TECHNOLOGY READINESS FOR NEW TECHNOLOGIES: AN EMPIRICAL STUDY

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Abstract

In this study, the researchers examined the relationship among factors of technological readiness, departments and class levels of undergraduate student. Technology reading index scale was adapted from Parasuraman (2000). This study was based on empirical investigation of 891 undergraduate students of Faculty of Economics and Administrative Sciences and Engineering of Aksaray University in Turkey. Chi-square analysis, independent sample t-test and analysis of variance (ANOVA) procedures were used to test the hypotheses. Findings of the study indicated that there was a significant difference in the scores between two undergraduate student groups (computers weighted departments vs. not computers weighted departments) for DIS and INS. Similarly, there was a significant difference in the scores in terms of gender for only the two factors. There was female scoring higher than male scoring. The subscales of technology reading index were different according to student's departments and class levels. The study was discussed implications of the findings and directions for future research.

Keywords: Optimism, Innovativeness, Insecurity, Discomfort, Internet usage, Technology Reading Index.

1. Introduction

Technology is defined in different ways. Generally, it is "the collection of techniques, skills, methods and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation" (https://en.wikipedia.org/wiki/Technology). Usage of information and communication technology increase on both developing and developed countries and the situation has affected the process of teaching, learning, research, and searching for information (Partala and Saari, 2015; Kumar, 2012). Technology is important in terms of both people and organizations because new technology improve efficiency and effectiveness (Partala and Saari, 2015). However, new technology-based products and services immediately not embrace and adopt by people. The reason for this is people's beliefs and attitudes. As regards technology, there are two beliefs including people's positive and negative beliefs. The beliefs are different according to individuals.

The technology readiness index (TRI) was developed to measure people's general beliefs as regards technology by Parasuraman (2000). The construct was comprised four dimensions such as optimism, innovativeness, discomfort and insecurity. The dimensions affect people's tendency to embrace and use new technologies.

Our goal is to determine differences among departments and class levels of undergraduate student as well as genders towards new technology.

2. Literature

In current literature related to new technologies and people-technology interactions suggest that consumers have simultaneously two different views (favorable and unfavorable) in terms of technology based product and services (Parasuraman, 2000).

Technology readiness is defined as "people's propensity to embrace and use technologies for accomplishing goals in home life and at work" (Parasuraman, 2000, p. 308). It is a combination of both positive and negative feelings of individuals about new technological product and services. The dimensions of TRI are defined as (Parasuraman, 2000, p.311):

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- OPT: "A positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives".
- INN: "A tendency to be a technology pioneer and thought leader".
- DIS: "A perceived lack of control over technology and feeling of being overwhelmed by it".
- INS: "Distrust of technology and skepticism about its ability to work properly".

OPT and INN is drivers of TRI. However, others are inhibitors of technology readiness.

A number of studies have been carried out variables such as age (Venkatesh et. al., 2003), culture (Srite and Karahanna, 2006; Singh, 2006, Elliot et. al., 2008), user experience (Partala and Saari, 2015) on new/high technology. Kumar (2012) found that no significant differences between rural and urban students for use of computer and internet, usage patterns of OPAC and the ease of OPAC use and their expectations from OPAC. A study was conducted to test the relationship between technology acceptance model (TAM) and TRI by Godoe and Johansen (2012). They found that OPT and INN significantly influences perceived usefulness and perceived ease of use and perceived usefulness has a significant positive influence on actual usage. Similarly, Tsourela and Roumeliotis (2015) investigated the moderating role of technology readiness, gender and age in acceptance and actual use of technology based services. They found that the variables are the effects of the determinants on behavioral intention and actual use exist.

Technology readiness index construct has examined in terms of many different perspectives. One from these perspectives is demographic characteristics. INN and INS dimensions of TRI were different in terms of gender (Demirci and Ersoy, 2008; Lee et al., 2010). With regards to age, INS and DIS dimensions were found to be different (Demirci and Ersoy, 2008; Lee et al., 2010). Dimensions of TRI was not statistically different in terms of educational level and average income (Demirci and Ersoy, 2008; see Lee et al., 2010 for technology innovativeness). Other is cross-cultural validity of technology readiness index (Meng et. al, 2010). Many studies have been carried out to test relationships between technology readiness and different variables such as cosmopolitanism, global identification, promotion focus, prevention focus (Westjohn et al., 2009)

H₁: There is difference between male and female in terms of purchasing items through the internet.

