

MEASURING DIGITAL DIVIDE IN KING ABDULAZIZ UNIVERSITY

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Abstract

Due to the undesirable effects of the gap between citizens to access and use information and communication technologies (ICT), most researchers have been paying much attention to the threat of a digital divide. Unfortunately an amazingly large number of people do not have the abilities to use the ICTs in a proper way and, therefore, cannot draw advantages from its usage. As a result, digital divide is commonly regarded as a potential barrier for participation in the information society. This study measure the digital divide in Saudi Arabia by analyzing the results of a small-scale study conducted at the University KAU, regarding students' and university members' perceptions toward the usage of ICT. This analysis measure the digital divide concerning some factors like gender, educational level using a questionnaire. The analysis shows that KAU has no digital divide.

Key words: *digital divide, information and communications technology, ICT, diffusion of technology, second order effects.*

Introduction

It is widely believed that access to ICT would result in economic growth and social development, and therefore in wealth and affluence. However, the digital divide threatens this outcome, motivating many researchers to debate look for a solution to decrease the problem or prevent its adverse impact (bridge the divide). The digital divide indicates the gap between people with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the internet for a wide variety of activities. The main reasons for the digital divide are assumed to be the lack of economic resources or capabilities required to use technologies (Selhofer and Husing, 2002). The digital divide is classified into two categories. While much of the research on the digital divide focuses on the **First order effects defined as the inequality in access to ICT**, others focus on studying the second order effects which is the inequality in the ability to use ICT among those who already have access (Dewan and Riggins, 2005). As the majority of the people in any social system have obtained access to a technology, the second order divide, which is considered in this study, attracts researchers more than the first order divide. They suggest three levels of digital divide analysis: individual, organizational, and global. While the individual level concerns people, the organizational one focuses on firms and institutions and the global level examines digital divide between countries. In the next section, much of the research conducted on the first and the second order effects at the individual level of analysis are presented. This paper seeks to examine the second order divide in Saudi Arabia at the individual level where most of people have access to ICT so there is no need to look at first order divide.

There are three aims of this study. The main aim is to identify clearly whether there are other reasons than availability access that prevent people from using ICT. It results from the fact that despite provision of public access to PCs and the internet through schools, public libraries,

and community centers as a way of bridging the digital divide in most societies, it has not overcome the problem. The second aim is to ascertain whether the type of ICT access is affected by factors like gender and education level. It may help understanding demographic factors that affect digital divide. The third aim is to indicate to what extent lack of English language proficiency is an obstacle to using ICT. It is needed to be answered especially in the Arabic area where English language not the mother one. It may help decreasing digital divide in such area if it is proved that English is a reason of not accessing ICT. Answering these questions may help us understanding reasons of digital divide if founded as a trial to find a solution

To achieve these aims, our study is conducted at the University KAU, regarding students' and university members' perceptions toward the usage of ICT. KAU enables its members to access ICT anywhere inside the campus which make it a good environment to conduct the research. Survey methodology is used as a base for this study.

Literature Review

Within the digital divide literature, some studies focus mostly on measuring the first order effects while others concentrate on examining the second order effects. In studying first order effects, Rice and Katz (2003) show that the primary factors predicting Internet usage are income level and age. They reached their results through a random telephone survey. Eamon (2004) studied the differences between academic and non-academic Internet use among 1,029 children between the ages of 10 and 14 according to family income levels. This study shows that family income is the primary factor in determining which side youths fall along the digital divide, while other demographic factors are not as significant. Norris and Conceicao (2004) point out that those without online access are excluded from Internet-based training and education. They note that the digital divide creates a gap between those who are able to take advantage of online education opportunities and those who are not. Selwyn et al. (2005) conducted household interviews with 1,001 adults in the United Kingdom to understand who uses and does not use the Internet and how and why. Overall, they found that people's usage of the Internet is based on interest, relevance, mediation of significant others, and household dynamics (Dewan and Riggins, 2005). In studying second order effects resulting from the different ways people use ICT technology, Howard et al. (2001) provide several key insights into how people use the Internet. They find that more experienced users are much more likely to perform online transactions such as recommender services and online auctions and manage their money online compared to more recent adopters of the Internet. Hargittai (2002; 2003) suggest that age, education level, and time spent online are relevant predictors of the user's Web searching skills. She finds that public policies aimed at getting people online or aimed at providing connections to certain geographic locations may not be sufficient to bridge the digital divide. It will be necessary to invest in training and support for those who have gone online. Mossberger et al. (2003) suggest four different types of divide related to ICT: an information divide related to certain people's inability to gain access to online information due to demographic characteristics; a skills divide related to computer-specific capabilities; an economic opportunity divide related to the inability to receive training, education or employment opportunities; and a democratic divide related to certain people's inability to participate in e-government. A key reason for the second order effect is the way of connecting to the internet. Davidson and Cotten (2003) find that significant usage differences exist between broadband and dial-up users. They find that those with broadband connections are more likely to spend more time on the Internet than those with dial-up connections so they are better able to gain more value from using the internet. Robinson et al. (2003) show that education, income, age and marital status are associated with consistently more long-term uses related to enhanced life chances via work, education, health or political participation (Donat et al., 2009). Billon et al. (2009) seek to determine the

