

Survey Data Report for Tech Literacy Project

Numbers of questionnaires: 123

Valid Number: 94

Date: March - May 2019

Last modified: July 29, 2019

Thematical Statements:

1. Although there are many different types of electronic devices on the market, these electronic devices are not well integrated into their hobbies, transportation, entertainment and other aspects of life.
2. Communication is the most basic need that technology can provide for the elderly, but it has not met the standards that satisfy and fulfill their needs.
3. Older Americans, who have higher education levels, also have a great familiarity of using technology products and value-added functions, such as entertainment and education. And older Americans with lower education are more eager for basic technology services, such as transportation, communication, exercise, and medical care.
4. For much older people (over 85 years old), they are more likely to use taxi services and ask families to drive them than before and less public transportation. This trend grows with age. Since car services are much more expensive than public transportation, we assume that their commuting cost and the efforts of taking care of them are increasing.
5. Older people tend to seek a single channel of help when they encounter technical problems. However, people who seek for help in more channels do not have a higher knowledge in technology and autonomy.
6. Personal autonomy, participation and technological familiarity are positively correlated, and it seems that higher autonomy leads to higher participation with a stronger correlation than it affects higher technological familiarity (the Correlation Coefficient between autonomy and participation is 0.688, which is much larger than that 0.353 between autonomy and technology).
7. There are three primary personas in our surveys:
 - 45.7% percent of the participants are highly self-autonomous and independent on digital devices currently, but they are willing to learn new technology and are engaged in socializing.
 - 38.3% of them are highly independent, self-reliable, but they are also caring and eager to help others. However, they seldom use technology and are unwilling to learn it.
 - 10.6% percent of them are easily following the trend and might be highly dependent on others. They use digital devices now, but they are uncomfortable with new technology and think that it is a challenge to access veritable and useful information.

Implications for Design:

Facts	Interpretations	Implications
<p>Only around 26% of their hobbies are related with digital devices</p> <p>33% of them know less about digital devices that we defined</p> <p>Communication ranks in the first place where 39% of them choose it as where they mostly need tech-support</p> <p>97% of them still use telephone as their main communication mean to contact family and friends</p>	<p>1. Although there are many different types of electronic devices on the market, these electronic devices are not well integrated into their hobbies, transportation, entertainment and other aspects of life.</p> <p>2. Communication is the most basic need that technology can provide for the elderly, but it has not met the standards that satisfy and fulfill their needs.</p>	<p>Communication can be used as a portal for older people to familiarize technology products. (Comments: there are many social media apps today, they have different characteristics, and some might differ by different platforms, which means, the learning efforts might be a little higher)</p>
<p>In older groups or lower education levels, the percentage of people with less knowledge of digital devices is higher than other levels.</p> <p>people who are in elementary educational level has a higher need in transportation and exercise than people who are in advanced educational level. While the situation reverses when it comes to entertainment and education.</p>	<p>3. Older Americans, who have higher education levels, also have a great familiarity of using technology products and value-added functions, such as entertainment and education. And older Americans with lower education are more eager for basic technology services, such as transportation, communication, exercise, and medical care.</p>	<p>Perhaps we need to consider the complexity of learning new technology in different levels, and we can motivate themselves to learn by helping with each other. (Comments: maybe there should be some rewards that could facilitate people who are in a high technology level helping others)</p>
<p>The frequency of going out decreases with age.</p> <p>For the elderly who are older, they are more likely to use taxi and car than before, and less public transportation.</p>	<p>4. For much older people (over 85 years old), they are more likely to use taxi services and ask families to drive them than before and less public transportation. This trend grows with age. I assume that their commuting cost and their social cost might also increase.</p>	<p>Older people might have chronic disease or other physical disability. We might need to put more consideration into this. (Comments: how to enchant our smart object, to make it more humanistic, the serial number on the back of an iphone is difficult to read)</p>
<p>They depend a lot on their family members or friends for supports.</p> <p>Only 17% percent of them choose more than two options when they met technology issues.</p> <p>There are no significant differences in terms of their technology and autonomy scores between people who have more channels to ask for supports.</p>	<p>5. Older people tend to seek a single channel of help when they encounter technical problems. However, people who seek for help in more channels do not have a higher knowledge in technology and autonomy.</p>	<p>It is ideal if we could provide more channels for them to seek for help. However, the more importantly is how to make sure those channels work, what kinds of supports those resources could provide, how to match those resources with their learning curves and how to manage their expectations step by step.</p>

<p>the Correlation Coefficient between autonomy and participation is 0.688, which is much larger than that 0.353 between autonomy and technology</p>	<p>6. Personal autonomy, participation and technological familiarity are positively correlated, and it seems that higher autonomy leads to higher participation with a stronger correlation than it affects higher technological familiarity</p>	<p>Participation could bridge people from high autonomy to high technology familiarity. Which means, it might be worth considering games, communications, interest group which are easy to apply by technology. This could also be an approach for mitigating their resistance to technology products.</p>
<p>45.7% percent of the participants are highly self-autonomous and independent on digital devices currently, but they are willing to learn new technology and are engaged in socializing.</p>	<p>Personas</p>	
<p>38.3% of them are highly independent, self-reliable, but they are also caring and eager to help others. However, they seldom use technology and are unwilling to learn it.</p>		
<p>10.6% percent of them are easily following the trend and might be highly dependent on others. They use digital devices now, but they are uncomfortable with new technology and think that it is a challenge to access veritable and useful information.</p>		