H₂: There is difference between male and female in terms of internet using skills.

H₃: There is difference between male and female in terms of frequency of purchases on internet.

H₄: There is difference among different department of students in terms of technology reading; (a) OPT b) INN c) DIS d) INS

H₅: There is difference among different class level of students in terms of technology reading; (a) OPT b) INN c) DIS d) INS

H₆: There is difference between female and male in terms of technology reading; (a) OPT b) INN c) DIS d) INS

H₇: There is difference between students who studied on computers weighted section with those who not studied in terms of technology reading; (a) OPT b) INN c) DIS d) INS

3. Research Method

This study was carried out between dates of December 2015 and February 2016. The data of the study have been collected by web-based and traditional survey methods. To test the hypothesis, a sample of 924 Turkish students Faculty of Economics and Administrative Sciences (Management Information System, Business Administration, Economics, Political Science and Public Administration and Public Finance Departments), Faculty of Education (Computer Education and Instructional Technology Department) and Faculty of Engineering (Electrical and Electronics Engineering and Industrial Engineering Departments) of Aksaray University were completed the survey.

Technology reading index scale adapted from Parasuraman (2000) of the survey consisted of 36 items and 4 subscales in which participants indicate their level of agreement with each technology statement on a Likert scale of 1 (strongly disagree) to 5 (strongly agree), The 4 subscales are optimism (10 items), innovativeness (7 items), discomfort (10 items), and insecurity (9 items). All analyzes were made according to 891 usable data.

4. Data Analysis and Results

4.1. Primary Analysis

Demographic features of participants are reported in Table 1. Of the 891 survey participants, 55% were females. %71 of sample was between 20 and 29 age. With respect to class level, 41% were first class, 20% were second and third class and 19% were fourth class. 32% of respondents reported department business administration. In terms of monthly average household income, 30% were between 1001 and 2000 TL.

Table 1: Sample Characteristics

Sample Characteristic	Items	Freguency	Percentage (%)
Gender	Female	488	55
	Male	403	45
Age	19/-	259	29
	20-29	632	71
Class	1	371	41
	2	177	20
	3	176	20
	4	167	19
Department	Computer Education and Instructional Technology(CEIT)	49	6
	Electrical and Electronics Engineering(EEE)	101	11
	Industrial Engineering(IE)	101	11
	Economics(ECON)	50	6
	Business Administration(BA)	281	32
	Public Finance(PF)	19	2
	Politics and Public Administration(PPA)	82	9
	Management Information Systems(MIS)	208	23
Income	749 /- TL	158	18
	750- 1000 TL	181	20
	1001-2000 TL	268	30
	2001-3000 TL	166	19
	3001-4000 TL	51	6
	4001-5000 TL	29	4
	5001 TL and over	24	3

In this research, Cronbach's Alpha was used to access the internal consistency reliability. Individual reliabilities for components of the scale are provided in the Table 2. As seen Table 2, Cronbach Alpha (α) of all the subscales were greater than 0.60 (Bagozzi and Yi, 1988, Hair et al., 1998). Thus was supported internal consistency of the subscales.

Table 2: Cronbach Alpha Value of Technology Reading Index Subscales

Factors	Total items	Cronbach Alpha
Optimism (OPT)	10 items	0,937
Innovativeness (INN)	7items	0,814
Discomfort (DIS)	10 items	0,887
Insecurity (INS)	9 items	0,906

4.2. General Statistics

Male and female participants reported to the Internet usage purpose. As shown Table 3, male respondents use Internet mostly for information search and entertainment. As to female respondents, they use mostly information search and social networking.

