient of structural model.

Figure 1 – Structural Equation Model – Determinants of Social Media Usage of College Students

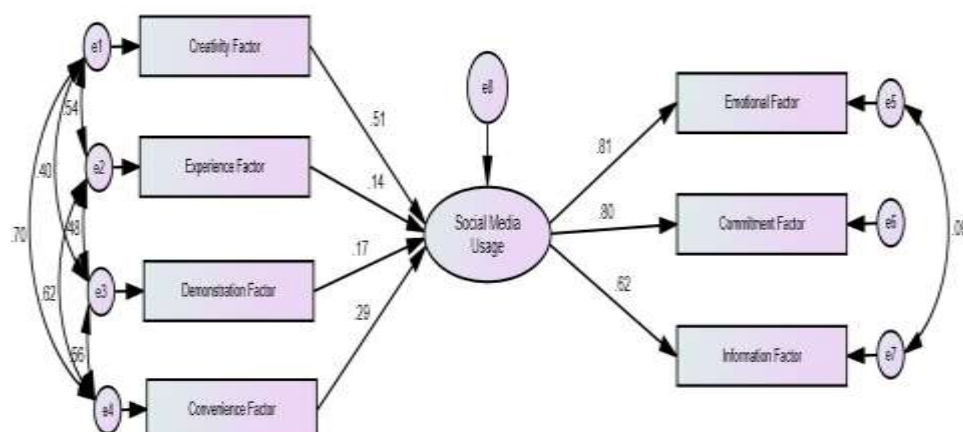


Table 5: Hypothesis Testing Results for the Structural Model

Hypothesis	Path	Un. Std. Estimate	Std. Estimates	S.E.	C.R.	P	Result
Social Media Usage							
H₁	Influence by Creativity Factor $SOMU \leftarrow CRF$	0.280	0.506	0.031	9.034	***	Significant Support
H₂	Influence by Experience Factor $SOMU \leftarrow EF$	0.132	0.143	0.046	2.882	.004	Significant Support
H₃	Influence by t Demonstration Factor $SOMU \leftarrow DF$	0.177	0.171	0.048	3.705	***	Significant Support
H₄	Influence by Creativity Factor $SOMU \leftarrow CF$	0.125	0.287	0.027	4.675	***	Significant Support
Emotions Factor							
	Influenced by Social Media Usage $EMF \leftarrow SOMU$	1.149	0.806	0.078	14.707	***	Significant Support

Hypothesis	Path	Un. Std. Estimate	Std. Estimates	S.E.	C.R.	P	Result
Information Factor Influenced by Social Media Usage Commitment Factor Influenced by Social Media Usage	$IF \leftarrow SOMU$	0.612	0.618	0.058	10.512	***	Significant Support
	$CMF \leftarrow SOMU$	1.000	0.799	***	***	***	Significant Support
Note: * at 5% Significant level; *** at 1% Significant level							
Overall Model Fit Measures	CMIN/df = 7.631/7 = 1.090; P-Value = 0.366; GFI = 0.992, AGFI = 0.968; NFI = 0.993; TLI = 0.998; CFI = 0.999; RMSEA = 0.018; P-CLOSE = 0.745; SRMR = 0.0156						
Recommended Thresholds Model Fit Measures	CMIN/df < 5 (Kline, R.B. 2005); P-Value > 0.05 (Hair., et. al., 2006); GFI & AGFI > 0.95 (Hair., et. al., 2006; Sharma et. al., 2005); NFI, TLI & CFI > 0.95 (Hu, L. T., & Bentler, P. M. 1999; Hair et. al., 2006; Bonett, D. G. 1980; McDonald, R. P., & Ho, M. H. R. 2002) RMSEA & SRMR < 0.08 (MacCallum et. al., 1996; Hair., et. al., 2006); P-CLOSE > 0.05 (Hair., et. al., 2006)						

Table 5 and Figure 1 reveal the results of the four hypotheses developed for the study. The path coefficients for all the four hypotheses were supported in the present study. The smart phone and internet usage variables such as, creativity factor, experience factor, demonstration factor and convenience factor have significant and positive influence on the social media usage factors simultaneously. The smart phone and internet usage acts as an antecedent for the social media usage of college students in the study area. The creativity factor, experience factor, demonstration factor and convenience factor have significant and positive influence on overall social media usage. The present study proves that smart phone and internet usage have significant and positive influence on the social media usage and vice-versa.