Detailed report-

1. Background information (Q1-Q7):

In the valid questionnaire, there are 24 males and 71 females. **75% percent of them are females, far higher than the men.** The median age of our subjects is 77 years old (1-1). More than half of our subjects are White people. The number of people ranked second and third is Black or African American and Asian. The number of people in Hispanic, Latino American, and American Indian is relatively few in our subjects. **57% percent of them have an annual income of less than \$25000, and 15% of them are \$25000 to \$34999.** The rest of them are scattered in the higher income range. Other than that, 16 people did not provide their income information (1-2). By ranging the educational level of Elementary School to No degree college training as elementary and intermediate, 2-year college and university degree to graduate school degree as advanced. **72% percent of them are in elementary and intermediate level (1-3).** In terms of marital status, **47% are widowed, 19% percent are married, and 20% percent are divorced.** The remaining 12% percent are never married (1-4). **53% percent of them live alone, 17% live with spouse,** and 10% live with children and grandchildren. The remaining 12% live in the elder's center and 4% live with nurse or care giver (1-5).

2. Daily behavior information (Q8, Q14, Q15):

By categorizing their hobbies in the scenario instances of place, time, and people, we have a broad understanding of their main daily activities, where and how they do it. The features table of instances and elements of older Americans (2-1) shows that **most of them love reading, exercising, and playing games, but only around 26% percent of their hobbies are related with digital devices (2-2).** In daily commuting, we know that the older people are, the fewer times they go out, since it is inconvenient for them to travel individually. By categorizing their age into three ranges, 65-74, 75-84, and larger than 85, we find that the distribution of their frequency of going out has significant difference across the categories. **Figure 2-3 tells us that the frequency of going out decreases with age.** We also want to know if their age affects the means of transportation they choose when they go out. Therefore, we layer the transportation into different ages. The result shows that, **for the elderly who are much older, they prefer to use more taxi and family or friend's car than before and less public transportation (2-4).** The total percentage of public transportation is declining when age ascend, from 44.0% of age 65-74, to 34.6% of age 75-84, to 14.8% of age larger than 85. The total percentage of taxi and car driving is ascending from 29.4% to 42.9% to 66.6%. From those results shown above, we assume that because the elderly is less likely to go out than before and they will choose to travel by taxi and car once they go out, their single travel costs are increasing. Not only does it increase the cost of money, but also it increases the cost of others taking care of them.

3. Use condition of technology (Q9-Q13, Q16-19):

From Q9 and Q10, we find that nearly 45% percent of them know about smartphones, while 33% percent (people who only choose "did not answer" and "others") know less about digital devices that we define. In addition to that, we categorize this group according to different ages and levels of education. **In older groups and lower education levels, the percentage of people with less knowledge of digital devices is higher (3-1).** In terms of where they mostly need technology support, communication ranks in the first place where 39% of people choose it. Medical care, transportation, shopping, and entertainment goes to the second place. Details are listed in figure 3-2. Also, if comparing the data into different ages, we find that the results are different. **For people's age in 65 to 74, the top three situations where they need technology support are communication, medical care, and entertainment. For people's age in 75 to 84,**

the top three are communication, exercise, and medical care. For people's age over 85, they are transportation, shopping, and communication (3-3). Additionally, if comparing the data into levels of education, the top three situations in elementary level are transportation, exercise, and medical care, the top three in intermediate level are communication, shopping, and exercise, and in the advanced level, they are communication, entertainment, and medical care. What interests us also is that people who are in elementary educational level have a higher need in transportation and exercise than people who are in advanced educational level. While the situation reverses when it comes to entertainment and education. And the communication accounts for a high proportion of all three groups (3-3).

In terms of information channels for technology supports, option- the "family members or friends" ranks the first place where they can reach out to. And the "self-study based on my own interests" goes to the second place. The total percentage of "community" and "home for the elders" are far less than the first one. Assumed that the option "self-study based on my own interests" represents higher self-autonomy of people who choose it, we find that 44.8% percent of people within that group are in a higher educational level, and its percentage increases with the growth of education level (3-4). The significant level is 0.039 which is smaller than 0.5, showing that people who choose "self-study based on my own interests" have significant difference within the groups of different education levels.

Telephone is highest communication mean for they to contact family and friends. 97% percent of people choose it. Social media such as twitter and Facebook have a much lower percentage, one is 18% and another is 3%. 36% percent of them choose email as the second communication mean. 16% percent of people use video chat to contact their family and friends (3-5). There are 48% percent of people who have never used self-service devices before. 37% percent of them are use the device occasionally and only 8% percent of people frequently use them.

