

## PalArch's Journal of Archaeology of Egypt / Egyptology

### SUSTAINABLE HEALTHCARE MANAGEMENT AND E-HEALTH: PERCEPTIONS ABOUT PROBLEMS AND PROSPECTS.

*Ghulam Muhammad Kundi*

College of Public Health and Health Informatics, Al-Bukayriyah

Qassim University, Kingdom of Saudi Arabia

Email: [g.muhammad@qu.edu.sa](mailto:g.muhammad@qu.edu.sa)

**Ghulam Muhammad Kundi. Sustainable Healthcare Management And E-Health: Perceptions About Problems And Prospects. Palarch's Journal Of Archaeology Of Egypt/Egyptology 19(1), 160-173. ISSN 1567-214x**

**Key Words: E-Health, Problems Of E-Health, Prospects Of E-Health, Health Informatics, Sustainable Health Service Management, AMOS-SEM**

#### **ABSTRACT**

This paper was aimed to find the effect of E-Health on prospects and problems of E-health. A survey approach was used and a total of 169 respondents participated in the study. A closed-ended questionnaire was distributed among the respondents. Descriptive statistics and inferential statistics were used for testing hypotheses. SPSS 25 and AMOS-SEM software were used for analysis. For reliability and validity Cronbach alpha, EFA and CFA were run on data. To test the hypotheses, correlation and regression analysis in SPSS, and measurement model and structural model were tested in the AMOS-SEM. The study finds a significant relationship between e-health and prospects of e-health while negative but significant relationship between e-health and problems of e-health were reported. This study found that that underdeveloped countries and developing countries both should adopt E-health to reduce problems and increase the efficiency of healthcare institutions.

#### **INTRODUCTION**

E-Health has become a reality around the globe where users from advanced and developing countries are taking benefits from the digital technologies to get healthcare services through a different and novel delivery channel – the Internet (Ahmed & Shaikh, 2008). The health system in Pakistan is spraining because of increasing cost and demand gravities (Shoaib, Mirza, Murad, & Malik, 2009; Qureshi, Anjem, Zubair, Nawaz, & Shah, 2014). The shortage of skilled healthcare workers is one of the main infrastuture issues (Naseem & Rashid, 2014; Ahmad, Sattar, & Nawaz, 2016). There is a need to move away from the

dependency of tools such as pen, paper, and human memory to a milieu where patients and health care providers can reliably access and share health information in real-time across geographic and health sector boundaries (Jan, 2016; Kazi, 2017).

In 2000, Pakistan had 133,900 users which turned into 44,608,065 i.e., 22.2% penetration rate, increased into 32,000,000 within short spell of time (Hafeez, 2014). In developing countries like Pakistan, healthcare is tackling several issues. The government values the importance of E-Health but attention on its implementation is still poor. This study is an effort to analyze the effect of E-Health on healthcare in Pakistan as perceived by the providers of healthcare services (Ahmed & Shaikh, 2008; Monitoring Report, 2016; Nawaz, 2017). It is positively expected that in the coming days, E-Health will provide services to health professionals and patients (Velthoven, Powell, & Powell, 2018). It is, however, very critical for the government and the prospected users to be ready for handling the issues of developing and using E-Health systems across the country (Jan, 2016; Amir, 2017; Milward, Drummond, & Fincham-Campbell, 2018). The government has to come up with practical solutions with favorable digital public policies in supporting the growth of online healthcare services for health professionals and citizens. The government has to arrange for removing the infrastructural barriers thereby strengthening the E-Health systems to work in a robust manner (Coathup, Finlay, & Teare, 2018). It is very encouraging that people are positive and optimistic about the role of E-Health in Pakistan (Green, Ali, Naeem, & Ross, 2000; Ahmed & Shaikh, 2008). Several initiatives have been taken to put the citizens online for seeking healthcare facilities like doctors and services (Khoja, Scott, & Gilani, 2008; Shoaib, Mirza, Murad, & Malik, 2009). For example, 'Marham (<https://www.marham.pk/>) is the latest addition to the online opportunity initiatives for citizens to seek doctors for different diseases and health problems (Naseem & Rashid, 2014; Khalid, 2017). Likewise, E-Health program of COMSATS (<http://www.ehealthcomsats.com/>) is one of the leading projects by the Commission on Science and Technology for Sustainable Development in the South (COMSATS) to capitalize on ICTs for the improvement of health in developing countries like Pakistan (Coathup, Finlay, & Teare, 2018; Monitoring Report, 2016). The prospects of E-Health are quite brighter in Pakistan due to the increasing role of ICTs in different sectors of the country and health-related initiatives of using digital systems for caring healthcare (Nawaz, 2017; Ittefaq & Iqbal, 2018). Further, the country cannot afford the provision of traditional health facilities and services therefore E-Health is the only plausible option to fulfill the countrywide health services for the masses across the country (Coathup, Finlay, & Teare, 2018).

