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Research Article

Measuring Digital Divide by Using Confirmatory Factor Analysis and MANOVA: A Case of Turkey

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ABSTRACT

The aim of the study is to determine the factors of individuals' skills with regard to internet usage in Turkey by Confirmatory Factor Analysis, and to analyze the factor indicators in order to clarify if they vary by gender, age and education level, i.e. if a digital divide is in question, by Multivariate Analysis of Variance (MANOVA) method. For that purpose, the data on "IT Usage – 2016" of Turkish Statistical Institute was selected as baseline. All data used in this study is categorical. Though, since Confirmatory Factor Analysis and MANOVA are methods using continuous variables, firstly, the variables were transferred to quantified variables by Optimal Scaling method, and before employing Confirmatory Factor Analysis and MANOVA methods, the validity of both multivariate normality and equality of variance-covariance matrices hypotheses was checked. The results obtained showed that the skill with regard to internet usage consists of four factors: personal intended internet activities, e-learning, e-government services, and software related activities. According to the MANOVA results, these factors significantly vary by gender, age, and education level, and thus, there's a second and a third level digital divide between individuals in Turkey.

Keywords: Digital Divide, Optimal Scaling, Confirmatory Factor Analysis, MANOVA

Dijital Bölünmenin Doğrulayıcı Faktör Analizi ve MANOVA ile Ölçülmesi: Türkiye Örneği

ÖZ

Bu çalışmanın amacı Türkiyede'ki bireylerin Internet kullanım yetkinliklerinin kaç faktörde tanımlanabileceğini Confirmatory Factor Analysis ile araştırmak ve bu faktörleri belirleyen indikatörlerin bireylerin cinsiyet, yaş ve eğitim düzeylerine göre farklılaşıp farklılaşmadığını yani bir digital divide olup olmadığını Multivariate Analysis of Variance (MANOVA) yöntemi ile analiz etmektir. Bu amaçla Türkiye İstatistik kurumunun IT Usage 2016 verileri kullanılmıştır. Anketin tüm verileri kategoriktir. Ancak Confirmatory Faktor Analysis ve MANOVA continous variables uygulanan yöntemler olduğundan öncelikle değişkenler Optimal Scaling yöntemi ile quantified variable lara dönüştürülmüştür. Confirmatory Factor Analysis ve MANOVA uygulanmadan önce multivariate normality ve equality of variance-covariance matrices varsayımlarının geçerliliği araştırılmıştır. Elde edilen sonuçlara göre İnternet kulllanım yetkinliklerinin; Kişisel Amaçla İnternette Yapılan Faaliyetler, E-Learning Kullanımı, E-Devlet Kullanımı ve Yazılım ile İlgili Faaliyetler olmak üzere dört faktörden oluştuğu görülmüştür. MANOVA sonuçlarına göre bu faktörler cinsiyete, yaşa ve eğitime bağlı olarak anlamlı bir şekilde farklılaşmaktadır. Buna göre Türkiye'deki bireyler arasında 2. ve 3. düzeyde digital dividenin olduğu saptanmıştır.

Anahtar Kelimeler: Dijital Bölünme, Optimal Ölçekleme, Doğrulayıcı Faktör Analizi, MANOVA