75% percent of them ask for help from family members or friend when they have technology issue. 21% percent of them ask for help from a service, 20% percent of them search in the internet, and 19% percent of them refer to the manual (3-6). In the group of asking for help from family members and friends, 44% percent of people within that group also choose other options for help, while only 17% percent of them choose more than two options when they met technology issues. We also find that this group of people who have more than two options are almost highly educated. What's more, we know that more choices can give people more autonomy. In the surveys, 57% percent of them only choose one option of asking for help. Therefore, it might be an indication that more channels for them to ask for help could increase their self-autonomy and technology familiarity. In the question that which places they think smart devices inconvenience them the most, 34% percent of people choose restaurant, 28% percent of them choose bank, 21% percent of them choose hospital, and 19% percent of them choose transportation (3-7).

4. Score of autonomy, participation, and technology:

By comparing the median of the three sets of data, we learn that people behave more positive in the participation, the score is 69. The second place is the autonomy score-67. The technology score goes to the last. The score is 49, which is much lower than autonomy and participation (4-1). In general, we assume that people who have a higher participation score may also have a higher score in autonomy and technology. By using spearman's correlations analysis, the chart did provide evidence that shows positive correlations between autonomy, participation, and technology (4-2). Furthermore, it also shows that the correlation level of autonomy and participation is the highest, then the second correlation is the level of technology and participation, and then the level of autonomy and technology.

By using factors analysis and cluster analysis, we detail the questionnaire into 7 main factors that lead to 3 primary personas. The seven main factors are “sociable with free spirit”, “thoughtful and popular who always eager to help”, “dependable and comfortable with technology”, “open minded and positive with new technology”, “self-protected and independent”, “autonomous with useful information”, and “self-control” (4-3). By removing the categories of fewer samples, we categorize three primary personas for our subjects. 45.7% percent of them are high self-autonomous and not dependent on digital devices currently but are willing to learn new technology and are engaged in socializing. 38.3% of them are highly independent, self-protected, but also caring others and are eager to help others. However, they don’t use technology much and are not willing to learn. 10.6% percent of them are easy following the trend and might be highly dependent on others. They use digital devices now but are not welcome with new technology and think that it is a challenge to access right and useful information (4-4).

Figures-

Figure 1-1 Age and Gender

Age range	Male	Female
65-74	13	27
75-84	10	28
>=85	1	14
unknown		2
Median Age	77	77
Total Number	24	71