## LITERATURE REVIEW

E-health is usually referring to the Internet and medicine, but actually, it includes everything related to healthcare with computers or ICTs (Green, Ali, Naeem, & Ross, 2000). The concept of E-Health in Pakistan is new and novel in terms of what and how (Ahmed & Shaikh, 2008). It is a new account of the Internet expanding and improving health care activities (Shoaib, Mirza, Murad, & Malik, 2009). Computers and the Internet always create opportunities as well as challenges, so E-Health is a digital concept or terminology which is harnessing the computers and networks for the doctors and other health service

providers as well as the patients for handling health-related issues online (Velthoven, Powell, & Powell, 2018; Jan, 2016; Naseem & Rashid, 2014). It should however be noted that E-Health is not just the purchase of hardware and software, rather it includes several activities of health information system development (Ittefaq & Iqbal, 2018). E-Health system needs to include the prospected users in the development process so that their concerns could be incorporated in both hardware and software systems thereby making them compatible with the user requirements (Amir, 2017).

The main purpose of E-Health is to improve the quality of life for the masses through assisting health professionals in undertaking their healthcare job using digital systems and serving online (Albejaidi & Kundi, 2017). E-health is known for increasing efficiency by reducing costs and providing quality healthcare services (Qureshi, Kundi, Qureshi, Akhtar, & Hussain, 2015). It enables the physicians about a novel type of patient-doctor relationship. E-health offers a high degree of information access, distribution, and mobility. It has a wide area for monitoring the environment (Ahmed & Shaikh, 2008). It can provide long-term health management and optimal resource sharing. E-Health enables the exchange of available information across the network in no time by reducing the need for documentation thereby reducing cost and labor for record-keeping (Jan, 2016; Naseem & Rashid, 2014; Nawaz, 2017). E-health can review immense data on patients to keep physicians alarmed about any unhealthy trends thereby helping doctors to respond quickly to the public health medical situation (Amir, 2017; Coathup, Finlay, & Teare, 2018). E-Health providers can self-build a web-based personal health record, which is patient-driven to improve the evaluation of a patient's health (Milward, Drummond, & Fincham-Campbell, 2018). It is now clear from the digital initiatives taken and supported by the government, Pakistan seems resolute to collaborate with WHO and other international players for installing robust health-related ICTs and thereby improve healthcare facilities and services across the terrain of the country (Ahmed & Shaikh, 2008; Naseem & Rashid, 2014). The real issues in this regard are whether the national health infrastructure is capable to support E-Health system and if implemented, the existing human capacities will be able to run the system (Monitoring Report, 2016). If national level infrastructure and the service providers are in the required position, the new digital healthcare systems will be the key driver in the success of healthcare in Pakistan (Amir, 2017). There is a need to conduct studies regarding the newly emerging physician-patient digital relationships and to consider the opinion of health providers concerning ICTs in the healthcare system (Kazi, 2017; Khalid, 2017).

### ***Problems of E-Health***

The most common problem for healthcare professionals is that they lack the skills to handle internet tools like browsers and search engines. Internet search engines help to identify health information however, it requires training of users (Qureshi, Qureshi, Chishti, Kundi, Akhtar, Khan, & Khan, 2014). Technology and training in health informatics is a must for doctors and paramedics (Naseem & Rashid, 2014; Qureshi, Anjem, Zubair, Nawaz, & Shah, 2014). In Pakistan, doctors are making sluggish use of the internet due to the absence of proper training as well as adequate technologies for this purpose (Shoaib, Mirza,

Murad, & Malik, 2009) although doctors have access to the internet but they do not use it because they believe that net-based information is unreliable and poor in quality (Nawaz, 2017). There is an understanding of doctors about the reliability of material on the internet affects their performance as well as the productivity of the organizations in the healthcare sector (Amir, 2017; Milward, Drummond, & Fincham-Campbell, 2018).