XI. PRACTICAL IMPLICATIONS

The present study aims to add knowledge to the existing body of knowledge on factors contributing the social media usage of college students and youth in Indian context. This study proves that college students of University of Madras affiliated college have higher usage and exposure to smart phone, internet and social media in their daily life. The college students opined that it's very difficult to survive in this world without smart phone, internet and social media networking sites for societal engagement. The results of the exploratory factor analysis proves that

four dimensions are the key factors of smart phone and internet usage namely, creativity factor, convenience factor, demonstration factor and experience factor whereas; social media usage has three dominant dimensions such as information factor, emotions factor and commitment factor. Therefore, college students' uses smart phone and internet due to convenience and experience gained for the usage in their early life. The college students are suggested to spend the quality time in the real world with their family, friends and peers rather than the unknown persons in the virtual world. The commitment factor of college students are on higher side to social media usage due to convenience and experience of smart phone usage. The users of smart phone, internet and social media must gain proper awareness on usage of social media for various privacy aspects to mitigate the data breach and data misuse. The major aim of this empirical study is to develop structural equation model on simultaneous influence of smart phone and internet factors on social media usage of college students in Chennai city of Tamil Nadu. The screening time of smart phone and social media usage should be reduced constantly and college students should use these modern devices for the purpose of enrichment in knowledge through various academic activities like, participation in webinar, seminars, lectures from subject experts etc., to overcome physical and mental illness caused due to higher usage of internet and smart phone (Senthil&Thangam., 2018). To conclude, life style change is the cause for higher penetration of smart phone and internet usage and social media usage in technological environment. The role of smart phone and internet in the life of college students is inevitable and unavoidable. The parents and teachers are suggested to educate the students on various consequences on smart phone, internet and social media usage to drive the youth force towards the path of excellence in future.

XII. LIMITATION AND FURTHER RESEARCH DIRECTIONS

The present study was limited to 275 samples of college students residing in Chennai city alone due to time and cost constraint. Hence, the findings of the study may not be generalised to overall population of the study. This research has adopted non-random convenience sampling technique to collect responses via online survey. So, limitations association with non-probability sampling and online survey are also applicable for the present study. The study was conducted to examine the perception of college students perusing their higher education in University of Madras, Chennai and its affiliated colleges alone and other educational institutions and cities may be yield different findings from the present study. This study can be further extended to adoption Technological Adoption Model (TAM) approach on social media adoption among college students to examine the role technology in their life. The comparative study can be conducted among students of government institutions and private institutions to explore the differences in usage pattern and engagement towards smart phone and social media networking sites. This study can be extended to other age groups such as, Baby Boomers, Generation Y and Generation Z to explore the influence of age in usage pattern of peoples in different socio-economic regions in India.

REFERENCES

1. Agostino, D., & Sidorova, Y. (2017). How social media reshapes action on distant customers: some empirical evidence. *Accounting, Auditing & Accountability Journal*, 30(4), 777–794. doi: 10.1108/AAAJ-07-2015-2136