Figure 1-2 Income Range

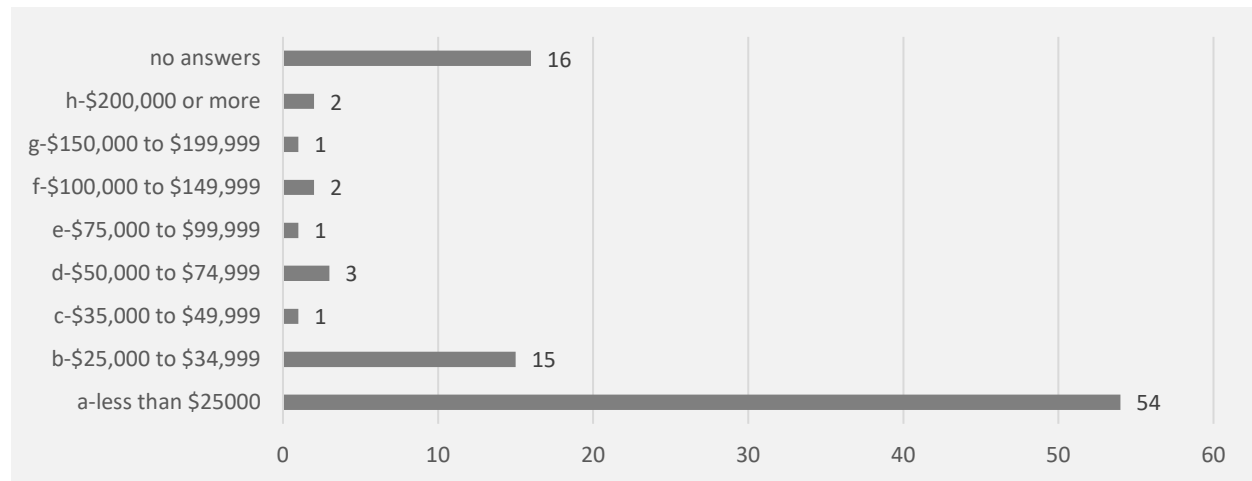


Figure 1-3 Education Level

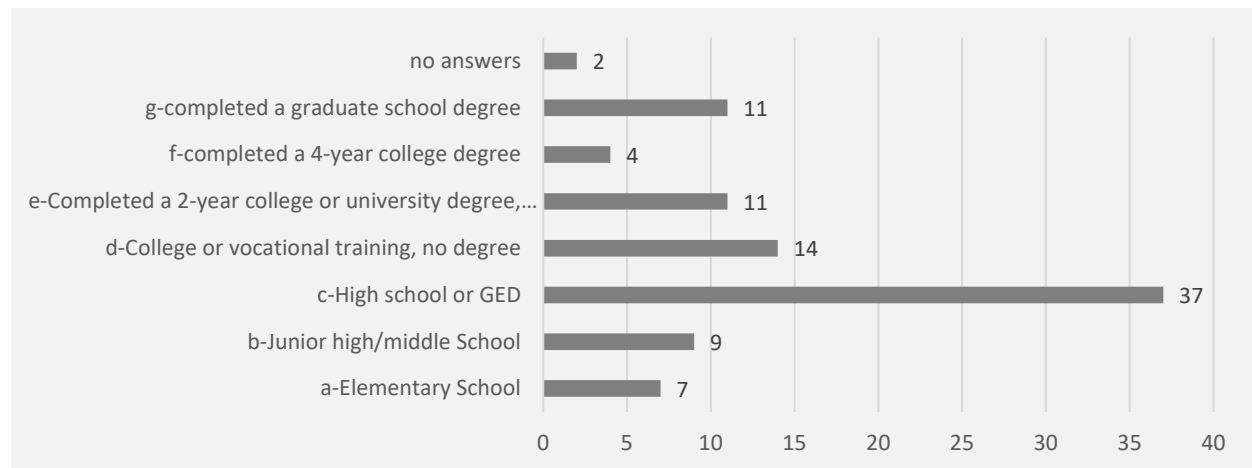


Figure 1-4 Marital Status

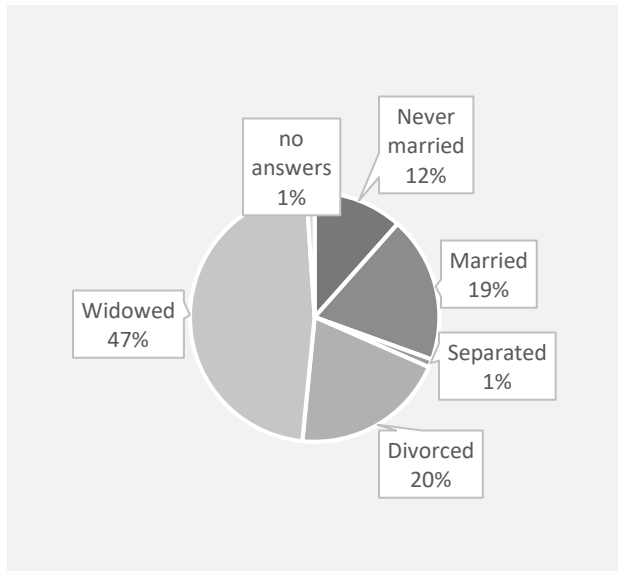


Figure 1-5 Who do they live with

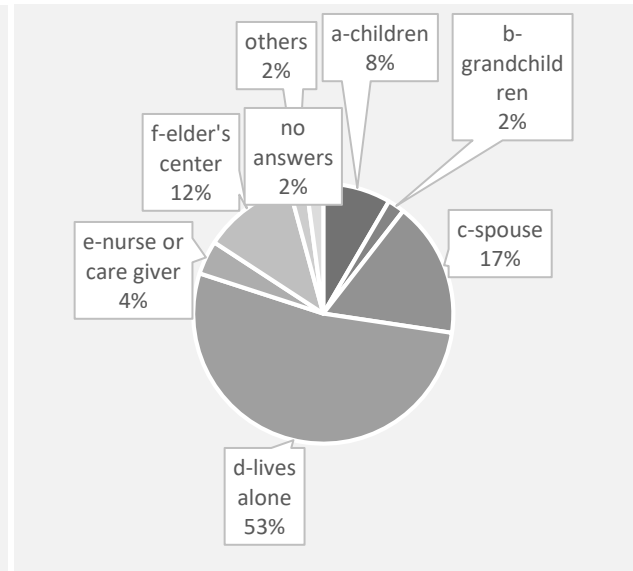


Figure 2-1 Instances and elements for hobbies descriptions

Study	Exercise	Crafts and Arts	Daily Chores	Media Entertainments
reading, researching, writing, etc.	dancing, working out, exercising, running, walking, Tai Chi, etc.	decorating, painting, DIY, collecting coins, etc.	cooking, gardening, quilting, sewing, knitting, etc.	photographing, watching TV, listening to music, playing computer games, wechatting, etc.
Social Activities	Games			
dancing, playing cards, mahjong, enjoy going to daycare, church, etc.	playing puzzles, crosswords, bingo, domino, mahjongg, etc.			