combination of technologies using a wide set of variables that capture various dimensions of digital divide. They conclude that the study of the determinants of digital divide should consider internet users, mobile telephones, PCs, and telephone mainlines as indicators of infrastructure. They also suggest that ICT diffusion patterns are also the result of the influence of supply and demand factors such as Income level, Population and its characteristics, educational systems, English language, and cultural variables. They find that the digital divide is greater for newer technologies than for more mature and saturated technologies (Billon et al., 2009). Donat et al. (2009) aim to introduce some new possibilities of measuring attitudes towards the internet, based on the heuristic of attitudes as tripartite constructs. They concentrate especially on the views of non-users in comparison to users. They find significant differences between users and non-users concerning their attitudes towards the internet and new technologies. Age and education prove to be major determinants of attitude patterns. They find that there are significant effects of age on internet usage. They find no effects of gender on internet usage in their data set – they suggest this seems to indicate that the gender gap has already diminished in Austria. They also show that the predictor variable “education” has yielded very strong effects on the dependent variable internet usage. They find no effects for income in their data set. They conclude that having children at home significantly heightens the probability of using the internet (Donat et al., 2009).

The next section provides the research methodology, data, and variables. Then, the findings are shown. The final section presents the major conclusions and discusses issues for further research.

Methodology of Research

The questionnaire, titled “measuring the digital divide in KAU”, took approximately 10 minutes to complete has been designed for this study by the authors. It consisted of a series of multiple choice questions designed to assess five dimensions of internet usage among the university professors and students- accessibility, skills, types of visited sites, social contact, and attitude toward using the internet. These dimension may be important to KAU to overcome digital divide if found. These dimension may not be examined in literature review but they are important in an environment like KAU according to the nature of people and different culture than other reviews. The participants were also asked demographic data related to gender, city, age, marital status, no of child, academic degree, and their attitude toward the internet. All questionnaires were completed within a one-month. Q1-Q8 are the demographic questions. Likert scale is used as a base for the questionnaire multiple choice questions for two reasons- first; it's the most widely used scale in survey research. Second, it enables the respondents to specify their feeling and usage intensity which is very important to this paper aim. Some questions used five scales like Q8, 10, 13, 14, and 15. Others used seven scales like Q11, 12, and 16. Q9 is used to identify the accessibility dimension. It was for no reason except feeling participants with variety and may let him /her more specified. Q10, 11, 12, and 13 are used to measure skills dimension. Q14 is used to show the most visited sites type among the participants. Q15 is used to point out to which extent the participant social contact is affected by the internet usage. Q8 and Q16 are used to reveal the participants attitude toward the internet usage as an information gathering mean (Appendix 1).

Questionnaire was distributed to 600 random sample. 400 college students (200 male and 200 female) and 400 professors (200 male and 200 female) was selected from different colleges located in KAU to fill in the questionnaire. After exclusion of incomplete questionnaire, the data were analyzed for a total of 558 surveys appropriate for the present analyses. The distribution of the questionnaire is shown in Figure 1.

	Professor	Students	Total
Male	67	201	208
Female	90	210	300
Total	157	411	508

Figure 1: Participant distribution.

SPSS was used to process research data. First, descriptive statistic is used as an important way for data cleaning. It is used throughout data analysis in two ways- means, and numbers of valid cases of one variable. It is very important to monitor the 'N' (number of valid cases) for each variable. Second, Frequency table is created for each question. Third, data from the four groups (male professor, male students, female professor, and female students) were compared using the chi-square tests. The analyses arranged on the basis of the five dimensions and demographic characteristics described above.

Results and Discussion

Table 1. Different internet access means among participants.

