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# **A STRUCTURAL EQUATION MODELING OF UNIVERSITY STUDENTS' SMARTPHONE DEPENDENCE IN AN EMERGING COUNTRY**

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## **Abstract**

Smartphone dependence has been emerged as a crucial concern especially for young consumers along with rapid technological advances over the past decades. Better understanding the determinants of smartphone dependence on young consumers may be valuable to decrease compulsive smartphone use in the future. The main objective of this study is to examine the association between smartphone dependence and product features, brand name, product price, social influence and social needs using a Structural Equation Modeling (SEM). For this purpose, a well-established survey was conducted to 411 university students in a north-eastern university of Turkey. The empirical evidence of the present study reveals that there exists a positive relationship between smartphone dependence and social influence and social needs. Results also suggest that product price has a negative impact on smartphone dependence. This study is most probably the first attempt to examine factors affecting smartphone dependence in this specific sample. The results of this study may add value to explain the key drivers of problematic smartphone use in emerging countries.

Keywords: smartphone, dependence, structural equation modeling, social influence, social needs, Turkey

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## **Introduction**

Along with rapid technological advances over the past two decades, smartphones are adopted as the indispensable part of people's lives in all age groups while a majority of them carry smartphones all the time (Lee et al., 2014; Smura et al., 2009; Suki, 2013a, 2013b; Tian et al., 2009). Smartphones provide their users to connect a constant internet connection, to find information, to connect with others, to manage their everyday lives, to have fun, to relieve stress, and a variety of other functionalities (Lee et al., 2014; Suki, 2013a; Park et al., 2013). The number of smartphone users has been gradually increased worldwide by the courtesy of the recent developments in new operating systems, numerous applications, and competition between vendors (Park et al., 2013). According the latest forecasts (Statista, 2015), the number of smartphone users worldwide is expected to be almost 2.16 and 2.56 billion people in 2016 and 2018, respectively. The telecommunication sector has the largest share in the electronic devices market in Turkey along with the high demand to smartphones. Numerically, the telecommunication sector has shown an almost 31% growth in the second quarter of 2015 with respect to the same quarter in 2014, while the market share of 4G supporting smartphones increases up to 50% (GfK, 2015; Çelik et al., 2015).

A recent comprehensive survey in the US colleges reveals that the ownership of smartphones among undergraduate students was 86% in 2014 up from 76% since the previous year and at much higher rates than the general adult population (Dahlstrom and Brooks, 2014; Çelik et al., 2015). Furthermore, most recent consumer surveys (Deloitte, 2014a, 2014b) confirm that 18 – 24 years age-group has the highest penetration in terms of smartphone ownership with 85% in Finland and the UK. Similarly, the results of Deloitte's Turkish Mobile Consumption Survey, 2013 highlight that smartphone use is the highest among 25 – 34 age group with 73% in 2013 (Deloitte, 2013; Çelik et al., 2015). Not surprisingly, smartphone brand has an important role on younger consumers' rapid smartphone penetration and preference, since consumers' perception of brand image dramatically influences their purchase behaviour in the marketplace (Ataman and Ülengin, 2003).

Smartphone use can be dramatically associated with negative behavioural aspects (Haverila, 2011), namely, smartphone dependency. Smartphones are widely considered as the major information technology devices and overdependence on smartphone may lead to compulsive usage (Lee et al., 2014). Particularly, social influences and social needs (Suki, 2013b; Arif and Aslam, 2014), social networking (Salehan and Negahban, 2013; Jeong et al., 2016), perceived enjoyment, satisfaction

with smartphones and personal innovativeness (Park and Lee, 2011), and future purchase behaviour (Ding et al., 2011; Arif and Aslam, 2014) were all found as the main determinants of smartphone dependency. This paper aims to examine smartphone dependence on young consumers with an emphasis on undergraduate students. The remainder of the paper is as the following. The next section gives information about the data. Results section introduces the analysis results in line with previous studies. The paper concludes with recommendation for future studies and policies.