Figure 2-2 Hobbies

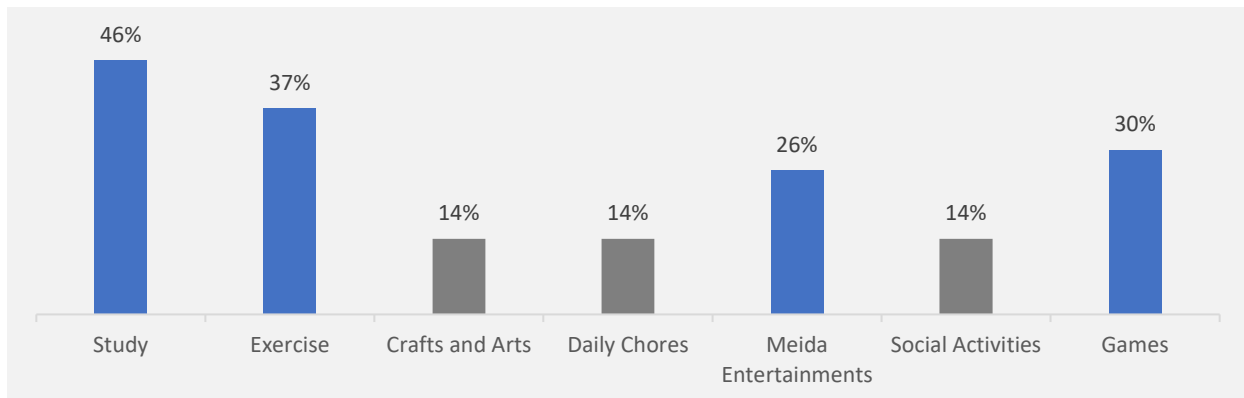


Figure 2-3 Independent and Correlations of age and how frequently they go outside

Independent-Samples Kruskal-Wallis Test Summary

Total N	92
Test Statistic	6.401 ^a
Degree of Freedom	2
Asymptotic Sig. (2-sided test)	.041

a. The test statistic is adjusted for ties.

Correlations		how frequently do they go out	age
Kendall's tau_b	how frequently do they go out	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	94
age	age	Correlation Coefficient	.195*
		Sig. (2-tailed)	.016
		N	92

*. Correlation is significant at the 0.05 level (2-tailed).

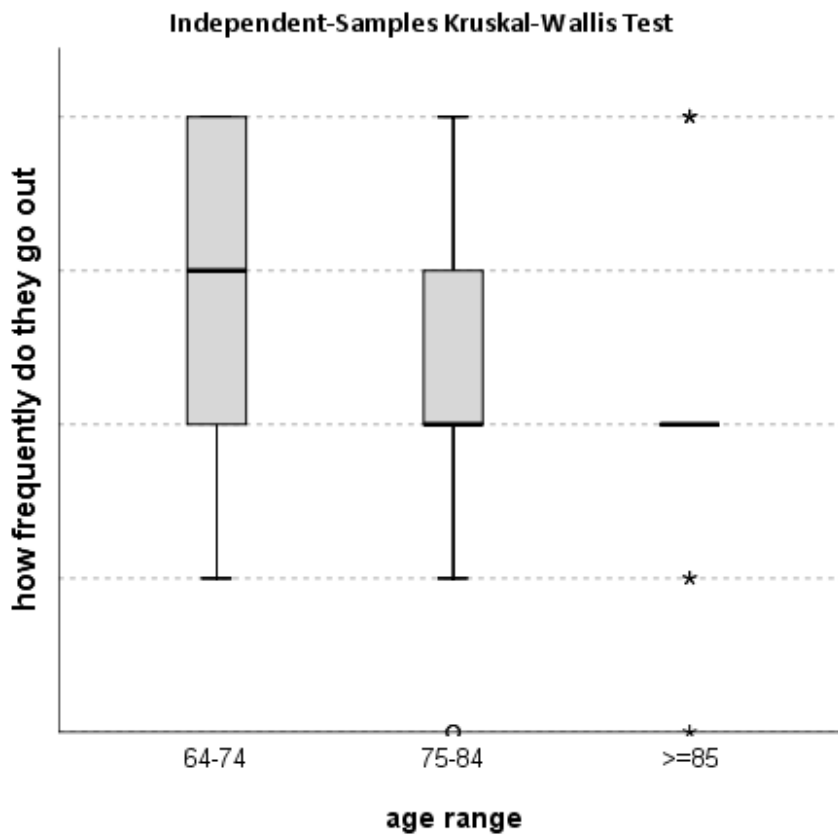


Figure 2-4 Transportations Crosstabulation

			Subway	Bus	Train	Plane	Bicycle	Walking	Taxi	Car (driving yourself)	Family of friend's car	Others	
Age	65-	Count	13	24	11	3	2	19	2	15	15	5	109
Range	74	% within Q1_1	11.9%	22.0%	10.1%	2.8%	1.8%	17.4%	1.8%	13.8%	13.8%	4.6%	
	75-	Count	10	15	4	3	3	11	5	14	17	2	84
	84	% within Q1_1	11.9%	17.9%	4.8%	3.6%	3.6%	13.1%	6.0%	16.7%	20.2%	2.4%	
	>=85	Count	2	2	0	1	0	4	2	6	10	0	27
		% within Q1_1	7.4%	7.4%	0.0%	3.7%	0.0%	14.8%	7.4%	22.2%	37.0%	0.0%	
Total		Count	25	41	15	7	5	34	9	35	42	7	220

Percentages and totals are based on responses.

a. Dichotomy group tabulated at value 1.