### *Prospects of E-Health*

It is however notable that healthcare facilities in Pakistan have started improving but still it is not in proportion to the population growth (Ahmed & Shaikh, 2008). The healthcare facilities available are far short of what is required to serve the population of more than 200 million. Rural populations have to face bigger and more problems regarding health services (Naseem & Rashid, 2014 ). There has been an increase in healthcare expenses on the planning and implementation of developing healthcare facilities and delivery systems in tune with the population growth in the country (Kazi, 2017; Milward, Drummond, & Fincham-Campbell, 2018). It is promising that annually an increase is occurring in the number of doctors, dentists, and physicians (Ittefaq & Iqbal, 2018). It is however notable those healthcare facilities in Pakistan have started improving but still it is not in proportion to the population growth (Ahmed & Shaikh, 2008).

## **METHODS**

For conducting scientific research in social sciences, positivism is the most popular philosophy to be adopted to come up with reliable and valid findings. Positivism suggests that knowledge must be verifiable and it has to be recorded through standard concepts/terminologies for communication. Scientific methods and tools are used for both data collection and analysis. Further, survey approach has been used to conduct field surveys for primary data collection through a sample of 169 subjects.

### *Tools & Techniques*

A survey instrument was used to collect data from the respondents. A questionnaire on a 5-point Likert scale was administered. Population of study were doctors, systematic random sampling was employed.

### *Thematic Processing*

It was used to collect and analyze qualitative data from the literature through first collecting primary themes, which were rearranged into organizing themes and finally preparing a global theme or theoretical framework for the field study. First-hand data has been analyzed using SPSS 25 for statistical procedures including correlation, regression, and tests of significance to test the hypotheses, AMOS-21 was used for SEM.

## DATA ANALYSIS

### *Common Method Bias*

Common method bias may affect the validity of results so to reduce the chance of CMB. Harman single factor test was run by researchers. Principal Axis factoring was used in SPSS and all the items of E-Health, prospects, and problems of E-Health were loaded on a single factor and it gives us 11.19% variance of the first factor which is less than 50% thus it means that problem of common method bias is not an issue in this data. Further exploratory factor analysis (EFA) for each variable was run separately, the results are presented below.

### *Reliability and Validity*

Reliability statistics are reported in Table 1 below. All values of Cronbach alpha are presented. According to (Nunally, 1978) the value of alpha is acceptable at 0.700. In the table below all the values of Cronbach alpha (1951; 1970) are higher than 0.7. Alpha value for E-health is 0.780, alpha for prospects of E-health is 0.856, the problem of e-health is 0.933, and alpha value for overall scale is 0.816 is acceptable, this implies that scale of the study has internal consistency and it is reliable. Further analysis of exploratory factor analysis revealed that eleven items of e-health are used in this study, yet four items were deleted from analysis due to low factor loadings. The remaining seven items have loadings higher than 0.4 so these items were retained in the analysis, presented in table 2. The EFA for prospects in E-Health was run, it was found that KMO=0.869 is greater than 0.5, BTS=0.00 is significant so the assumption of EFA is not violated thus researcher proceeds to the rotation. Only one item i.e., item 4 was deleted from analysis due to low factor loading and remaining 9 items were retained in analysis as could be in Table 3. None of the item was deleted from problems of e-health since all items have factor loadings higher than 0.4, see table 4.

**Table 1:** Reliability Results

	<b>Variables/Instrument</b>	<b>No of Items</b>	<b>Cronbach's Alpha</b>
1	E-Health	11	0.780
2	Prospects of E-Health	10	0.856
3	Problems of E-Health	10	0.933
4	Questionnaire	31	0.816

**Table 2: EFA E-Health**

<b>Validity Statistics on E-Health</b>				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.758	Qs	Score
Bartlett's Test of Sphericity	Approx. Chi-Square	519.316	EH1	0.827
	df	55	EH2	0.463
	Sig.	0.000	EH3	0.817
			EH4	0.683
			EH5	0.740
	Required	Computed	EH6	0.570
KMO test	= or > .7	.758	EH7	.344*
Bartlett's test	= or < .05	.000	EH8	.484
Factor Loadings	= or > .4		EH9	.289*
			EH10	.382*
*Items scoring <.4 were excluded from analysis			EH11	.362*