Q9: From which network you surf the internet?		Professor (%)	Student (%)
Home	Male	38	44
	Female	56	50
Work	Male	34	9
	Female	43	6
Cellular	Male	8	15
	Female	24	22
Net Café	Male	1	11
	Female	1	1

Table 1 shows that the most internet access mean among professors is home, then work, and finally their cellular. Students prefer to use home then their cellular to connect to the internet and the available university internet is being the final choice for them. Regarding the internet café as expected, it's used rarely especially by female professor or student due to the Arabic traditions in the country. It is clear from Table 1 that 1% only used these cafes network among 3 groups while 11% of male students use it which is a very low percentage. The percentage of professor university network usage is fair and optimal but the students percentage is very low than expected. Analyzing chi-square test results for internet access methods find out a relation between gender and using home network in professors group with p-value=0.028 and in students group with p-value=0.000. Same relationship is discovered concerning cellular network with p-value=0.001 and 0.005 for professors and students groups correspondingly. It is also observed a relationship between gender and work/net café network in students group only with p-value=0.034 for work network and p-value=0.000 for net café network.

Dimension 2 concern measuring two kinds of skills among groups- English language capability and navigational skills. Q10, 11, and 12 are utilized to observe the first skill whereas Q13 is used for the second one. English capabilities may answer the third question in this

study. Tables 2, 3, and 4 show the crosstab for the first three questions participants answers. It appears that English language of most of participants is good. As predictable professors language is better than students. The number of female professors with excellent and very good degree is equivalent. The number of female professors (31) with excellent language degree is greater than corresponding male (18). Female students' language degree is considered the lowest level among groups. By looking at Table 3, it's observed that female students group is also the lowest one believes in developing language by internet usage. It may be resulted from their low English level, Table 2. However, it's proved by other groups that there is a relationship between internet usage and developing English language, Table 3. It's evident that all groups with different language experience believe that English language is certainly not a problem through navigating web pages. Such question was asked to discover if the language is an obstacle or motivation to use ICT.

Table 2. English language degree among participants.

Q10: What is your English language degree?		Excellent	Very Good	Good	Weak	Strongly Weak	
Professor	Male	Frequency	18	28	19	2	0
		Percentage	11.46	17.83	12.10	1.27	0.00
	Female	Frequency	31	31	26	2	0
		Percentage	19.75	19.75	16.56	1.27	0.00
Student	Male	Frequency	32	65	82	20	0
		Percentage	7.82	15.89	20.05	4.89	0.00
	Female	Frequency	10	82	94	23	1
		Percentage	2.44	20.05	22.98	5.62	0.24

Table 3. Participants' answers frequencies for how much internet usage upgrade their English level.

Q11: To which level, you think internet upgrade your English language?		Strongly help level 7	level 6	level 5	level 4	level 3	level 2	Never level 1	
Profes- sor	Male	Frequency	18	5	10	18	8	2	6
		Percentage	11.61	3.23	6.45	11.61	5.16	1.29	3.87
	Female	Frequency	26	3	18	16	9	5	11
		Percentage	16.77	1.94	11.61	10.32	5.81	3.23	7.1
Student	Male	Frequency	58	19	31	32	28	8	25
		Percentage	14.11	4.62	7.54	7.79	6.81	1.95	6.08
	Female	Frequency	33	14	21	41	38	17	46
		Percentage	8.03	3.41	5.11	9.98	9.25	4.14	11.2

Table 4. Participants’ answers frequencies for how English language is being obstacle for their internet usage.

Q12: To which level, you think English language was an obstacle to internet usage?		Strongly obstacle level 7	level 6	level 5	level 4	level 3	level 2	Never level 1	
Professor	Male	Frequency	6	1	5	7	11	9	28
		Percentage	3.82	0.64	3.18	4.46	7.01	5.73	17.83
	Female	Frequency	5	4	7	9	13	10	42
		Percentage	3.18	2.55	4.46	5.73	8.28	6.37	26.75
Student	Male	Frequency	15	10	16	21	24	35	79
		Percentage	3.68	2.45	3.92	5.15	5.88	8.58	19.36
	Female	Frequency	10	19	23	21	29	36	70
		Percentage	2.45	4.66	5.64	5.15	7.11	8.82	17.16

With regard to the navigational skills, Table 5 shows the diversity of strategies used by participants to access Web sites. The most used way is to use a direct link from the home page, and the second is to use search engines and then is to write the URL. The use of either URL or search engines strategies does not consistently or notably differ by education or gender. Usage of links appear in participant own browser home page depends on gender among groups (professors and students), Table 6.