			Subway	Bus	Train	Plane	Bicycle	Walking	Taxi	Car (driving yourself)	Family of friend's car	Others	
Age	65-	Count	13	24	11	3	2	19	2	15	15	5	40
Range	74	% within Q1_1	32.5%	60.0%	27.5%	7.5%	5.0%	47.5%	5.0%	37.5%	37.5%	12.5%	
	75-	Count	10	15	4	3	3	11	5	14	17	2	38
	84	% within Q1_1	26.3%	39.5%	10.5%	7.9%	7.9%	28.9%	13.2%	36.8%	44.7%	5.3%	
	>=85	Count	2	2	0	1	0	4	2	6	10	0	15
		% within Q1_1	13.3%	13.3%	0.0%	6.7%	0.0%	26.7%	13.3%	40.0%	66.7%	0.0%	
Total		Count	25	41	15	7	5	34	9	35	42	7	93

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

Figure 3-1 People who have fewer technology knowledge in different ages and education level

	65-74	75-84	>=84	Low education level	Middle education level	High education level	
Count	11	14	7	9	18	4	
number of people within that group	40	38	15	16	51	26	
% within	28%	37%	47%	56%	35%	15%	

Figure 3-2 Where do they mostly need technology support

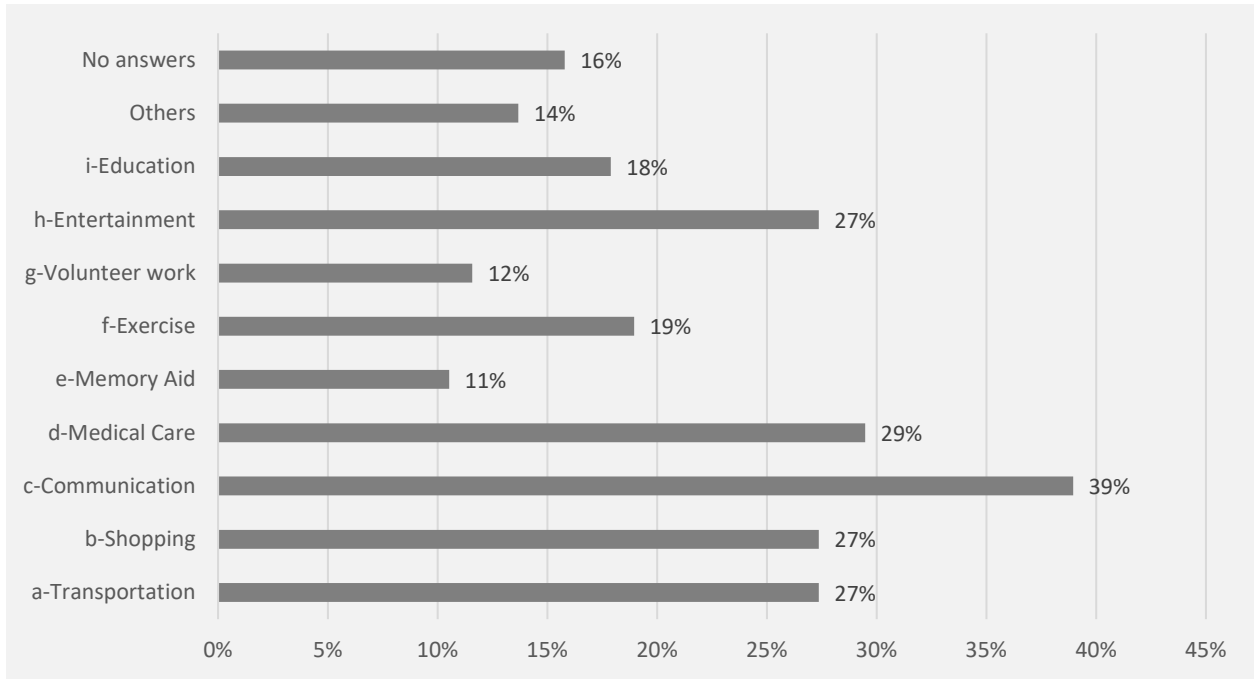


Figure 3-3 Places where they need technology support Crosstabulation

		transpo	Shoppi	comm	medic	memo	volunte	entertai	educat	others			
		rtation	ng	unicati	al care	ry aid	er work	nment	ion				
Age Range	65-74	Count	9	12	19	14	7	10	5	13	10	5	33
		% within Q1_1	27.3%	36.4%	57.6%	42.4%	21.2%	30.3%	15.2%	39.4%	30.3%	15.2%	
	75-84	Count	10	8	12	11	6	12	2	10	2	5	34
		% within Q1_1	29.4%	23.5%	35.3%	32.4%	17.6%	35.3%	5.9%	29.4%	5.9%	14.7%	
	>=85	Count	7	6	5	3	1	3	1	2	4	2	12
		% within Q1_1	58.3%	50.0%	41.7%	25.0%	8.3%	25.0%	8.3%	16.7%	33.3%	16.7%	
Total	Count	26	26	36	28	14	25	8	25	16	12	79	

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

	% within self-study based on my own interests	63.5%	37.9%	55.4%
	Adjusted Residual	2.3	-2.3	
advanced	Count	13	13	26
	Expected Count	17.8	8.2	26.0
	% within education level range	50.0%	50.0%	100.0%
	% within self-study based on my own interests	20.6%	44.8%	28.3%
	Adjusted Residual	-2.4	2.4	
Total	Count	63	29	92
	Expected Count	63.0	29.0	92.0
	% within education level range	68.5%	31.5%	100.0%
	% within self-study based on my own interests	100.0%	100.0%	100.0%

Figure 3-5 What communication means do you often use when you need to contact family and friends?