2. Aharony, N. (2017). Factors affecting LIS Israeli students' mobile phone use: an exploratory study. *The Electronic Library*, 35(6), 1098–1121. doi:10.1108/el-06-2016-0131
3. Al-Mouh, N., & Al-Khalifa, H. S. (2015). The accessibility and usage of smartphones by Arab-speaking visually impaired people. *International Journal of Pervasive Computing and Communications*, 11(4), 418–435. doi:10.1108/ijpcc-09-2015-0033
4. Alshuaibi, M. S. I., Alshuaibi, A. S. I., Shamsudin, F. M., & Arshad, D. A. (2018). Use of social media, student engagement, and academic performance of business students in Malaysia. *International Journal of Educational Management*, 32(4), 625–640. doi: 10.1108/IJEM-08-2016-0182
5. Archana, G. & Balaji, P. (2019). Prevalence and Psychological Intervention of Internet and Smart Phone Addiction. *International Journal of Recent Technology and Engineering*, 8(4S4), 273–276. doi: 10.35940/ijrte.D1072.1284S419
6. Archana, G. & Balaji, P. (2019). Psychological Dependence on Social Media Usage of College Youth. *International Journal of Recent Technology and Engineering*, 8(4S4), 277–280. doi: 10.35940/ijrte.D1073.1284S419
7. Astrachan, J. B. (2011). Cell Phones and Electronic Devices in Maryland Courthouses. *SSRN Electronic Journal - Maryland Bar Journal*, 43(6), 20-25. doi:10.2139/ssrn.1934273
8. Balaji, P., & Jagadeesan, P. (2019). Imperativeness and Dimensions of Labour Welfare Measures for Employees' Fulfilment in Manufacturing Companies of Chennai. *Prabandhan: Indian Journal of Management*, 12(5), 35-46. doi: 10.17010/pijom/2019/v12i5/144277
9. Balaji, P., & Murthy, S.S. (2019). Web 2.0: An Evaluation of Social Media Networking Sites. *International Journal of Innovative Technology and Exploring Engineering*, 8 (10), pp. 752-759. Retrieved from <https://www.ijitee.org/wp-content/uploads/papers/v8i10/J88920881019.pdf>
10. Barbu, M. (2015). Reliable and accurate data capture using tablets, phones or other mobile devices. *Trials*, 16(S2), 29. doi:10.1186/1745-6215-16-s2-p29
11. Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588–606. doi:10.1037/0033-2909.88.3.588
12. Chad C. Tossell, Philip Kortum, Clayton Shepard, Ahmad Rahmati & Lin Zhong (2012) An empirical analysis of smartphone personalisation: measurement and user variability. *Behaviour & Information Technology*, 31:10, 995-1010, doi: 10.1080/0144929X.2012.687773
13. Choi, Y.-S. (2019). A Study on Mobile Phone Addiction and Physical Pain Based on Characteristics of Mobile Phone Usage. *Journal of Medical Imaging and Health Informatics*, 9(6), 1191–1195. doi:10.1166/jmihi.2019.2716
14. Chun, J. (2016). Effects of psychological problems, emotional dysregulation, and self-esteem on problematic Internet use among Korean adolescents. *Children and Youth Services Review*, 68, 187–192. doi:10.1016/j.childyouth.2016.07.005
15. Debasis Das, U A Lanjewar (2020). Effects of Smart Phone Usage and Its Addiction Among College Students in Nagpur City. *International Journal of Recent Technology and Engineering*. 8(5), 274–276. doi:10.35940/ijrte.d9902.018520
16. Evans, O. (2019). Repositioning for Increased Digital Dividends: Internet Usage and Economic Well-being in Sub-Saharan Africa. *Journal of Global Information Technology Management*, 22(1), 47–70. doi:10.1080/1097198x.2019.1567218