Table 5. Various internet navigation strategies.

Q13: how you navigate around the web?		More	Sometimes	Little	Rarely	None	Mean
URL	Frequency	189	150	117	72	25	5.28
	Percentage	34.18	27.12	21.16	13.02	4.52	
Search Engines	Frequency	415	89	31	14	7	5.62
	Percentage	74.64	16.01	5.58	2.52	1.26	
Links	Frequency	167	164	129	52	37	5.9
	Percentage	30.42	29.87	23.50	9.47	6.74	

Table 6. Chi-Square test results for Q13.

Chi-Square Tests		Value	df	Asymp. Sig. (2-sided)
Professors	Pearson Chi-Square	11.79	5	0.038
	Likelihood Ratio	12.75	5	0.026
	Linear-by-Linear Association	0.12	1	0.728
Students	Pearson Chi-Square	11.95	5	0.035
	Likelihood Ratio	12.61	5	0.027
	Linear-by-Linear Association	7.16	1	0.007

Table 7 shows the frequency table and mean of Q14 answers. As shown in the table, most of participants used email, university, general information, educational, research, multimedia,

and chatting sites more. Governmental sites are used little by most of participants while Elearning, Ecommerce, job search, Ebanking, and games sites are rarely used. All of these sites are navigated by participants in the order shown in last column in Table 1. Data analysis proves that female groups (professors, students) with strongly use most of site types more than male groups except two site types ecommerce and job search. In both types female professors and male students use it more than others but in general male usage percentage exceeds female percentage.

In a trial to discover if there is a relationship between gender and type of visited sites in the educational level groups, Pearson chi square is evaluated. Results indicate that there is a relationship between gender and visiting educational sites in the professor group. It shows that there is a relationship in the student group between visiting research, Elearning, governmental, university, and Bank sites and student gender. In contrast, there is no relation concerns Email, Ecommerce, Job Search, Chatting, Multimedia sites.

Table 7. Sites types navigated.

Q14: how often you visited a web site for _____ issue?		More	Some-times	Little	Rarely	None	Mean	Order
Educational	Frequency	206	154	115	60	18	2.85	4
	Percentage	37.25	27.85	20.80	10.85	3.25		
Research	Frequency	214	126	108	70	33	2.76	5
	Percentage	38.84	22.87	19.60	12.70	5.99		
E_Learning	Frequency	29	34	65	104	293	0.86	13
	Percentage	5.52	6.48	12.38	19.81	55.81		
Governmental sites	Frequency	60	115	167	108	88	1.91	8
	Percentage	11.15	21.38	31.04	20.07	16.36		
University Site	Frequency	383	104	48	12	6	3.53	2
	Percentage	69.26	18.81	8.68	2.17	1.08		
Bank	Frequency	90	87	103	92	163	1.72	9
	Percentage	16.82	16.26	19.25	17.20	30.47		
Email	Frequency	447	59	28	11	7	3.68	1
	Percentage	80.98	10.69	5.07	1.99	1.27		
Ecommerce	Frequency	28	66	70	95	283	1.01	12
	Percentage	5.17	12.18	12.92	17.53	52.21		
General informa-tion	Frequency	258	170	89	25	14	3.14	3
	Percentage	46.40	30.58	16.01	4.50	2.52		
Job Search	Frequency	76	74	74	93	220	1.43	11
	Percentage	14.15	13.78	13.78	17.32	40.97		
Chatting	Frequency	156	93	87	81	119	2.16	7
	Percentage	29.10	17.35	16.23	15.11	22.20		
Multimedia	Frequency	179	88	78	83	119	2.23	6
	Percentage	32.72	16.09	14.26	15.17	21.76		
Games	Frequency	89	61	105	125	167	1.6	10
	Percentage	16.27	11.15	19.20	22.85	30.53		

Table 8 indicates that the three social contact ways are used strongly by the participants in email, telephone, and interview order. It's observed that participants becomes prefer email as a good social contact way with their colleges in work. Analyzing chi-square test results on this dimension does not reveal any important issue. Distribution of using email among participants groups is shown in Table 9. It's noticeable that female in both educational level groups deals with emails more than male.

Table 8. Different social contact methods.

Q15: how you contact with your colleague?		More	Sometimes	Little	Rarely	None	Mean
Face to face interview	Frequency	244	180	76	38	12	3.17
	Percentage	44.36	32.73	13.82	6.91	2.18	
Telephone calls	Frequency	256	167	80	26	27	3.23
	Percentage	47.32	30.87	14.79	4.81	4.99	
E-mail	Frequency	260	172	80	27	19	3.23
	Percentage	46.59	30.82	14.34	4.84	3.41	

Table 9. Participants' email usage.