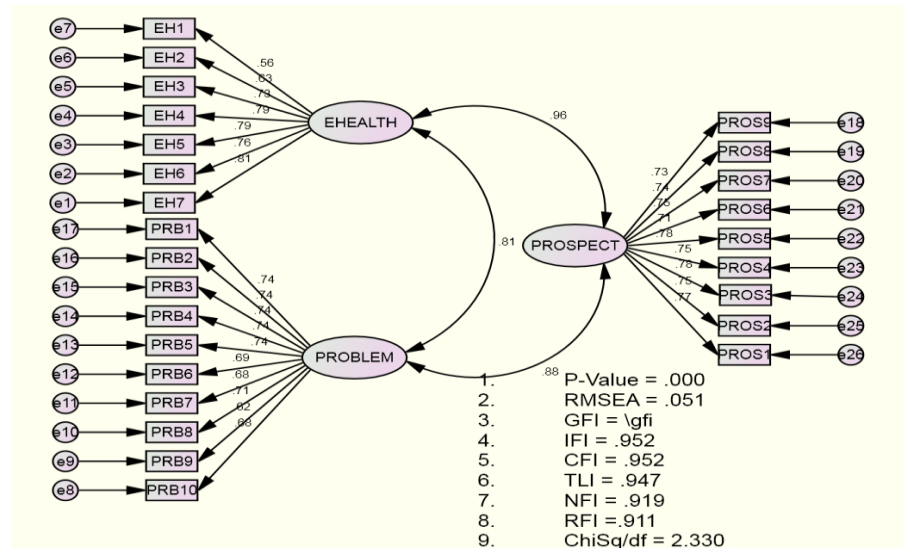
**Table 3**  
EFA Prospects of E-Health

<b>Validity Statistics on Prospects of E-Health</b>				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.869	Qs	Score
Bartlett's Test of Sphericity	Approx. Chi-Square	682.778	PRS1	.876
	df	45	PRS2	.751
	Sig.	.000	PRS3	.722
			PRS4	.179*
	Required	Computed	PRS5	.580
KMO test	= or > .7	.869	PRS6	.777
Bartlett's test	= or < .05	.000	PRS7	.783
Factor Loadings	= or > .4		PRS8	.613
			PRS9	.760
*Items scoring <.4 were excluded from analysis			PRS10	.515

**Table 4: EFA Problems of E-Health**

<b>Validity Statistics on Problems of E-Health</b>				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.881	Qs	Score
Bartlett's Test of Sphericity	Approx. Chi-Square	1891.445	PRB1	.944
	df	45	PRB2	.722
	Sig.	.000	PRB3	.640
			PRB4	.855
			PRB5	.876
	Required	Computed	PRB6	.766
KMO test	= or > .7	.881	PRB7	.758
Bartlett's test	= or < .05	.000	PRB8	.648

Factor Loadings	= or > .4		PRB9	.838
			PRB10	.854



**Figure 1.** Measurement Model

Confirmatory factor analysis was run in AMOS-SEM. it was found that all items retained in EFA are also validated in CFA. The model was found fit. All the values of fit indices are above the given criteria. Factor loadings of all items for E-health, prospects of e-health, and problems of e-health were above 0.5. Covariance estimates between e-health and problems are 0.81, between e-health and prospects are 0.96, and prospects and problems of e-health are 0.88. RMSEA = 0.051<0.08, IFI=0.952, CFI=0.952, TLI=0.947, NFI=0.919, RFI=0.911 all are above the threshold of 0.9, X<sup>2</sup>=2.330<3. For e-Health AVE=0.543, and CR composite reliability is 0.891. For prospects of e-health AVE=0.565 and CR=0.921. For problems of E-Health AVE =0.563 and CR=0.928 all are found valid Figure 1.

Descriptive findings are presented in Table 5 and 6. There is a total of 169 participants participated in this study. Out of 169 there were 49 senior male respondents and 40 senior female respondents. Further 53 junior male respondents and 27 junior female participants participated in this study. Likewise, highest mean score was recorded for E-Health M=5.9188, S.D=0.63837, followed by prospects of E-Health M=4.368, S.D=0.44952. While lowest mean is recorded for problems of E-Health i.e. M=2.847, S.D=0.778 Figure 2. Problems of e-health are overlooked and ignored so these problems need more attention. Also, the standard deviation of all three items is not near to each other so there is no homogeneity in the response of respondents.