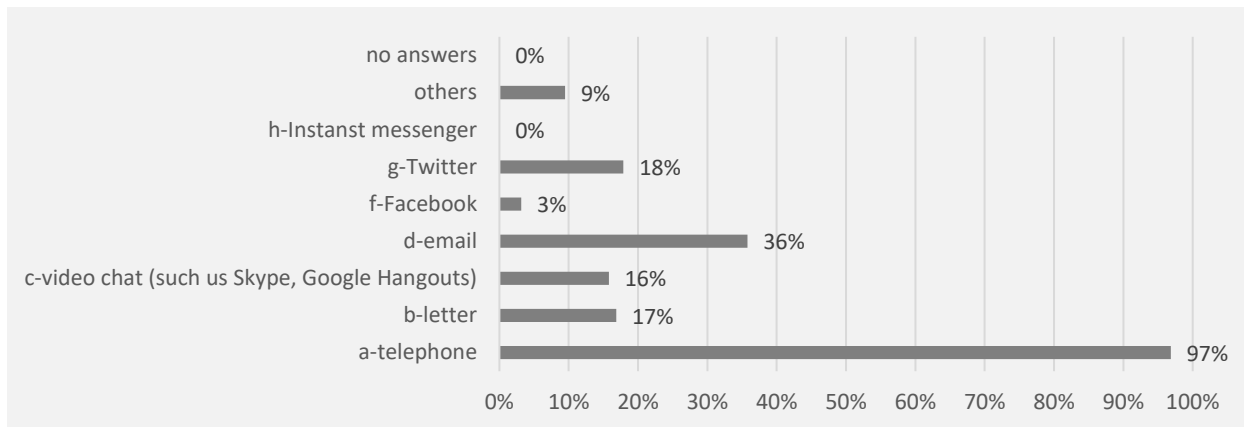


Figure 3-6 Which places do you think smart devices inconvenience you the most?

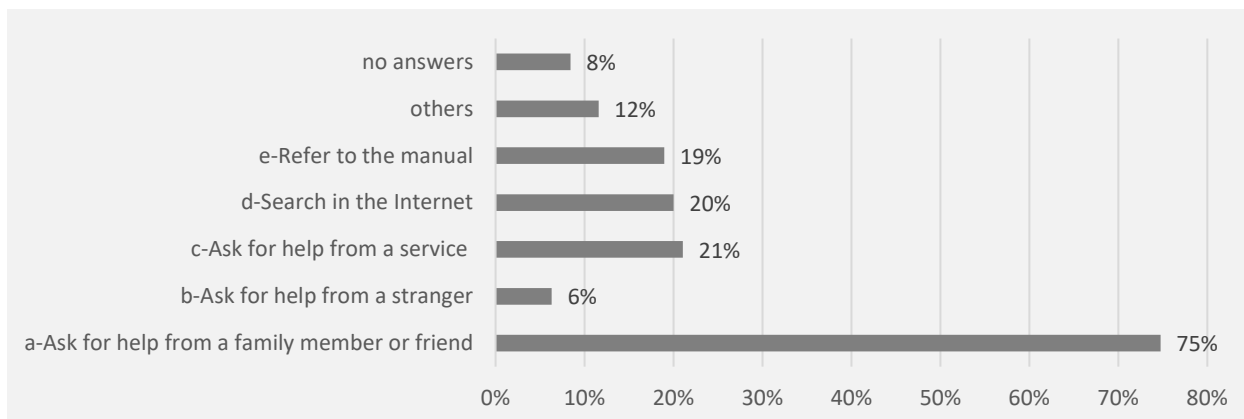


Figure 3-7 Which places do you think smart devices inconvenience you the most?

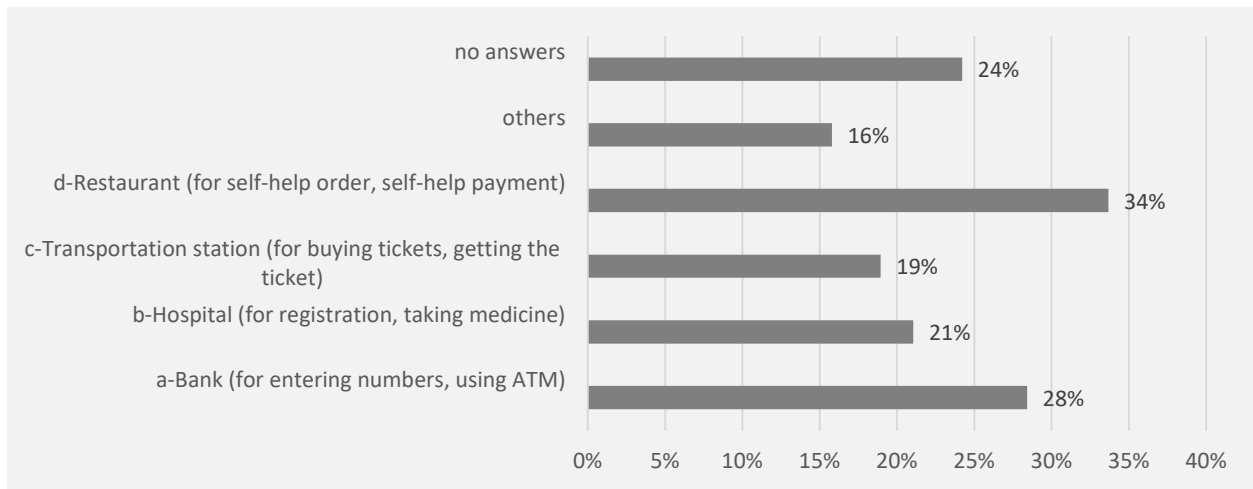


Figure 3-8 Descriptive data of people's tech and autonomy score in Q18 by categorizing them into how many options they choose