1. Introduction

Digital Divide is a term referring to the division between individuals who have access to internet and who don't have that and also includes the investigation of the differences and their causes regarding the skills of internet users. It can be studied in three, namely "between individuals", "between organizations" and "global" aspects (Dewan and Riggens, 2005). Here it's possible to classify the digital divide that stands between individuals and between organizations as "Domestic Digital Divide" and the divide on a global level i.e. the divide level on which comparison of regions/countries in question is as "International Digital Divide". (Zhu, 2011), on the other hand, considers the digital divide term from two different angles: first, as the examiner of inequalities in ITC access and of the facts lie behind this situation, and second, as the determiner of differences between individuals' skills with regard to internet usage (e-trade, e-government, e-learning etc.). These differences have their roots generally in socioeconomic, demographic and regional (urban/rural) factors. Gender factor plays a special role in access to and usage of internet. Whilst according to the 2013-report of the International Telecommunication Union (ITU) female internet users' rate was 11% lower than male users', the Intelligence Unit Bridging Digital Divides report of The Economist shows that this rate rose 16% higher in 2016. Gender-related differences are to be observed especially in developing countries. The World Bank states in its 2016-report, too, that especially the developing countries fall behind the advantages of digital technologies. In order to overcome digital divide in developing countries, it would be necessary to increase not only the rates of internet diffusion but also the efficiency of its usage. In this respect, e-government services are being considered influential in terms of individual internet adoption and usage level. According to the Harvard University Berkman Klein Center for Internet and Society, language and content factors have an impact on internet usage, too. Using local language in accessing basic information and e-government services has a positive effect on encouraging participation on the Internet. Also, games and videos are motivating users to get and stay online and helping particularly young people out with digital literacy. Along with the Internet diffusion, factors like availability, affordability, relevance, and readiness of a country have importance, too."The Inclusive Internet Index" by the Intelligence Unit of The Economist is being calculated based on sub-indexes of these four factors. "The Inclusive Internet Index", in general, evaluates the Internet adoption and its beneficial use in countries and provides the opportunity needed for comparisons between countries. Availability expresses the quality of infrastructure; affordability the costs of internet access in comparison with income and the competition within internet marketing; relevance the competence of content in local language and readiness the Internet usage skills and the political support level concerning these skills. According to these subindexes of "The Inclusive Internet Index", Turkey is ranked 31st among 75 countries with its 68.3 points on the scale of 100: according to availability subindex, ranked 33rd with 60.6 points; to affordability subindex, ranked 37th with 73.2 points; to relevance subindex, ranked 17th with 83 points and to readiness subindex, ranked 48th with 54.7 points. It's here clearly seen that the lowest subindex is readiness and it indicates that individuals' level concerning internet usage skills and competence in Turkey is lower than other three factors. In comparison with other countries, the biggest gap in terms of digital divide exists in individuals' access to and usage skills of internet. According to the data given

in the Turkish Statistical Institute's "Household Survey Concerning the Usage of Information Technologies, 2016" the computer users' rate is %54 while internet users' rate is %61.2.

This study aims to determine the factors which shape the individuals' internet usage skills, to discover the indicators which characterize those factors and to question if these indicators become dissimilar depending on demography. With this design, we'll be analyzing the data to see if a domestic digital divide is of concern between internet users in Turkey by using Optimal Scaling, Confirmatory Factor Analysis and MANOVA methods.

2. Literature Review of Digital Divide

The survey of Ferro (et.al, 2011) underlines the importance of digital literacy and identifies that the acquisitions in this regard also show differences in the level of education and income of the individuals. In the research of Brantzaegt (et.al, 2011), Cluster and Logistic Regression Analyses are performed in order to collect and determine/estimate data on internet usage and internet user types. (Sheerder et.al, 2017) presents a review of second and third level studies and classify them in this study. (Okunalo's et.al, 2017) study shows that there's a multiple digital divide in e-government usage due to demographic, socioeconomic and locational conditions. (Cruz-Jesus et.al, 2016) evaluates the digital divide between and within EU countries (insight) by performing Factor Analyzing on internet activities of these countries. (Mumporeze et.al, 2017) makes a qualitative research about digital divide related to gender in Rwanda. (Puspitasari et.al, 2016) examines the impact of smartphones on mobile internet usage and effects of mobile internet of digital divide between different social groups. This study uses the survey of Pearce and Rice (2013) as reference and investigates the digital divide observed in individuals' mobile internet usage at four levels: mobile ownership (level1), mobile internet adoption (level2), use of mobile internet (level3) and internet acquisition (level4). In his study, (Helbig et.al, 2009) studies the factors that cause digital divide, in three levels namely internet access approach, multiple dimension approach and examining the interaction between internet usage experiences and some demographic factors. (Cruz-Jesuz et.al, 2012) focuses on EU countries during the period 2008-2009 and undertakes a digital divide by using Factor and Cluster Analysis methods. (Feng-Wu et.al, 2014) works with elementary school aged students with/without learning disability and reaches the conclusion that there's not a digital divide in terms of having access to a computer or internet but in terms of internet usage skills. The study of (Cilan et.al, 2009) explores the digital divide between member and candidate countries of the EU by using Discriminant Analysis and claims that IT indicators should be taken into key indicators list. (While Berlanger & Carter,2009) state that diverse internet activities and online information search experiences are among to the factors which affect the internet usage, they also argue that these factors per se wouldn't be enough to define the IT competence. In a study (Helpser, VanDeursen, 2016) skills are collected under 4 titles according to a new scale developed by researchers themselves by performing Confirmatory Factor Analysis on internet skills: Operational Skills (basic technical skills necessary for using internet), Mobile Skills (skills necessary for getting online), Information Navigation Skills (being able to search for and utilize information in

internet) and Social Skills (being able to communicate online, produce a content at a certain quality and share it).