### **Materials and Methods**

The main objective of this paper is to examine factors that may moderate university students' dependence on smartphones. University students are more likely to have a product demand that increases their quality of life and their choices are generally more concentrated on products with technological advances over the past decades. This paper utilized the data obtained from a written-questionnaire administered among 411 university students (between November and December, 2014) studying at Ardahan University in the north-eastern Turkey. Established in 2008, Ardahan University is a very young university and as far as is known, no studies have been carried out in this specific sample. According to the Turkish Council of Higher Education statistics, the number of students studying in vocational schools and faculties at Ardahan University was 7,428 during the sample period (Turkish Council of Higher Education, 2015). The data were obtained using a stratified sampling method to keep the level of representation both proportional and as high as possible, while 411 completed and usable questionnaires (response rate was almost 91%) exceed the number of minimum sample size, which is calculated as 349 with a 5% tolerance, and at 95% confidence level. See Yamane (1967) for details about the calculation of the minimum sample size for such a sampling method. The questionnaire had two main sections. First section involves questions about students' demographic and socio-economic characteristics. Following earlier research (Suki, 2013a, 2013b), second section involves specific questions about product features, product name, product price, social influence, social needs, and smartphone dependency.

### **Results**

Table 1 presents descriptive statistics on respondents' demographic, socio-economic and other characteristics. As shown in Table 1, almost half of the respondents (50.12%) were men, while a majority of them (84.7%) were aged between 18 and 22 years. More than 70% of the respondents (72.7%) were studying at the Faculty of Economics and Administrative Sciences, while more than 40% of them (40.9%) were

sophomores. Almost 44% of the respondents (43.6%) had less than 300 Turkish liras (TL) individual income, while almost half of them had monthly household income between 801 and 1600 TL. Price of smartphone was less than 400 TL for almost 37% of the respondents (37.2%). Brand names are anonymised in this study for privacy reasons. More than 40% of the respondents were using Brand B. Finally, 27% of the respondents were spending between one and two hour(s) daily on smartphone.

Table 1: Descriptive statistics

Variable	Frequency (%)
Gender	
Male	206 (50.12)
Female	205 (49.88)
Age group	
18 – 22	348 (84.7)
23 – 27	51 (12.4)
>27	12 (2.9)
Faculty/Vocational School	
Physical education and sports	24 (5.8)
Economics and administrative sciences	299 (72.7)
Vocational school	88 (21.5)
Class standing	
Freshman	110 (26.8)
Sophomore	168 (40.9)
Junior	91 (22.1)
Senior/Super senior	42 (10.2)
Monthly individual income	
<300 TL	179 (43.6)
301 – 600 TL	108 (26.3)
601 – 900 TL	29 (7.1)
>900 TL	20 (4.8)
Monthly household income	
<800 TL	27 (6.6)
801 – 1600 TL	202 (49.1)
1601 – 2400 TL	55 (13.4)
2401 – 3200 TL	47 (11.4)
>3200 TL	31 (7.5)
Price of smartphone	
<400 TL	153 (37.2)
401 – 800 TL	117 (28.5)
801 – 1200 TL	41 (10.0)
1201 – 1600 TL	24 (5.8)

1601 – 2000 TL	16 (3.9)
>2000 TL	18 (4.4)
Brand name	
Brand A	33 (8.0)
Brand B	175 (42.6)
Brand C	54 (13.1)
Other brand	95 (23.1)
Time spent on smartphone within 24 hours	
Less than an hour	96 (23.4)
1 – 2 hour(s)	111 (27.0)
2 – 3 hours	54 (13.1)
3 – 4 hours	21 (5.1)
4 – 5 hours	20 (4.9)
More than 5 hours	59 (14.4)

Some percentages may not be aggregated as 100% due to missing values.

This paper aims to determine the impact of product features, brand name, product price, social influence, and social needs on university students' smartphone dependence. For this purpose, Figure 1 depicts the research model to be used for the present study. The hypotheses of this study were as the following:

H1: Product features significantly affect university students' smartphone dependence

H2: Brand name significantly affects university students' smartphone dependence

H3: Product price significantly affects university students' smartphone dependence

H4: Social influence significantly affects university students' smartphone dependence