Table 3: Purpose of the Internet Using

Items	Male		Female		Total
	Frequency	%	Frequency	%	
Information Search	31	7,7	64	13,1	105
Social networking	26	6,5	63	12,9	89
Browsing	17	4,2	31	6,4	48
Entertainment	29	7,2	22	4,5	51
Chat	7	,7	12	2,5	19
Information Search, Social Networking and Entertainment	4	1	11	2,3	15
Information Search, E-mails, Chatting, Entertainment, Buying, Banking, Social networking, Product Search and Browsing	21	5,2	7	1,4	28

Table 4: Using Internet Mostly

Items	Male		Female		Total
	Frequency	**%**	**Frequency**	**%**	
Mobil Devices	87	21,6	207	42,4	294
Home and Mobile Devices	116	28,8	76	15,6	192
Home	77	19,1	93	19,1	170
Home, School and Mobile Devices	61	15,1	52	10,7	113

As shown Table 4, approximately 50% of male respondents said they used mostly Internet both mobile devices and home/mobile devices. For female respondents, the ratio was 58%.

Table 5: Actively Using the Internet

Items	Male		Female		Total
	Frequency	**%**	**Frequency**	**%**	
Less than 3 months	30	7,4	65	13,3	95
3-6 months	16	4	25	5,1	41
7-12 months	11	2,7	18	3,7	29
1-2 years	19	4,7	44	9	63
3-4 years	49	12,2	83	17	132
5-6 years	74	18,4	93	19,1	167
More than 6 years	203	50,4	159	32,6	362
Do not use at all	1	0,2	1	0,2	2

As seen Table 5, approximately 70% of the male samples have used Internet for 5 or more years. However, 52% of female respondents had used Internet for 5 or more years.

Table 6: Online Expenditure in the Past 6 Months

Items	Male		Female		Total
	Frequency	**%**	**Frequency**	**%**	
0-500 TL	330	81,9	452	92,6	782
501-1000 TL	36	8,9	16	3,3	52
1001-1500 TL	9	2,2	2	0,4	11
1501-2000 TL	8	2,0	11	2,3	19
2001-2500 TL	4	1,0	2	0,4	6
2501-3000 TL	5	1,2	2	0,4	7
3001 / + TL	11	2,7	3	0,6	14

As reported in Table 6, 68% of male respondents have made an online purchase in the last 6 months, spending varying amounts. For female respondents, the ratio was 58 %.

Table 7: Owning a Computer

Items	Male		Female		Total
	Frequency	%	Frequency	%	
Yes	328	81,4	388	79,5	716
No	75	18,6	100	20,5	175

Table 7 indicates that approximately 19% of male respondents do not have a computer while the ratio of female respondents was 21%.

Table 8: Having an Internet Connection

Items	Male		Female		Total
	Frequency	%	Frequency	%	
Yes	364	90,3	461	94,4	825
No	39	9,7	27	5,5	66

As reported in Table 8, approximately 10% of male respondents do not have a internet connection while the ratio of female respondents was 6%.

Table 9: Having a Credit-Card

Items	Male		Female		Total
	Frequency	%	Frequency	%	
Yes	257	63,8	212	43,4	469
No	146	36,2	276	56,6	422

Approximately 64% of male respondents have a credit card. Although, the ratio was 44% for female respondents.

Table 10: Paying for Online Shopping

	Male		Female		Total
	Frequency	%	Frequency	%	
Credit Card	222	55,5	170	34,9	392
Debit Card	71	17,4	81	16,6	152
Cash on Delivery	34	8,3	107	21,9	141
Never Bought Online	63	15,6	119	24,4	182
Others	13	3,2	11	2,2	24

4.3. Hypotheses Testing

4.3.1. Chi-square Analysis

Table 11: Purchasing Items through the Internet

Purchasing items through the Internet	Male		Female		Total	Chi-Square Test*	p
	Frequency	%	Frequency	%			
Apparels	79	19,6	204	41,8	283		
Books	87	21,6	133	27,3	220		
Electronic goods	124	30,8	34	7,0	158		
Stuff available only online	41	10,2	44	9,0	85		
Financial services/Banking	31	7,7	22	4,5	53	112,850	0,000
Cinema tickets/Movies/Shows	22	5,5	22	4,5	44		
Unique daily use items	5	1,2	9	1,8	14		
Other	14	3,5	20	4,1	34		

*df= 7

Electronic products were the most purchased, with approximately 31% of male respondents who had purchased online having purchased this. This item in turn follows books (22%), apparel (20%), stuff available only online (10%), financial services/banking (8%) and tickets (6%). But, approximately 42 % purchased good by female respondents was apparels. Other purchased products in turn were books (28%); stuff available only online (9%); electronic goods (7%); financial services/banking and cinema tickets/movies/shows (%5). As seen Table 11, there is a significant difference in purchase behavior between female and male. The finding show that online purchasing items in terms of gender tend to vary with product category. H_1 is supported. The finding is parallel with current literature (Bhatnager et al., 2000; Doolin et al., 2005).