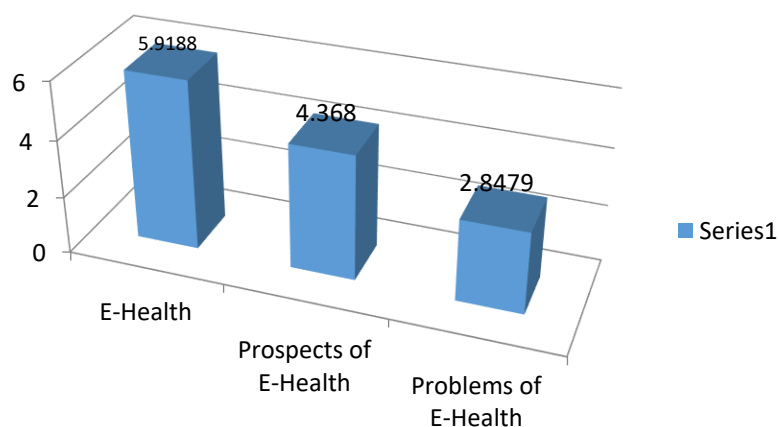
**Table 5:** Descriptive for Demographics

		Gender		Total
		Male	Female	
Experience	Seniors	49	40	89
	Juniors	53	27	80
Total		102	67	169

**Table 6:** Descriptive Results

Descriptive Statistics					
	n	Min	Max	Mean	Std. Deviation
E-Health	169	3.73	7.00	5.9188	.63837
Prospects of E-Health	169	3.20	5.10	4.3680	.44952
Problems of E-Health	169	2.00	6.60	2.8479	.77859

Mean Scores

**Figure 2:** Graph Mean Scores

**H<sub>1</sub>.** E-Health is significantly associated with Prospects and Problems of E-Health.

**Table 7:** Testing of Hypotheses

Correlations ( n = 169 )			
		E-Health	Prospects of E-Health
Prospects of E-Health	Pearson Correlation	.403**	1
	Sig. (2-tailed)	.000	
Problems of E-Health	Pearson Correlation	-.238**	.099
	Sig. (2-tailed)	.002	.202



\*\* . Correlation is significant at the 0.01 level (2-tailed).

The association between e-health and prospects of e-health in table 7 is  $r = 0.403$ ,  $p < 0.01$ , while the association between e-health and problems of e-health is  $r = -0.238$ ,  $p < 0.05$ . It means that when there is an increase in e-health there is an increase in prospects of e-health while on other side increase in e-health decrease in problems of e-health so based on above discussion  $H_1$  is accepted as true.

$H_2$ . Prospects of EH are significantly positively explained by Predictor.

**Table 8**

Model Summary (prediction positive)

Model	R	R <sup>2</sup>	Adj R <sup>2</sup>	SE	F	Sig.
1	.403a	<b>.162</b>	.157	.41264	32.368	.000b

**Table 9: Coefficients**

Model	UNS coefficients		Std coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	2.689	.297		9.057	.000
	E-Health	.284	.050	.403	5.689	.000

b. Predictors: (Constant), E-Health; a. Dependent Variable: PRS

The results for  $H_2$  could be seen in in Tables 8 and 9. For prospects of e-health, e-health shows variance upon prospects  $R^2 = 0.162$  i.e. 16.2% variance. Model was found fit  $F = 32.368$ ,  $p < 0.01$ , while unit change is checked by standardized regression coefficient i.e.  $\beta = 0.403$ ,  $p < 0.01$ , it means one-unit change or one percent change in e-health bring 40.3% change in prospects of e-health. So  $H_2$  is accepted.

$H_3$ . Problems of EH are significantly negatively predicted by E-Health.

**Table 10**

Model Summary (Prediction negative)