H5: Social needs significantly affect university students' smartphone dependence

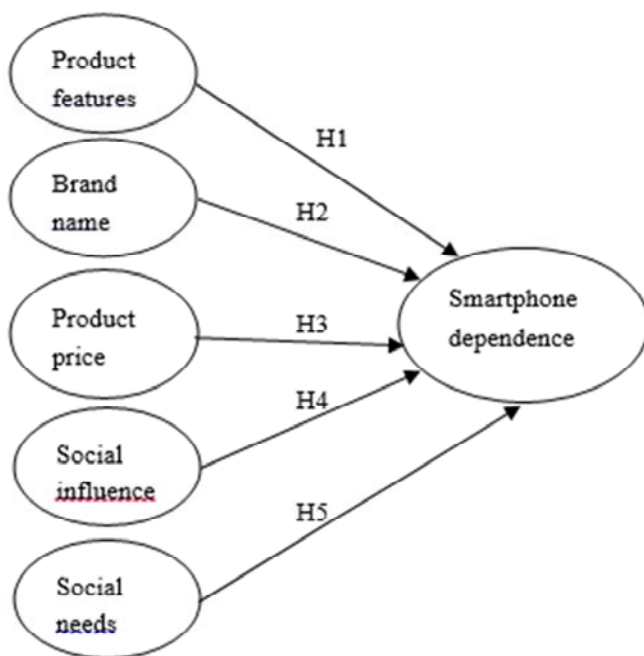


Figure 1: Research model

The SEM was performed to test the underlying hypotheses using SPSS AMOS 20.0 computer program. Table 2 presents the output of reliability and validity analyses of the model. As shown in Table 2, all cut off and threshold values exceed the recommended value of 0.50 by Hair Jr. et al. (2006).



**Table 2: Reliability and validity analysis**

Constructs	Items	Standardized Loadings	Cronbach's $\alpha$
Product features	PF1	0.689	0.753
	PF2	0.751	
	PF3	0.555	
	PF4	0.715	
	PF5	0.616	
Brand name	BN1	0.490	0.620
	BN2	0.829	
	BN3	0.760	
Product price	PR1	0.673	0.519
	PR2	0.665	
	PR3	0.740	
Social influence	SI1	0.781	0.743
	SI2	0.782	
	SI3	0.730	
Social needs	SN1	0.694	0.792
	SN2	0.727	
	SN3	0.771	
	SN4	0.740	
Smartphone dependence	DP1	0.847	0.822
	DP2	0.828	
	DP3	0.830	
	DP4	0.730	

**Table 3: Inter-construct correlations**

Variables	1	2	3	4	5	6
1 Product Features	1					
2 Brand name	0.407**	1				
3 Product price	0.199**	0.172**	1			
4 Social influence	0.276**	0.222**	0.187**	1		
5 Social needs	0.470**	0.337**	0.218**	0.404**	1	
6 Smartphone dependence	0.267**	0.217**	-0.33**	0.450**	0.425**	1
Mean	3.70	3.64	3.24	2.56	3.36	2.51
Std. Dev.	0.94	1.00	1.05	1.18	1.14	1.17

**\*\*Correlation is significant at the 0.01 level**

As shown in Table 3, social influence ( $r = .450, p < .001$ ) and social needs ( $r = .425, p < .001$ ) had the highest relationship with university students' smartphone dependence. The structural model in the SEM was evaluated by examining fit indices and variance explained estimates. A variety of indices were used to assess the model's overall fit in Table 4. The results indicated that the chi-square of the model was 282.28 with 130 of freedom ( $\chi^2/df = 2.171$ ) and root mean square error of approximation (RMSEA) of 0.053. Table 4 also confirms that the model fits well with respect to the corresponding goodness-of-fit indices for structural model.

**Table 4: Goodness-of-fit indices for structural model**

Indices	Recommended Values	Model Values
$\chi^2$	n/a	282.28
Df	n/a	130
$\chi^2/df$	<3.0	2.171
CFI	>0.9	0.960
GFI	>0.9	0.930
NFI	>0.9	0.930
RMSEA	<0.08	0.053
PNFI	>0.5	0.790
AGFI	>0.9	0.910

Table 5 and Figure 2 present the analysis results to determine potential factors influencing university students' smartphone dependence. Accordingly, social influence ( $\beta = .449, p < .005$ ) had the highest impact on university students' smartphone dependence and therefore H4 was accepted. Another influencing factor of smartphone dependence was social needs ( $\beta = .411, p < .005$ ) and H5 was also accepted. On the other hand, product price had a negative impact on smartphone dependence ( $\beta = -.229, p < .005$ ), while H3 was accepted. However, H1 and H2 were rejected while betas for both product features and product name were not statistically significant at the 0.05 level.