For this study, a subsample was used that consists of respondents who already took place in the Turkish Statistical Institute's "Household Survey Concerning the Usage of Information Technologies, 2016" and used computer and internet within last three months. All the survey questions were categorical though quantified beforehand by using Optimal Scaling method since the statistical method of the study was parametric. The study aims to determine the factors which influence the internet usage skills of internet users in Turkey by using Confirmatory Factor Analysis and to examine and interpret if these factors vary by demographic conditions by performing MANOVA test. Therefore, it's possible to say that Turkey's interpersonal digital divide will be a research object at 3rd and 4th levels.

3. Optimal Scaling

Optimal Scaling is based on assigning numeric values to variable categories and this process called quantification is based on an optimization criterion. Unlike nominal and ordinal scales, assigned numeric values have metric properties. Determination of the numeric values assigned to the categories of variables is based on an iterative estimation method known as ALS (Alternating Least Squares) (Gifi, 1990). According to this method, numbers assigned to categories are getting processed as inputs and computed again each time, and this process continues until the criteria which indicate the end of the operation are met. Information in a variable remains unchanged during the quantification process (Deniz et.al, 2011).

Optimal Scaling based on Gifi System is a method that can be used not only in case of having categorical variables but also in case of failing at validation of linear models despite numeric variables. Optimal Scaling method, at the same time, prevents the occurrence of problems due to fewness of number of units, affluence of number of variables and variables having too many different values in data set (Gifi, 1990 & Meulman, 1998).

4. Confirmatory Factor Analysis

In an attempt to explore the relationship between a factor and indicators which are supposed to be related to a factor, we usually use either Principal Component Analysis or Factor Analysis. The factors in Confirmatory Factor Analysis are termed latent factors. For each latent factor, there are identifying indicators. Here, the researcher decides which indicator identifies which latent factor. Usually, this decision is based on a theoretical background. A relation between latent factors is supposed to be. Indicators are continuous variables. Measurement errors are independent from each other and factors (Rex Kline, book 2005). Additionally, while using Confirmatory Factor Analysis it's possible to check the goodness of fit with statistical tests and indexes. This is, though, not the case with Principal Components Factor Analysis (Hair, Anderson, 5th Edition, 1998).

Until today, the most frequently used method in terms of model fit was Normed Chi-Square (NC=$\frac{\chi_M^2}{df_M}$) goodness of fit statistics. But due to reasons like sensitive reaction ofχ_M^2 against sample sizes in incorrect models, irrelevance of df_M to sample size and

lack of an exact limit which would let model give "acceptable" results while working with NC, it's being argued recently that NC shouldn't take a part in model assessment (Kline, 2011). A model can be accepted as "good", as long as it shows indexes over 0.90 by goodness of fit indexes like Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI); statistics under 0.80 by Root Mean Square Error (RMSE) and statistics near zero by Standardized Root Mean Square Residual (SRMR) which takes readings between 0 and 1.

5. MANOVA

MANOVA (Multivariate Analysis of Variance) is a method designed to test if the group's mean vectors vary. One-Way MANOVA is used in this study. Meaning, this analyze contains one categorical independent variable and more than one quantitative dependent variable. Each latent factor's indicators represent dependent variables, while each demographic factor stands for independent variables. In order to perform a MANOVA analyze it is inevitable to provide multivariate normality and variance-covariance matrices equality assumptions (Tacq, 1991).