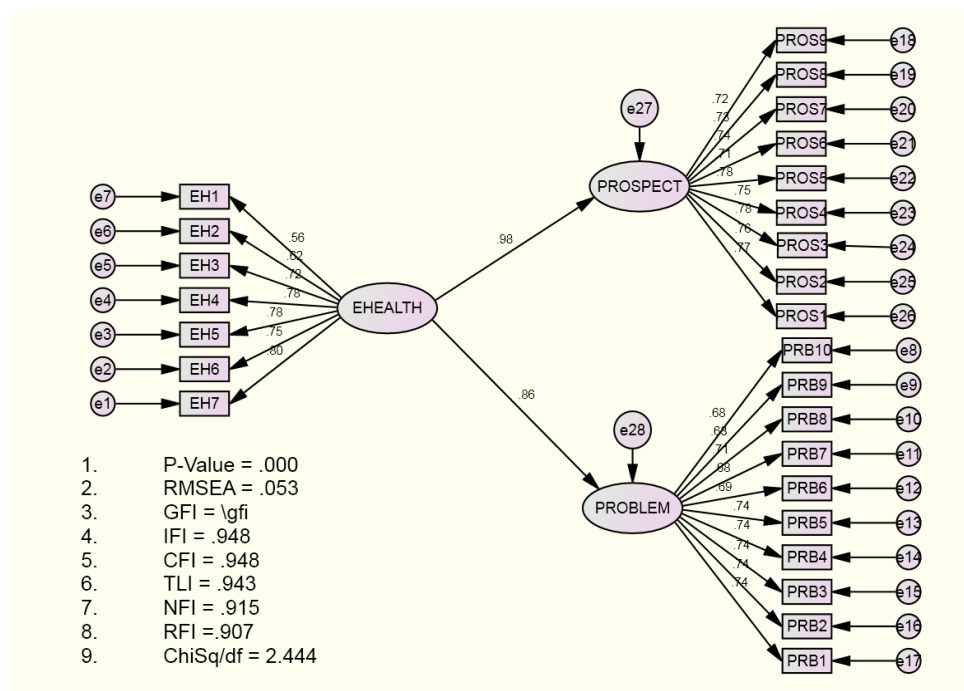
Model	R	R <sup>2</sup>	Adj R <sup>2</sup>	SE	F	Sig.
1	.238a	<b>.057</b>	.051	.75853	10.004	.002b

**Table 11:** Coefficients

Model	UNS coefficients			Std coefficients	t	Sig.	
	B	Std. Error	Beta				
1	(Constant)	4.564	.546			8.363	.000
	E-Health	-.290	.092	<b>-.238</b>		-3.163	.002

b. Predictors: (Constant), E-Health; a. Dependent Variable: PRB

Table 10 and 11 shows the results for H<sub>3</sub>. E-health shows variance upon problems of e-health R<sup>2</sup>= 0.057, i.e. 5.7% model fitness is F= 10.004, p<0.05, while unit change is β = -0.238, p<0.05 it means one unit change in e-health would bring 23.8% decrease in problems of e-health. Moreover, it is a significant change and decrease table 8.



**Figure 3**  
Structural Model

The structural model was developed and tested and found that the impact of e-health on prospects of e-health is β=0.98, p<0.01, and the impact of e-health on problems of e-health is β=0.86, p<0.01. it means that e-health has a significant impact on both criteria so H<sub>2</sub> and H<sub>3</sub> also substantiated Figure 3.

**H<sub>4</sub>.** Juniors are scoring higher on EH and PRS.

**Table 11:** Demographic Impacts (Groups Statistics)

	Experience	n	Mean	Std. Deviation	Std. Error Mean
E-Health (EH)	Seniors	89	5.8560	.67570	.07162
	Juniors	80	5.9886	.59047	.06602
Prospects of E-Health (PRS)	Seniors	89	4.2989	.46258	.04903
	Juniors	80	4.4450	.42423	.04743
Problems of E-Health (PRB)	Seniors	89	2.8382	.71039	.07530
	Juniors	80	2.8588	.85250	.09531

**Table 12:** Independent Sample t-test

		F	Sig.	t	df	Sig. (2-tailed)
E-Health	Equal variances assumed	.563	.454	-1.352	167	.178
	Equal variances not assumed			-1.362	166.874	.175
Prospects of E-Health	Equal variances assumed	.221	.639	-2.132	167	.034
	Equal variances not assumed			-2.142	166.928	.034
Problems of E-Health	Equal variances assumed	.273	.602	-.171	167	.865
	Equal variances not assumed			-.169	154.398	.866

The results for significant mean difference were checked through t-test which are presented in table 11 and 12. Results indicate that juniors are scoring higher on all three variables; however, significance has come on only one variable. Thus, juniors are significantly scoring higher on the PRS,  $F=0.221$ , sig 2 tailed =0.034 showing that juniors are more optimistic than their counterparts.  $H_4$  is therefore partially accepted as true 9.