Table 12: Internet Using Skills

	Male		Female		Total	Chi-Square Test*	p
	Frequency	%	Frequency	%			
Skilled	168	41,7	102	20,9	270		
Knowledgeable	162	40,2	248	50,8	410		
Less Knowledgeable	63	15,6	101	20,7	164	50,907	0,000
Want to Learn Internet Search and Browsing Techniques	10	2,5	37	7,6	47		

*df= 4

The results reported in Table 12 indicate significant differences in Internet using skills in terms of gender. The findings show that they tend to define differently their Internet using skills. H_2 is supported. As seen Table 13, there is a significant difference in online purchase behavior frequency between female and male. Internet shopping was still a relatively infrequent event for both female and male respondents. However, males are more frequent online purchasers than females. H_3 is supported. The finding is consistent prior studies (Li et al., 1999, Teo, 2001, Doolin et al., 2005).

Table 13: Frequency of Purchases on Internet during the Past 6 Months

	Male		**Female**		**Total**	**Chi-Square Test***	**p**		
	Frequency	**%**	**Frequency**	**%**					
Never	127	31,5	204	41,8	331				
1-2 times	106	26,3	151	30,9	257				
3-5 times	93	23,1	80	16,4	173	23,969	0,00		
6-10 times	43	10,7	28	5,7	71				
11-20 times	21	5,2	13	2,7	34				
21times or more	13	3,2	12	2,5	25				

*df= 5

4.3.2. ANOVA Analysis

One-way analysis of variance (ANOVA) was conducted to determine differences of subscales of technology reading index according to studying department of student. The subscales of technology reading index were statistically different according to student's departments. To determine statistical significance, Tamhane's T2 test was used. The results of the ANOVA analysis showed significant differences between Group 7 and other groups (Group 1, Group 2, Group 3 and Group 5) in terms of OPT. The mean scores for groups from MIS, ECON, BA and PPA were found to be significantly high when compared to those for EEE for the OPT. A significant differentiation was found between Group 1 and Group 7 in terms of INN. For DIS and INS, the results of the ANOVA analysis showed significant differences between Group 7 and other groups (Group 1, Group 2 and Group 3). The ANOVA results, Table 14, support the hypothesis.

Table 14: Comparison of Subscales of Technology Reading by different department of students

Factors	Group 1 MIS Mean/SD	Group 2 ECON. Mean/SD	Group 3 BA Mean/SD	Group 4 PF Mean/SD	Group 5 PPA Mean/SD	Group 6 CEIT Mean/SD	Group7 EEE Mean/SD	Group 8 IE Mean/SD	*F*-value	*p*-value	Differ (Tamhane's T2)
OPT	3,79 (1,04)	3,66 (0,84)	3,68 (0,99)	3,29 (1,33)	3,59 (1,06)	3,39 (1,36)	3,02 (1,17)	3,46 (1,04)	6,19	0,000	Group 1 and 7 Group 2 and 7 Group 3 and 7 Group 5 and 7
INN	3,38 (0,88)	3,15 (0,70)	3,21 (0,90)	2,87 (0,82)	3,19 (0,94)	3,24 (1,09)	3,00 (0,84)	3,13 (0,67)	2,584	0,012	Group 1 and 7
DIS	3,47 (0,88)	3,64 (0,76)	3,46 (0,85)	3,08 (1,15)	3,41 (0,94)	3,18 (1,14)	3,06 (0,89)	3,36 (0,80)	3,84	0,000	Group 1 and 7 Group 2 and 7 Group 3 and 7
INS	3,46 (0,86)	3,73 (0,97)	3,59 (0,96)	3,50 (1,25)	3,37 (1,09)	3,24 (1,20)	3,07 (0,96)	3,46 (0,91)	3,987	0,000	Group 1 and 7 Group 2 and 7 Group 3 and 7