E-mail Usage Frequency			More	Sometimes	Little	Rarely	None
Professor	Male	Frequency	28	27	8	2	2
		Percentage	17.83	17.20	5.10	1.27	1.27
	Female	Frequency	53	19	13	1	3
		Percentage	33.76	12.10	8.28	0.64	1.91
Student	Male	Frequency	80	59	33	14	7
		Percentage	19.46	14.36	8.03	3.41	1.70
	Female	Frequency	99	67	26	10	7
		Percentage	24.09	16.30	6.33	2.43	1.70

It's observable from Table 10 and Table 11 that participants' attitude toward internet usage is strongly positive and most of them consider it a good alternative method to gather information. Among professors group (male and female) p-value =0.003 for gender and finding internet a good alternative factor which means that there is a good relation between the gender and this factor in this group. In contrast, among students group (male and female) p-value=0.032 which indicates no relation. P-value for all groups indicates no relation between gender and feeling toward internet usage. The data analysis shows that female professors and students feel strongly positive more than corresponding male which is not the first time female percentage being more than male percentage.

Table 10. Internet usage as an alternative to other information gathering strategies.

Q16: Do you feel that the internet is a good alternative?	Weak Alternative	2	3	4	5	6	Good Alternative	Mean
Frequency	4	7	24	52	72	115	274	7.14
Percentage	0.7	1.2	4.2	9.2	12.7	20.2	48.2	

Table 11. Participants' feeling toward internet usage.

Q8: what is your feeling toward internet?	No feeling	Strongly Negative	Negative	Positive	Strongly Positive	Mean
Frequency	17	4	3	229	314	3.44
Percentage	3	0.7	0.5	40.3	55.3	

Conclusions

The purpose of this paper is to illustrate the extent of the digital divide in terms of internet usage in KAU society. As a general finding, it is entirely observed that there is no digital divide in KAU. All participants access internet with diverse ways and navigate it with various strategies. Most of them consider email a superior social contact way. They believe that internet is a good information gathering method and may be considered a good quality alternative to other methods. Percentage of negative and strongly negative attitude toward internet usage is extremely low among participants. This paper aims to find answers to three main questions: first, are there other reasons than availability access that prevent people from using internet. It results from the fact that in spite of public access to internet through different places, there is a digital divide in most societies. Since KAU is a good example of universities that enable people to access internet anywhere inside its campus, it is chosen to be the environment of paper participants. It appears that internet access availability in KAU helps participants as most of professors use university network as the first way to access internet. With regard to students, they also used KAU network but with a lower percentage than expected which need to be considered. Whereas students do not live in dormitory. They need to be encouraged to use it more. The second question is whether the type of internet access is affected by factors like gender and education level. In most cases, there is no relation between gender and educational level and internet usage except some special cases. In general, it's clear that female internet usage exceed the male especially for governmental and email sites. It was completely different than expected particularly in Arabic environment. Most of these interactions concern male in such environment. It's known that female does not concern with governmental things and prefer to use telephone calls and face to face interview. In addition, positive feeling toward internet female percentage exceeds male. The third question is to what extent lack of English language proficiency is an obstacle to using internet especially in Arabic environment. The analysis of participant's data finds out in spite of not perfect English language especially among students, it was not an obstacle by any way. Q11 results indicates that English language may be a motivation toward using ICT as it helps participants improve their language capabilities especially that their mother language is Arabic. In addition to these three questions, data analysis observes some findings such as ecommerce divide. It was noticeable that percentage of ecommerce sites usage among participants is extremely low which needs further research to discover the reason.

It's also discovered that male ecommerce usage is much better than female which is very strange point need to be discussed in details. It may results from the fact that Arabic female prefers traditional commerce than electronic one. It needs more researches to be discovered. Finally, all results was a surprise, it was expected to find a big digital divide in Arabic environment like KAU. Some factors were expected to have a contribution but they do not such as: living place, no if child, marital status. However, all results point to a good digital usage KAU society.

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Appendix 1:

Questionnaire

- 1-Gender:** Male Female
- 2-Location:** Jeddah
 Mekka
 Riyadh
 Others
- 3-Age:** 20-24 25-29 30-39 40-49 50 or more
- 4-Marital Status:** Single Married Divorced
- 5-No of Childs:** 0 1-2 3-4 >4
- 6-Status:** Professor Student
- 7-Education** High school
 Bachelor's
 Master's
 pHd
 Post PhD

8-what is your feeling toward internet?