## DISCUSSION AND CONCLUSION

E-Health is the application of computer technologies to manage and deliver healthcare services to the public (Qureshi, Qureshi, Chishti, Kundi, Akhta, rKhan, & Khan, 2014). It is a new platform for providing healthcare to the general public without a physical appearance at the healthcare facilities. However, E-Health is not an off-the-shelf option, rather it takes a lot of effort to install a computer-based healthcare system. Until, the system becomes fully effective and operative, there are several problems for users (doctors and patients), which need time and training to fully command the system and take the required benefits (Qureshi, Kundi, Qureshi, & Akhtar, (2014. Current research was about the ability of E-Health facilities to resolve user problems and create prospects for the future of the new digital systems (Qureshi, Shah, Khan, Kundi, & Nawaz, 2013). Based on field data, it has become clear that the strengths and potentials of E-Health could be helpful in resolving the user

problems by providing them a user-friendly work environment. As the users become well-aware of the hardware and software facilities of the new healthcare facilities, their problems of use are reduced, and chances or prospects of E-Health become more promising and useful for both the doctors and patients (Coathup, Finlay, & Teare, 2018). Since E-Health is the future of healthcare facilities and delivery systems (Qureshi, Shah, Khan, Kundi, & Nawaz, 2013), therefore, it is concluded that unless the new system is properly developed and installed, and users are adequately trained in using and maintaining the system, the true benefits of digital health could not be attained. It is concluded that e-health is significantly related to the prospects and problems of e-health. Negative relation with e-health and its problems show that use of e-health will decrease the problems which implies that this new system is more useful and timesaving. Healthcare organizations must use this new system to increase the efficiency of doctors and healthcare facility. Thus based on the discussion all hypotheses has been accepted, and results of the study are consistent with Ahmad, Sattar, & Nawaz (2016); Amir (2017) and Coathup, Finlay, & Teare (2018).

### **LIMITATIONS OF THE STUDY**

The study used small sample due to time constraints, in future a study could be conducted with large sample. The study was conducted in comparatively small and remote city, where future studies could be conducted in wider areas including rural areas. The data was collected from healthcare professional, where in future data could also be collected from aptients to cross match and verify the findings.

### ***Implications For Doctors, Practitioners, And Future Research***

This study has several implications for doctors, physicians, and practitioners. Regarding use of e-health, all information about patients, their problems, their biography, i.e. name, date of birth, disease, height, weight, must be entered correctly because wrong information may lead the doctor or physician to wrong diagnosis and wrong medication that could ear bad reputation to the healthcare organization as well as doctors. Besides, it will also affect the health of patients. It is also imperative that whenever doctors need information, it must be provided at the right time to the right doctor so that patients may get treatment well on time. The use of a new e-health systems will improve the efficiency of staff, doctors, and the health of patients as well as the reputation of healthcare providers.

In future, researchers can use a big sample size for their study so findings can be generalized to more organizations. Researchers can use qualitative methods for a deep understanding of the problems of e-health. It is also recommended that mix methods approach like explanatory sequential research can also be used. In this study cross-sectional data was used for analysis, yet, researchers in future can use a longitudinal design for data collection.