ANOVA was conducted to determine differences of factors of technological readiness according to class level of students. The results are reported in Table 15. The factors of technological readiness were statistically different according to class level. To determine statistical significance, Tamhane's T2 test was used. The results of the ANOVA analysis showed significant differences between Group 1 and other groups (Group 2, Group 3 and Group 4) in terms of OPT. The findings indicate that as the class level of student increased, OPT factor of technological readiness of student increased. A significant differentiation was found between Group 1 and other groups (Group 2 and Group 3) in terms of INN. For DIS and INS, the results of the ANOVA analysis showed significant differences between Group 1 and other groups (Group 3 and Group 4)). The ANOVA results, Table 15, support the hypothesis.

Table 15: Comparison of Subscales of Technology Reading by different class level of students

Factors	Group 1 First class Mean/SD	Group 2 Second class Mean/SD	Group 3 Third class Mean/SD	Group 4 Fourth class Mean/SD	*F*-value	*p*-value	Differ (Tamhane's T2)
OPT	3,30 (1,19)	3,68 (1,00)	3,82 (0,96)	3,81 (0,91)	14,973	0,000	Group 1 and 2 Group 1 and 3 Group 1 and 4
INN	3,06 (0,92)	3,27 (0,78)	3,39 (0,83)	3,27 (0,85)	6,729	0,000	Group 1 and 2 Group 1 and 3
DIS	3,22 (0,98)	3,43 (0,86)	3,55 (0,82)	3,54 (0,76)	7,947	0,000	Group 1 and 3 Group 1 and 4
INS	3,27 (1,08)	3,43 (0,95)	3,62 (0,88)	3,69 (0,87)	9,235	0,000	Group 1 and 3 Group 1 and 4

4.3.3. Independent Sample T-Test

An independent samples t-test was conducted to explore the technology reading index (OPT, INN, DIS, INS) by comparing the means of males and females. The result of the independent sample t-test presented in Table 16. As seen Table 16, there was no significant difference in the scores between two groups for OPT, t (797,4) = -1,66, p > 0,05, two-tailed with female (M= 3,63, SD= 1,00) scoring slightly higher than male scoring (M = 3,51, SD = 1,17). H_{6a} is not supported.

As shown Table 16 , there was no significant difference in the scores between two groups for INN, t (796,8) = 1,15, p> 0,05, two-tailed with male (M= 3,25, SD= 0,94) scoring slightly higher than female scoring (M = 3,18, SD = 0,81). H_{6b} is not supported.

As seen Table 16, there was a significant difference in the scores between two groups for DIS, t (794,9) = -2,24, p< 0,05, two-tailed with female (M= 3,45, SD= 0,83) scoring slightly higher than male scoring (M = 3,31, SD = 0,97). The magnitude of the differences in the means (mean difference = -0,14, 95% CI: -0,26 to -0,02) was small (eta squared = 0,01). Consequently, H_{6c} is supported.

As seen Table 16, there was a significant difference in the scores between two groups for INS, t (889) = -2,61, p< 0,05, two-tailed with female (M= 3,53, SD= 0,97) scoring higher than male scoring (M = 3,36, SD = 1,02). The magnitude of the differences in the means (mean difference = -0,17, 95% CI: -0,30 to -0,05) was small (eta squared =0,01). The results suggest there is no difference between the genders in terms of OPT and INN. There was a difference between these groups in terms of DIS and INS. Consequently, H_{6d} is supported.