6. Research

The study is based on the 2016's "Household Survey Concerning the Usage of Information Technologies" which is being undertaken every year by the Turkish Statistical Institute using the random sampling method. The number of the respondents in main survey is 39754, but our study is limited with the 13510 respondents who had used internet and computer within last three months. Their distribution by demographic factors can be seen below:

Characteristic	Frequency	Percent
Gender		
Male	7352	54.4
Female	6158	45.6
Age		
(18-25)	3718	27.5
(26-35)	3921	29.0
(36-45)	3277	24.3
(46-55)	1739	12.9
(56-64)	666	4.9
(65-+)	189	1.4

Table 1. Demographic Factors

The questions in the survey that determin latent factors are the indicators of the study. Survey data is entirely categorical, and all the variables of demographic factors with the exception of education and age are categorized in two categories: Yes and No. In order to perform analyses by Confirmatory Factor Analysis and MANOVA, at first, the categorical indicators have been quantified by using Optimal Scaling method. Study's indicators defining IT usage are collected under four main factors: personal intended internet activities, e-learning, e-government services and software related activities. The indicators which represent the factors of Turkey significantly have been found out by Confirmatory Factor Analysis performed with variables in a data set that was reduced after carrying out an Explatory One-Factor Analysis on quantified variables (with at least 60% factor load) and Reliability Analysis (on a selection of variables with at least 70% reliability). Since the e-trade factor was represented with only "Have you ever bought or ordered goods or services in internet?" question, this factor was not included in Confirmatory Factor Analysis. This

is a constraint of our study. First of all, it will be researched if multivariate normality as a common assumption of both Confirmatory Factor Analysis and MANOVA is provided, then an analysis will be done to see if Variance-Covariance matrices equality as an assumption of MANOVA is provided. After investigating these assumptions, results of Confirmatory Factor Analysis and MANOVA will be presented.

6.1. Multivariate Normality with Chi-Square ($\chi 2$) Plot

Multivariate normality which is a common assumption of both Confirmatory Factor Analysis and MANOVA has been investigated by drawing an χ^2-plot including Chi-Square inverse probabilities on horizontal axis and Mahalanobis distances on vertical axis. According to the graph, in order to provide the multivariate normality Chi-Square inverse probabilities and mahalanobis distances have to have a linear relationship (Johnson, Wichern, 1998). Figure 1. shows that this linear relationship exists. Pearson correlation coefficient (r) which is calculated between those two variables in order to measure the linear relationship is 0.8659. Under the circumstances, distribution of data set can be considered normal.

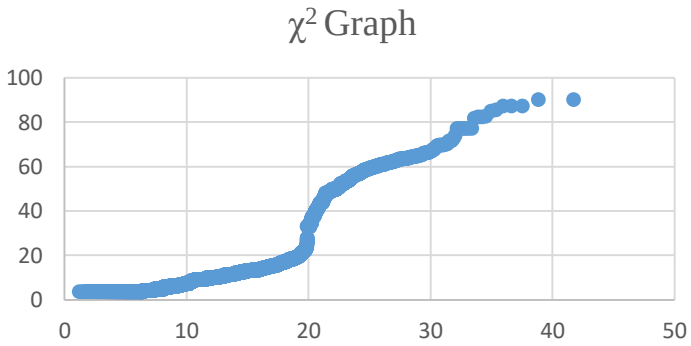

Figure 1. χ^2-Graph

In all Box M tests performed on gender, education level and age group variables, $p<0.05$ result was obtained. Given these results, it's not possible to say that variance-covariance matrixes are equal, but possible to ignore the variance-covariance matrices equality assumption in case of not realization of assumption claiming that MANOVA test statistics give robust results (Cooley & Lohnes, 1971).

6.2. Results of Confirmatory Factor Analysis

According to the Confirmatory Factor Analysis results significant variables which determine the internet usage of individuals in Turkey are shown below by their related factors:

Personal Intended Internet Activities (IA): "Listening to music (IA1)", "Watching TV (IA2)", "Watching videos on video sharing sites (IA3)"

E-Learning Factor (EL): "Receiving online training (EL1)", "Benefiting from materials of online trainings (EL2)", "Making contact with trainers and trainees through a website/portal (EL3)"

E-Government Usage Factor (EG): "Getting information through websites of public institutes (EG1)", "Downloading official forms/documents (EG2)", "Filling out an online form on public institute websites (EG3)"