17. Georgina MakuCobla, Eric Osei-Assibey, (2018) Mobile money adoption and spending behaviour: the case of students in Ghana. *International Journal of Social Economics*, 45(1). 29-42. doi: 10.1108/IJSE-11-2016-0302
18. Ghosh, I. and Singh, V. (2018). Phones, privacy, and predictions: A study of phone logged data to predict privacy attitudes of individuals. *Online Information Review*, Vol. ahead-of-print No. ahead-of-print. doi: 10.1108/OIR-03-2018-0112
19. Gul, S., &Bano, S. (2019). Smart libraries: an emerging and innovative technological habitat of 21st century. *The Electronic Library*, 37(5), 764–783. doi:10.1108/el-02-2019-0052
20. Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., &Tatham, R. L. (2006). Multivariate data analysis (Vol. 6): *Pearson Prentice Hall Upper Saddle River*.
21. Haverila, M. (2011). Behavioral aspects of cell phone usage among youth: an exploratory study. *Young Consumers*, 12(4), 310–325. doi:10.1108/17473611111185869.
22. Helal, G., Ozuem, W., & Lancaster, G. (2018). Social media brand perceptions of millennials. *International Journal of Retail & Distribution Management*, 46(10), 977–998. doi:10.1108/ijrdm-03-2018-0066
23. Hu, L., &Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. doi:10.1080/10705519909540118
24. ImtiazArifWajeehaAslam Muhammad Ali. (2016). Students' dependence on smartphones and its effect on purchasing behaviour. *South Asian Journal of Global Business Research*, 5(2), 285–302. doi: 10.1108/SAJGBR-05-2014-0031.
25. Jagadeesan, P., &Balaji, P. (2017). Hair Care Product Usage Purposes and Brand Predilection of Male Consumers. *Indian Journal of Public Health Research & Development*, 8(4), 367-371. doi: 10.5958/0976-5506.2017.00371.0
26. Jeong, S.-H., Kim, H., Yum, J.-Y., & Hwang, Y. (2016). What type of content are smartphone users addicted to?: SNS vs. games. *Computers in Human Behavior*, 54, 10–17. doi:10.1016/j.chb.2015.07.035.
27. Jiang, Z., & Zhao, X. (2016). Self-control and problematic mobile phone use in Chinese college students: the mediating role of mobile phone use patterns. *BMC Psychiatry*, 16(1). doi:10.1186/s12888-016-1131-z
28. Khang, H., Kim, J. K., & Kim, Y. (2013). Self-traits and motivations as antecedents of digital media flow and addiction: The Internet, mobile phones, and video games. *Computers in Human Behavior*, 29(6), 2416-2424. doi:10.1016/j.chb.2013.05.027
29. Kim, Y., Briley, D. A., &Ocepek, M. G. (2015). Differential innovation of smartphone and application use by sociodemographics and personality. *Computers in Human Behavior*, 44, 141–147. doi:10.1016/j.chb.2014.11.059.
30. Kline, R. B. (2015). Principles and practice of structural equation modeling. *Guilford publications*.
31. Ko, C.-H., Yen, J.-Y., Yen, C.-F., Chen, C.-S., & Chen, C.-C. (2012). The association between Internet addiction and psychiatric disorder: A review of the literature. *European Psychiatry*, 27(1), 1–8. doi:10.1016/j.eurpsy.2010.04.011.

32. Kumar, B. I. D., &Vasanth, G. (2017). Smart billing system framework for economic internet connectivity. *2017 International Conference On Smart Technologies For Smart Nation (SmartTechCon)*. doi:10.1109/smarttechcon.2017.8358622
33. Kunda, D., &Chishimba, M. (2018). A Survey of Android Mobile Phone Authentication Schemes. *Mobile Networks and Applications*. doi:10.1007/s11036-018-1099-7
34. Kwak, B., &Eom, W. (2012). Use of Smart Phone by College Students and Their Perception on Smart Phone-based Learning Management System. *The Journal of Social Sciences*, 31(1), 7. doi:10.18284/jss.2012.06.31.1.7
35. MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130–149. doi:10.1037/1082-989x.1.2.130
36. Manickam, S. A., V, M., &Heggde, G. (2019). Investigating the relationship between Age and Smart Phone Usage Patterns: Evidences from Indian Smart phone Users. *International Journal of Business Excellence*, 1(1), 1. doi:10.1504/ijbex.2019.10024144
37. McDonald, R. P., &Ho, M.-H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods*, 7(1), 64–82. doi:10.1037/1082-989x.7.1.64
38. Merlo, L. J., Stone, A. M., &Bibbey, A. (2013). Measuring Problematic Mobile Phone Use: Development and Preliminary Psychometric Properties of the PUMP Scale. *Journal of Addiction*, 2013, 1–7. doi:10.1155/2013/912807.
39. MohdSuki, N., &MohdSuki, N. (2013). Dependency on Smartphones: An Analysis of Structural Equation Modelling. *JurnalTeknologi*, 62(1), 49-55. doi:10.11113/jt.v62.1281.
40. Nguyen, M. T., Nguyen, P. T. N., & Nguyen, T. T. H. (2017). The Relationship Between Smart Phone Usage And Sleep Disturbances And Psychological Disstress Among Students. *Journal of Medicine and Pharmacy*, 125–130. doi:10.34071/jmp.2017.4.19
41. Nowrin, S., &Bawden, D. (2018). Information security behaviour of smartphone users. *Information and Learning Science*, 119(7/8), 444–455. doi:10.1108/ils-04-2018-0029.
42. Oulasvirta, A., Rattenbury, T., Ma, L., &Raita, E. (2011). Habits make smartphone use more pervasive. *Personal and Ubiquitous Computing*, 16(1), 105–114. doi:10.1007/s00779-011-0412-2.
43. Pattanaik, P. (2019). Consumer Usage of Smart Phone in India-The Impact of Demographic Profile. *Journal of Advanced Research in Dynamical and Control Systems*, 11(10s), 364–368. doi:10.5373/jardcs/v11sp10/20192814
44. Roldán, Á. (2016). 2ª jornada de la Fundación Lilly sobrepublicaciónmédica en España (Hotel EuroForum, El Escorial, Madrid, 20 de noviembre de 2006). *El Profesional de La Información*, 16(1), 78. doi:10.3145/epi.2007.ene.09
45. Sasikumar, S and Balaji, P. (2020). Smart Phone, Internet and Social Media Usage of CollegeStudents: A Cyber Psychology Study. *International Journal of Advanced Science and Technology*, 29(8s), 941 - 949. Retrieved from <http://sersc.org/journals/index.php/IJAST/article/view/10861>
46. Sasikumar, S., &Balaji, P. (2020). Perception Of Students Towards Cost-Free Welfare Schemes In School Education—A Study With Special Reference To Government Schools Of Tamil Nadu. *International Journal of Management (IJM)*, 11(3), 511-518. doi: 10.34218/IJM.11.3.2020.054