How many options they choose when their technology issues are not resolved			Statistic	Std. Error
technology	only one option	Mean	48.82	1.726
		Median	49.00	
	two options	Mean	53.71	3.712
		Median	57.00	
	more than two options	Mean	52.81	3.848
		Median	47.50	
autonomy	only one option	Mean	64.63	1.252
		Median	67.00	
	two options	Mean	65.35	2.748
		Median	69.00	
	more than two options	Mean	65.44	2.068
		Median	66.00	

Figure 4-1 Descriptive Statistics of Autonomy, Participation, and Technology

	N	25th	Percentiles 50th (Median)	75th
autonomy score	95	59.00	67.00	70.00
participation score	95	64.00	69.00	74.00
technology score	95	40.00	49.00	61.00

Figure 4-2 Correlations of Autonomy, Participation, and Technology

		autonomy score	technology score	participation score	
Spearman's rho	autonomy score	Correlation Coefficient	1.000	.353**	.688**
		Sig. (2-tailed)	.	.000	.000
		N	95	95	95
	technology score	Correlation Coefficient	.353**	1.000	.530**
		Sig. (2-tailed)	.000	.	.000
		N	95	95	95
	participation score	Correlation Coefficient	.688**	.530**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	95	95	95

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

Figure 4-3 Matrix of primary factors and their corresponding elements

	1	2	3	4	5	6	7
It is important for me to feel connected with my community	.795						
Pursuing spirituality (for example, the good or the truth) is important to me	.638						
I like to listen to other people	.635						
I care a lot about how I look when I go to public places	.622						
I regularly participate in community events, such as church and local events.	.597						
I enjoy doing and completing my tasks	.582						
I know how I can reach out to a service or people if I need to do something (like making reservations).	.561						
I make my own decisions and feel comfortable expressing my opinions	.549						
I have a good understanding of my goals, and I can plan how to achieve them	.516						
I treat other people with respect		.827					

I feel like I am a valuable person.		.745				
I feel like other people treat me with respect.		.624				
I want to help other people who are in a bad situation		.568				
When I really want to do something, I usually find a way to succeed in it.		.547				
I like to make new friends.		.542				
I get well along with others, including relatives and friends.		.527				
I know most functions of my mobile device		.697				
I download many apps in my mobile device and often use them.		.694				
I handle most activities of daily life with my mobile device		.660				
My mobile device plays an important role in my life		.624				
I feel comfortable learning new technology		.617				
I feel confident using computers, smartphones, or other electronic devices to do things online		.611				
I feel the need to learn more technology.			.774			
I would like to use more smart technology devices			.743			
I am proud of myself when I learn new technology			.683			
I find it difficult to live without smart technology devices			.565			
I can lift shopping bags or other heavy things without others' help.				.718		
I have no problem with going out by myself				.647		
I have no problem with doing my house chores every day.				.609		
I do not want other people doing physical work for me.				.578		
When I go out, it is easy for me to find the information I need					.571	

I find it easy to know whether the information I find online is trustworthy.						.544	
I have much control over the things that happen to me.							.662
There is much I can do to change many of the important aspects of my life							.612

Figure 4-4 Final Cluster Centers

	1	2	3	4	5
Sociable with free spirit	-3.28378	.22350	.00044	1.50086	-.07681
Thoughtful and popular who are eager to help	-1.98030	.06516	.09235	-4.65818	.32033
Dependable and comfortable with technology	-.06298	.09352	.27191	.47731	-2.0850
Open minded and positive with new technology	.08887	.54595	-1.02883	.01121	-3.7435
Independent and self-protected	-.76344	-.06473	-1.69468	1.23804	.54290
Autonomous with useful information	.71392	.41383	-.59250	-.11617	-3.8276
Self-control	-.14103	.43293	-.12626	-1.33912	-3.9589

Number of Cases in each Cluster

Cluster	1	3.000
	2	43.000 (45.7%)
	3	10.000 (10.6%)
	4	2.000
	5	36.000 (38.3%)
Valid		94.000
Missing		.000

Figure 4-5 Scores of Layers of Participation

Layers of Participation	Question Classification			Total
	Autonomy	Participation	Technology	
Coproduction	14.50	17.00	12.00	41.00
Argumentation	17.00	19.00	13.00	48.00
Experience	16.50	17.00	14.50	48.00
Commitment	19.00	18.00	12.00	48.00
Total	67.00	69.00	49.00	

a. data does not follow a normal distribution, so comparing in median score

b. total score for each cross-table grid is 20.00, total score for each layers of participation is 60, total score for each question category is 80.