Software Related Activities Factor (SA): "Preparing a text using a software like Word etc. (SA1)", "Preparing a presentation or a project with the help of texts, pictures, tables or graphs (SA2)", "Transferring photographs, videos or audio files to another platform using a software (SA3)"

Path diagram and results of the modified measurement model are as follows:

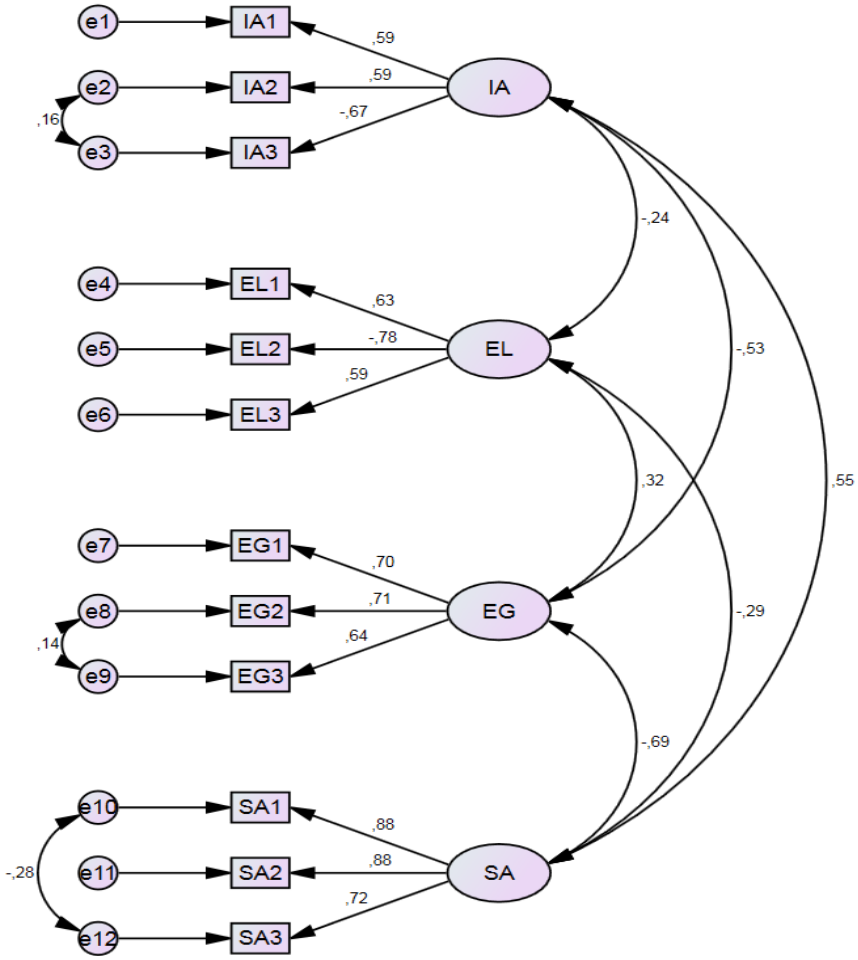

Figure 2. Path Diagram

Model's all path coefficients are significant. As mentioned before, indicators take place in questionnaire in two categories: "Yes" and "No". But in model, they all are presented in a quantified form. Since "Yes" was quantified as a negative numeric number at IA3 and EL2, path parameters of these indicators are negative too. In that case, it seems appropriate to interpret negative path coefficients as absolute. As seen here in Table 2, model's goodness-of-fit indexes fit perfectly with observed data. The fact that survey data fits with model supports the validity of the survey.

Fit Index	Model	Recommended values
GFI	0.994	≥0.90
TLI	0,988	≥0.90
CFI	0,992	≥0,90
RMSEA	0,026	≤0,08
SRMR	0,0182	Near to 0

Table 2. Fit Indices for the Modified Measurement Model

6.3. MANOVA Results

When the indicators forming each latent factor in the MANOVA test were applied separately according to gender, education and age demographic variables, the p values of Wilks' Lambda test results were as follows:

	Indicators of Factors			
Demographics	Factor IA	Factor EL	Factor EG	Factor SA
Age	(0.000)	(0.000)	(0.000)	(0.000)
Gender	(0.000)	(0.52)	(0.000)	(0.000)
Education	(0.000)	(0.000)	(0.000)	(0.000)

Table 3. MANOVA Test Results

Given MANOVA results, only gender remains same according to indicators which form the E-Learning (EL) Factor. This shows that there's no gender gap based on "Receiving online training (EL1)", "Benefiting from materials of online trainings (EL2)", "Making contact with trainers and trainees through a website/portal (EL3)" activities. But it's only because of very low rate of these activities by both women and men. 2.8% of male and 2.5% female respondents perform an (EL1) activity; 4.9% of male and 4.8% of female respondents perform an (EL2) activity, while only 3.1% of male and 3.3% of female respondents perform an (EL3) activity in internet.