Table 16: T-Test Comparing Technology Reading Index with females vs males

Variable	N	Mean	SD	t-value	p-value
OPT					
Male	403	3,51	1,17	-1,66	0,09
Female	488	3,63	1,00		
INN					
Male	403	3,25	0,94	1,15	0,25
Female	488	3,18	0,81		
DIS					
Male	403	3,31	0,97	-2,24	0,03*
Female	488	3,45	0,83		
INS					
Male	403	3,36	1,02	-2,61	0,01*
Female	488	3,53	0,97		

An independent samples t-test was conducted to compare the technology reading index (OPT, INN, DIS, INS) with students who studied on computers weighted section vs not computers weighted section. The result of the independent sample t-test presented in Table 17. Findings in Table 17 indicate that there was no significant difference in the scores between two groups for OPT, t (885,5) = -1,95, p > 0,05, on average, students who not studied on computers weighted section reported higher levels of OPT than did others. H_{7a} is not supported.

Similarly, there was no significant difference in the scores between two groups for INN, t (889) = 0,78, p> 0,05, on average, students who studied on computers weighted section reported higher levels of INN than did others. H_{7b} is not supported.

As seen Table 17 , there was a significant difference in the scores between two groups for DIS, t (889) = -2,13, p< 0,05, two tailed with students who not studied on computers weighted section scoring higher than others scoring. The magnitude of the differences in the means (mean difference = -0,13, 95% CI: -0,25 to -0,01) was small (eta squared = 0,01). Consequently, H_{7c} is supported.

Table 17: T-Test Comparing Technology Reading Index with students who studied on computers weighted section vs not computers weighted section

Variable	N	Mean	D	t-value	p-value
OPT					
computers weighted section	459	3,51	,14	-1,95	0,06
not computers weighted section	432	3,65	0,1		
INN					
computers weighted section	459	3,23	,87	0,78	0,43
not computers weighted section	432	3,18	,88		
DIS					
computers weighted section	459	3,33	,91	-2,13	0,03*
not computers weighted section	432	3,45	,88		
INS					
computers weighted section	459	3,35	,99	-3,20	0,00*
not computers weighted section	432	3,56	,99		

As seen Table 17, there was a significant difference in the scores between two groups for INS, t (889) = -3,20,   p< 0,05, students who not studied on computers weighted section scoring higher than others scoring. The magnitude of the differences in the means (mean difference = -0,21, 95% CI: -0,34 to -0,08) was small (eta squared =0,01). Consequently, H_{7d} is supported. The results suggest there is no difference between the two groups in terms of OPT and INN. There is a difference between these groups in terms of DIS and INS.

5.   Discussion

One of the main aims of the study was to explore the relationship among factors of technological readiness, student departments and class level of student. Technology Reading Index was measured by four factors; Optimism, Innovativeness, Discomfort and Insecurity.

In the study, the authors found significant difference in factors of technological readiness for student departments. In particular, factors of technology readings are significantly different in the Group 7, where the factor is low. The evaluation indicates that as the faculty changes, technological readiness of student changes. It was found that technological readiness of students of Faculty of Economics and Administrative Sciences was higher than that compared to Engineering. Besides, the study was found that students who studied on computers weighted section were more insecurity than not computers weighted section. Retailers, especially technological product retailers and e-retailers, should begin as regards how to reduce the insecurity perception. At the same time, they should be aware of class level and department of undergraduate student differences and improve marketing strategies attitudes and behavior of their target customers in according to the differences.

The results of this study indicate that there are significant differences between factors of technological readiness of class level of undergraduate student.

The authors found that purchasing items through the Internet, Internet using skills and purchases on Internet during the past 6 months differ significantly according to genders. The findings are parallel in current literature.

The contribution of this study lies in the confirmation of the undergraduate students' technological readiness and Internet shopping characteristics in terms of genders. As shown, results of the study contribute to existing literature by highlighting that different university department, class levels and genders may differ in terms of the four technological readiness factors.

6. Limitations and Future Research

This study has a few limitations. One obvious limitation is the use of student samples. However, the sample is widespread in current literature relating to online shopping behavior and technology (Rüzgar, 2005; Elliot et. al, 2008; Kumar, 2012). Other limitation, the survey was conducted in Turkey. However, different countries have different cultures and development. Therefore the results cannot be applied directly

different countries. Third limitation is the use departments of Faculty of Economics and Administrative Sciences, Faculty of Engineering and Faculty of Education. Future researchers should want to compare the result of the study. Future studies should collect the perspectives of others including different occupation, age, education level, income, developing/developed country, university and departments.

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