## REFERENCES

- Ahmad, I., Sattar, A., & Nawaz, A. (2016). Occupational health, and safety in industries in the developing world. *Gomal Journal of Medical Sciences*, 14(4), 223-226.
- Ahmed, J., & Shaikh, BT. (2008). An all-time low budget for health care in Pakistan. *J Coll Physicians Surg Pak*, 6, 388-91.
- Albejaidi, F., & Kundi, G.M. (2017). Issues of change-management in eHealth projects. *London Journal of Research in Humanities and Social Sciences*, 17(2), 33-40.
- Amir, M. (2017). Health issues. *Pakistan Today*, 26 April.
- Coathup, V., Finlay, T., & Teare, H.J. (2018). Making the most of the waiting room: Electronic patient engagement, a mixed-methods study. *Digit Health*, 4, 2055207617751304.
- Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334.
- Cronbach, L.J. (1970). *Essentials of psychological testing*. Harper & Row. P. 161.
- Green, A., Ali, B., Naeem, A., & Ross, D. (2000). Resource allocation and budgetary mechanisms for decentralized health systems: Experiences from Baluchistan, Pakistan. *Bulletin of the World Health Organization*, 78, 1024–35.
- Hafeez, M. (2014). Poverty and poor health in pakistan: exploring the effects of privatizing healthcare. *Harvard Int Rev*, 35, 4.
- Internet World Statistics Asia Internet Use, Population Data, and Facebook Statistics (June 30, 2018). At: <https://www.internetworldstats.com/stats3.htm>. 2019; 8.9.2019.
- Ittefaq, M., & Iqbal, A. (2018). Digitization of the health sector in pakistan: challenges and opportunities to online health communication: A case study of MARHAM Social and Mobile Media. *Digit Health*. 4, 2055207618789281. Doi.10.1177/2055207618789281. PMID: PMC6058414. PMID: 30057774.
- Jan, Z. (2016). New app aims to revolutionize healthcare, finding a doctor online. *The Nation*, 18 June.
- Kazi, M. (2017). Marham-connecting doctors and patients with the tap of a finger. *The Express Tribune*, 5 June.
- Khalid, H. (2017). 7-Lesser-known Pakistani start-ups that can make your life so much more convenient. *Dawn*, 9 June.
- Khoja, S., Scott R., & Gilani S. (2008). E-health readiness assessment: promoting “hope” in the health-care institutions of pakistan. *World Hospitals and Health Services*, 1: 36–38.
- Milward, J., Drummond, C., & Fincham-Campbell, S. (2018). What makes online substance-use interventions engaging? A systematic review and narrative synthesis. *Digit Health*; 4, 2055207617743354.
- Monitoring Report. Find doctors with mobile app ‘marham’ in Pakistan. *The News*, 2016; 3 October.
- Naseem, A., & Rashid, A. (2014). E-health: Effect on the health system efficiency of Pakistan. *Ann Saudi Med.*, 34(1), 59–64.
- Nawaz, A. (2017). Public health awareness: A Precursor to better preventive & curative health care in Pakistan. Review article. *Gomal Journal of Medical Sciences*, 15(3),151-154.

- Nunally, J. C. (1978). *Psychometric theory*. 2<sup>nd</sup> Ed. New York: McGraw-Hill.
- Qureshi, N.A., Kundi, G.M., Qureshi, Q.A., Akhtar, R., & Hussain, L. (2015). An investigation into the adoption and use issues of e-health in public sector hospitals of developing countries, *Mediterranean Journal of Medical Sciences*, 2(1), 23-36.
- Qureshi, N.A., Qureshi, Q.A., Chishti, K., Kundi, G.M., Akhtar, R., Khan, S.U., & Khan, I. (2014). An analysis of e-health in public sector hospitals of developing countries, *Gomal University Journal of Research*. 30(2),10-10,
- Qureshi, Q.A., Kundi, G.M., Qureshi, N.A. & Akhtar, R. (2014). Hospital administrators and technology as determinants for successful IT-usage in public sector hospital of developing countries, *Advances in Life Science and Technology*, 21, 63-68.
- Qureshi, Q.A., Qureshi, N.A., Chishti, K.A., Kundi, G.M., & Akhtar, R., Khan, S.U., & Khan, I. (2014). E-readiness: A critical factor for successful implementation of e-health projects in developing countries like Pakistan, *Gomal University Journal of Research*, 30(2), 77-86.
- Qureshi, Q.A., Shah, B., Khan, N., Kundi, G.M., & Nawaz, A. (2013). Infrastructural barriers to e-Health implementation in developing countries, *European Journal of Sustainable Development*, 2(1), 163-170.
- Qureshi, Q.A., Shah, B., Khan, N., Kundi, G.M., & Nawaz, A. (2013). Determining the user's willingness to adopt electronic health records (EHR) in developing countries. *International Journal of Business Management and Administration* 2(4), 069-072.
- Qureshi, QA. Anjem, M. Zubair, M., Nawaz, A.. &d Shah, B. (2014). Issues and prospects of e-health in Pakistan. *Mediterranean Journal of Medical Sciences*, 1(1),31-52.
- Shoaib, .S.F., Mirza, S., Murad, F., & Malik, A.Z. (2014). Current status of e-health awareness among healthcare professionals in teaching hospitals of Rawalpindi: A Survey. *Tele Medicine, and e-Health*, 4, 347-52.
- Velthoven, M.H.V., Powell, J., & powell, G. (2018). problematic smartphone use: digital approaches to an emerging Public Health Problem. *Digit Health*; 4, 2055207618759167.
- Wasif, S. (2013). Unhealthy revelations: Pakistan plagued by dismal healthcare system. *The Express Tribune*. 18 May.