Gender varies at (0.000) significance level by Internet Activities (IA), E-Government (EG) and Software Activities (SA) factors. At this point it is shown that women differ significantly from men when it comes to particularly IA3 ("Watching videos on video sharing sites") indicator belonging to IA factor; rate of "Watching videos on video sharing sites" is 74.3% by men, while by women it stands approximately 4% lower i.e. at 70.1%.

Differentiation at gender according to E-Government (EG) factor results mainly from "Getting information through websites of public institutes (EG1)" and "Downloading official forms/documents (EG2)" indicators. 60.5% of male respondents perform (EG1) activities in internet while this rate stands at 49.1% by women. When it comes to EG2 activities, rate is 30.2% by men and 24% by women.

According to gender, there are significant differences at indicators of Software Activities (SA) factor. 50.8% of male respondents perform the activity of "Preparing text using software like Word etc.", while 46.8% of women do the same. Activity of "Preparing a presentation or a project with the help of texts, pictures, tables or graphs" is performed by 40.7% of male and 37.3% female attendants. Rate of men performing the activity of "Transferring photographs, videos or audio files to another platform using software" is 30.1% by men and 25.4% by women.

In conclusion, it's to be said that women are at a lower level according to IA, EG and SA factors than men in Turkey.

In view of assessment made of age factor, the most successful age group in terms of using E-Learning (EL), Internet Activities (IA), E-Government (EG) and Software Activities (SA) is 18-25, and their ability of using internet in accordance with age factor is: the higher the age of the group, the lower the rate of their internet using skills in direct proportion. Given these facts, rate of performing the activities of "Preparing a text using a software like Word etc. (SA1)", "Preparing a presentation or

a project with the help of texts, pictures, tables or graphs (SA2)" and "Transferring photographs, videos or audio files to another platform using a software (SA3)" is for the (18-25) age group respectively 63.8%, 53.3% and 39.2%, but again respectively 22.8%, 12.7% and 6.3% for the (65+) age group. This shows that performing (SA) skills vary by age groups and the (18-25) age group is in the most advantageous position in contrast to the (65+) age group.

The (18-25) age group's skills of performing "Listening to music (IA1)", "Watching TV (IA2)" and "Watching videos on video sharing sites (IA3)" are rated by respectively 77.8%, 38.7% and 84.5%, while the ratio of the (65+) age group stands respectively at 31.2%, 15.3%, and 39.2%. These ratios show that performing – Internet Activities (IA) skills vary by age groups and the (18-25) age group is in the most advantageous position again.

The (18-25) age group's skills of performing "Receiving online training (EL1)", "Benefiting from materials of online trainings (EL2)" and "Making contact with trainers and trainees through a website/portal (EL3)"are rated by respectively 3.4%, 7.7% and 4.8%, while the ratio of the (65+) age group stands respectively at 0.5%, 0.0%, and 0.0%. These ratios show that performing - E-Learning (EL) skills vary by age groups and the (18-25) age group is, once more, in the most advantageous position.

Finally, the (18-25) age group's skills of performing "Getting information through websites of public institutes (EG1)", "Downloading official forms/documents (EG2)", "Filling out an online form on public institute websites (EG3)"are rated by respectively 57.3%, 32.3% and 47.6%, while the ratio of the (65+) age group stands respectively at 39.2%, 13.2%, and 18%.