- No feeling
- Strongly Negative
- Negative
- Positive
- Strongly Positive

9-From which network you surf the internet? (You can check several ways)

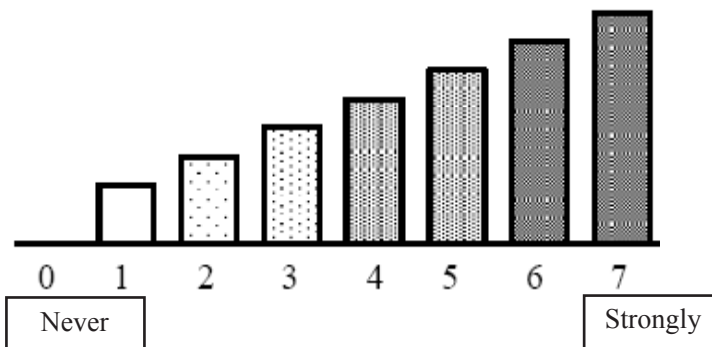
- Home
- Work
- Cellular
- Net Café

10- What is your English language degree?

- Excellent
- Very Good
- Good
- Weak
- Strongly weak

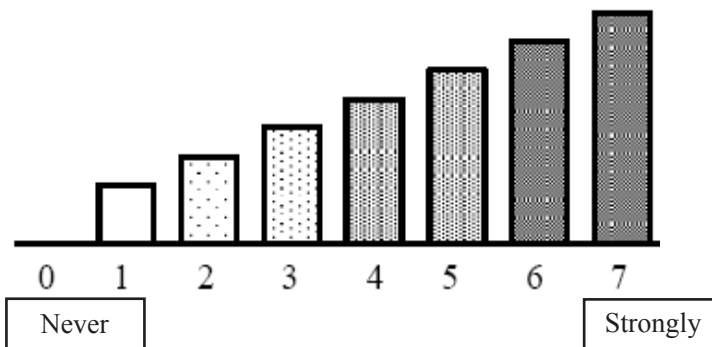
11- To which level, do you think internet upgrade your English language?

(Please circle the number that meet your perspective)



12- To which level, do you think English language was an obstacle to internet usage?

(Please circle the number that meet your perspective)



Please circle the number that meet your perspective for the following Questions:

13- How you navigate around the web?

Method	None 1	Rarely 2	Little 3	Sometimes 4	More 5
Writing URL in the address bar	1	2	3	4	5
Using search engine	1	2	3	4	5
Using links in your browser home page	1	2	3	4	5

14- How often you visited a web site for _____ issue?

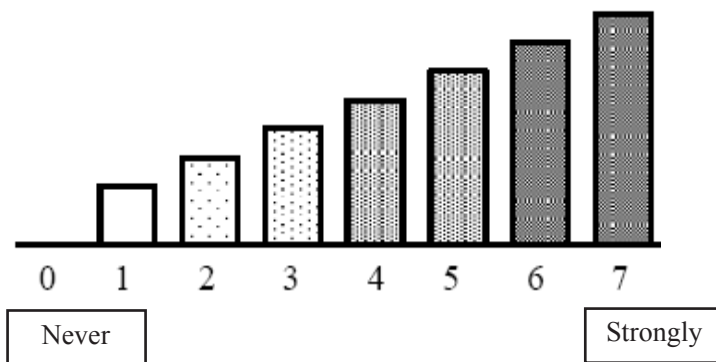
Site Type	None 1	Rarely 2	Little 3	Sometimes 4	More 5
Educational	1	2	3	4	5
Research	1	2	3	4	5
E_Learning	1	2	3	4	5
Governmental sites	1	2	3	4	5
University Site	1	2	3	4	5
Bank	1	2	3	4	5
Email	1	2	3	4	5
Ecommerce	1	2	3	4	5
General information	1	2	3	4	5
Job Search	1	2	3	4	5
Chatting	1	2	3	4	5
Multimedia	1	2	3	4	5
Games	1	2	3	4	5

15- How you contact with your colleague?

Contact Type	None 1	Rarely 2	Little 3	Sometimes 4	More 5
Face to Face interview	1	2	3	4	5
Telephone call	1	2	3	4	5
E-mail	1	2	3	4	5

16- Do you feel that the internet is a good alternative?

(Please circle the number that meet your perspective)



Thanks a lot

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