47. Senthil, P., &Thangam, M. A. (2018). Smart Mobile Phone Usage Restriction by Extending Phone Circuitry — An Alternative to Jamming. 2018 International Seminar on Intelligent Technology and Its Applications (ISITIA). doi:10.1109/isitia.2018.8711028
48. Shantharam, B. B., Balaji, P., &Jagadeesan, P. (2019). Impact of Customer Commitment in Social Media Marketing on Purchase Decision—An Empirical Examination. *Journal of Management (JOM)*, 6(2). 320-326.doi:10.34218/jom.6.2.2019.036.
49. Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models. *Journal of Business Research*, 58(7), 935–943. doi:10.1016/j.jbusres.2003.10.007
50. Shin, Y., & Lee, B. (2015). On-off line interpersonal relationship among subgroups of College students Smartphone Addiction. *Forum For Youth Culture*, 44, 67. doi:10.17854/ffyc.2015.10.44.67
51. Smith, S. D., Salaway, G., & Caruso, J. B. (2009). The ECAR study of undergraduate students and information technology. *Educause*, 1-15. Retrieved from <http://www.csplacement.com/downloads/ECAR-ITSkliisstudy.pdf>
52. Suresh. M, Balaji, P &Rameshkumar. P.M. (2020). Dominant Groups and Differences in Smart Phone and Internet Usage: A Discriminant Analysis Approach. *International Journal of Management*. 11 (4). 305-311.doi: 10.34218/IJM.11.4.2020.031
53. Tamil Selvi, R and Balaji, P. (2019). The Key Determinants of Behavioural Intention Towards Mobile Banking Adoption. *International Journal of Innovative Technology and Exploring Engineering*, 8(10), 1124–1130. doi:10.35940/ijitee.j8891.0881019
54. Tian, L., Shi, J., & Yang, Z. (2009). Why does half the world's population have a mobile phone? An examination of consumers' attitudes toward mobile phones. *Cyber Psychology &Behavior*, 12(5), 513-516.doi: 10.1089/cpb.2008.0335
55. Young, K. S. (1996). Psychology of Computer Use: XL. Addictive Use of the Internet: A Case That Breaks the Stereotype. *Psychological Reports*, 79(3), 899–902. doi:10.2466/pr0.1996.79.3.899
56. Young, K. S. (1998). Internet Addiction: The Emergence of a New Clinical Disorder. *Cyber Psychology &Behavior*, 1(3), 237–244. doi:10.1089/cpb.1998.1.237.