Evaluation of educational facts claims: the higher the education level, the higher the ratio of performing all of the activities namely Software Activities (SA), Internet Activities (IA), E-Learning (EL), E-Government (EG) in direct proposition. Performing ratio of SA activity "Preparing a text using a software like Word etc. (SA1)" stands at 9.1% by the (5 years or less) education group, while it reaches to a 84.3% degree by the highest education (13 years and more) group. Performing ratio of "Preparing a presentation or a project with the help of texts, pictures, tables or graphs (SA2)" activity stands at 5.2% by the (5 years or less) education group, while it reaches to a 72.8% degree by the highest education (13 years and more) group. Performing ratio of "Transferring photographs, videos or audio files to another platform using a software (SA3)" activity stands at 4.7% by the (5 years or less) education group, while it reaches to a 50.8% degree by the highest education (13 years and more) group.

When focused on rate per cent of educational groups' Internet Activities (IA) activities, it's seen that the lowest education group's performance of "Listening to music (IA1)", "Watching TV (IA2)" and "Watching videos on video sharing sites (IA3)" is rated by respectively 42.8%, 18.2% and 52.3%, while the ratio of the group with the highest educational status stands respectively at 70.3%, 45.6%, and 72.4%.

When focused on rate per cent of educational groups' E-Learning (EL) activities, it's seen that the lowest education group's performance of "Receiving online training (EL1)", "Benefiting from materials of online trainings (EL2)" and "Making contact with trainers and trainees through a website/portal (EL3)"is rated by respectively 0.2%,

0.2% and 0.6%, while the ratio of the group with the highest educational status stands respectively at 6.1%, 10.3%, and 6.7%.

When focused on rate per cent of educational groups' E-Government (EG) activities, it's seen that the lowest education group's performance of "Getting information through websites of public institutes (EG1)", "Downloading official forms/documents (EG2)" and "Filling out an online form on public institute websites (EG3)"is rated by respectively 29.2%, 6.1% and 17%, while the ratio of the group with the highest educational status stands respectively at 82.3%, 54.5%, and 59.3%.

7. Results

According to the measurement model estimated by the Confirmatory Factor Analysis, internet usage of individuals in Turkey can be investigated with four factors: Internet Activities, E-Learning, E-Government and Software Activities. The indicator that represents Turkey's internet activity best is "Watching videos on video sharing sites (IA3)" with a 0.67 of path coefficient. The indicator that indicates the E-Learning factor the best is "Benefiting from materials of online trainings (EL2)", with a 0.78 of path coefficient. The indicator that indicates the E-Government factor the best is "Getting information through websites of public institutes (EG1)" and "Downloading official forms/documents (EG2)" with respectively 0.70, 0.71 path coefficients. Finally, the indicators and path coefficients that indicate the Software Activities factor the best are "Preparing a text using a software like Word etc. (SA1)"with a 0.88 of path coefficient, "Preparing a presentation or a project with the help of texts, pictures, tables or graphs (SA2)" with a 0.88 of path coefficient and "Transferring photographs, videos or audio files to another platform using a software (SA3)"with a 0.72 of path coefficient.

The question if these factors vary by individuals' gender, age and education was checked by One-Way MANOVA and the fact was found out that gender was playing a role in all factors except E-Learning. The fact that E-Learning skills of both men and women are highly low-level is supposed to be the reason of this undifferentiating at E-Learning. Gender gap shows up at E-Government activities the most. Ratios of women are lower than men at all activities.

When focused on age, it's to be seen that age groups differ significantly at all factors and there's a big gap specifically between the youngest and the eldest groups. With increasing age the skills regarding these factors decreasing in direct proportion.

Finally, when focused on educational level of individuals, it's to be seen: the higher the level of education is, the higher the performing ratio of Internet Activities, E-Learning, E-Government and Software Activities gets in proportion. At the end of all these evaluations, it can be said that there's a digital divide with regard to gender, education level and age in Turkey. Disadvantaged groups are women, elders and the individuals with a low level of education.

In the light of all these results, development of state policies with the intent of improving internet usage skills and support of social responsibility projects which help specifically women, advanced aged, and low-educated individuals to receive education are recommended. Developing countries like Turkey are supposed to

concentrate more on policies in that area if countries' level at IT is accepted as key indicators of socioeconomic development level.

Categorical variables of the study were quantified by the Optimal Scaling method. Afterwards, Confirmatory Factor Analysis and MANOVA were selected to perform in order to measure the Digital Divide by quantified indicators. Performing analyses in this way is considered as a genuine method of measuring digital divide at 2nd and 3rd levels.

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