Table 5: Relationship with smartphone dependence

	Estimate	SE	CR	P
Product features → Smartphone dependence	0.024	0.07	0.37	0.714
Brand name → Smartphone dependence	0.063	0.06	1.03	0.305
Product price → Smartphone dependence	-0.229*	0.07	-3.10	0.002
Social influence → Smartphone dependence	0.449*	0.07	6.92	0.000
Social needs → Smartphone dependence	0.411*	0.07	5.66	0.000

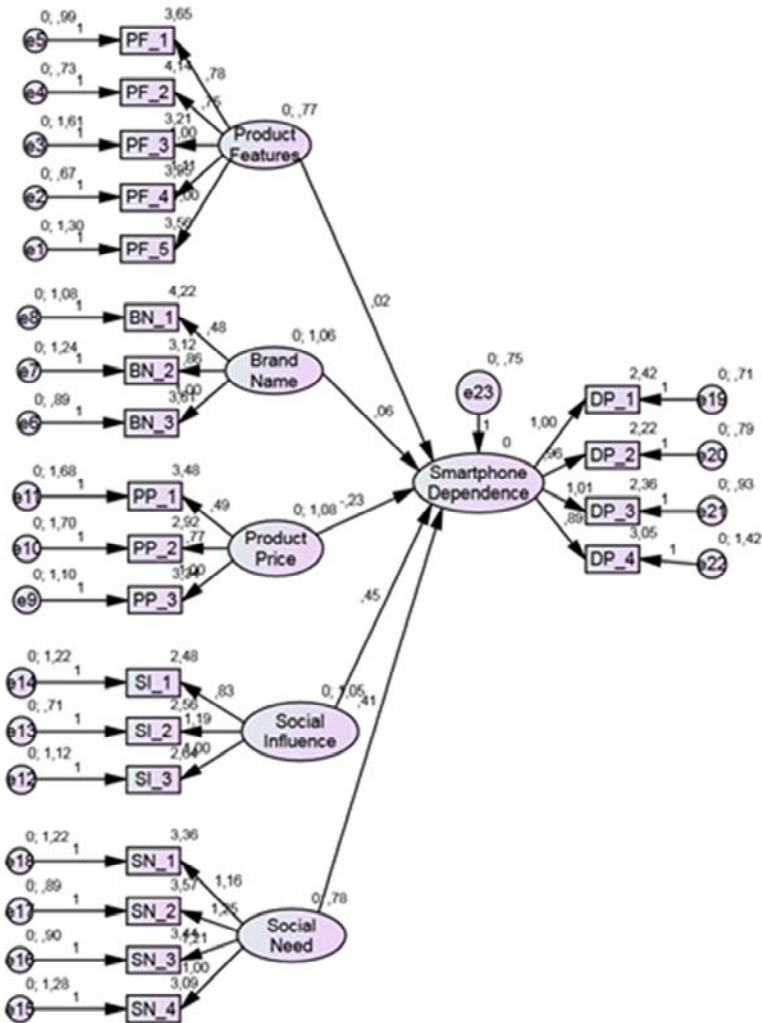


Figure 2: The results of the structural model

## **Conclusion**

Smartphone dependence on young consumers has been a crucial concern over the past decades along with rapid advances on information and communication technologies. Due to their compulsive use, university students are more likely to encounter with such a serious issue. In this manner, examining potential factors of smartphone dependence on university students will without doubt give a valuable information on decreasing smartphone dependence. The main purpose of this paper was to determine factors that may influence smartphone dependence in an emerging country. For this purpose, emphasis was placed on university students studying in a north-eastern university of Turkey where as far as is known no studies have highlighted smartphone dependence issue on university students. A SEM was performed to seek the association between smartphone dependence and product features, brand name, product price, social influence and social needs. As a result, social influence, social needs and product price were found to be significantly associated with university students' smartphone dependence. The results of this study show consistency with many earlier studies (Suki, 2013a, 2013b; Arif and Aslam, 2014).

Results reveal that social influence was significantly associated with smartphone dependence. Individuals are generally not conscious about social influence. Earlier research (Ding et al., 2011) suggests that family members and friends encourage young consumers to use smartphone that may also lead to smartphone dependence. Social needs were also found as an increasing factor of smartphone dependence. Young consumers are more likely to communicate with other people and along with the multifunctional feature of smartphones, they are one of the most convenient tools to satisfy their communication needs. Product price was found to have a negative effect on smartphone dependence. Not surprisingly, product price differentiation may be an important component of smartphone purchase behaviour for consumers with generally limited budgets such as university students. Consumers with high price consciousness are less likely to pay higher prices (Suki, 2013a, 2013b).

Further studies on smartphone dependence may provide valuable information for both future marketing strategies and better understanding the possible reasons of compulsive smartphone use. Future studies may be also beneficial to enable benchmarking opportunities of past and present research. Moreover, a comparison of SEM with other statistical methods such as discrete choice models may be encouraged to determine the best fit to explain smartphone dependence. For instance, a comparison of both ordered and unordered response models such as

alternative ordered response models among multinomial and mixed logit models may explain heterogeneity of consumer behaviour on smartphone use and dependence.

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