Supporting Information for the Article:

Urban Sustainability and Livability: an analysis of Doha's urban-form and possible mitigation strategies

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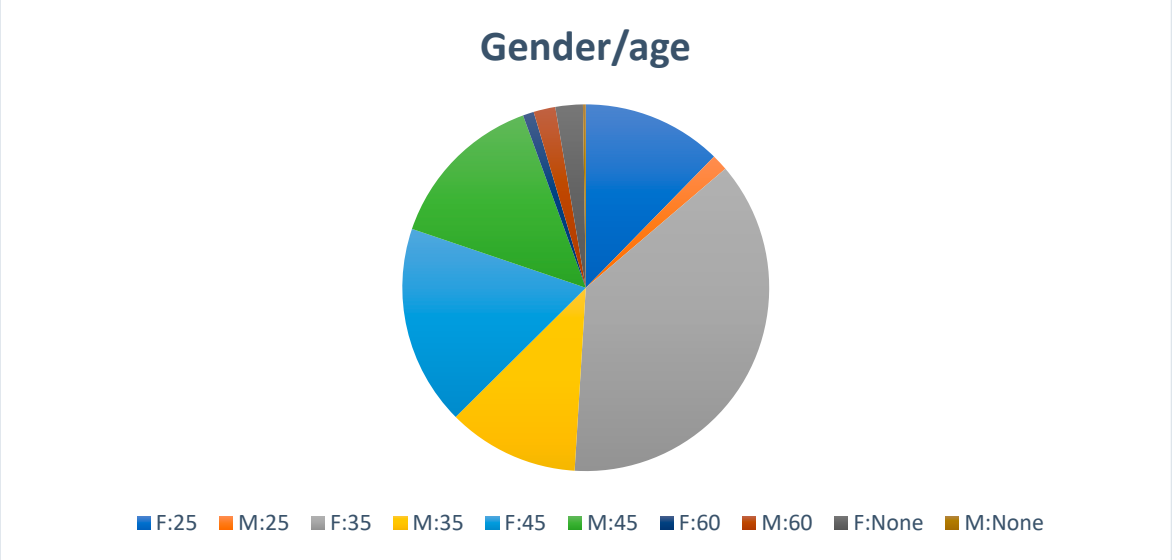
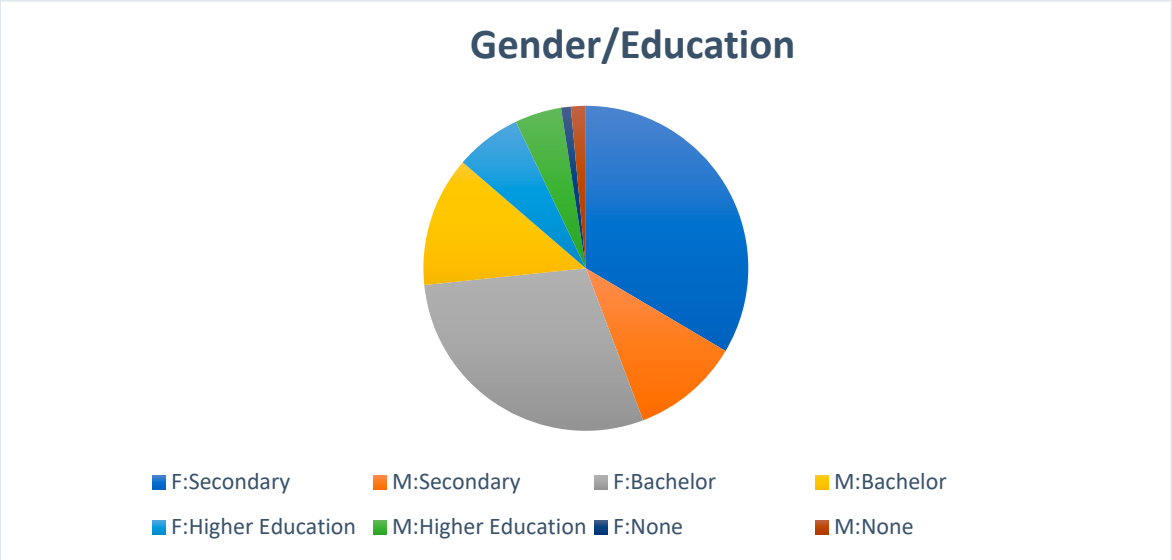
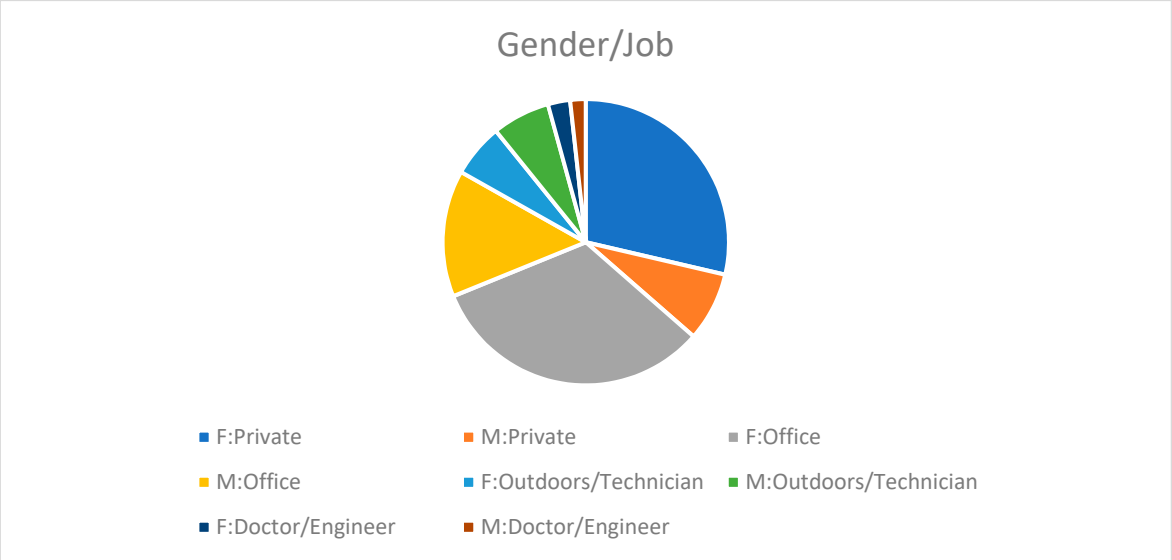
Summary of Questionnaire Results

1. *General Information of the partcipents:*

Info.	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Age	25-35		36-45		45-55		55+		none	
	51	6	154	48	73	59	4	8	10	1
Education	Secondary		Bachelor		Higher Education		None			
	137	44	119	53	27	19	4	6		
Job	Private		Office		Outdoors/Technician		Doctor/Engineer			
	114	31	129	57	24	26	10	7		







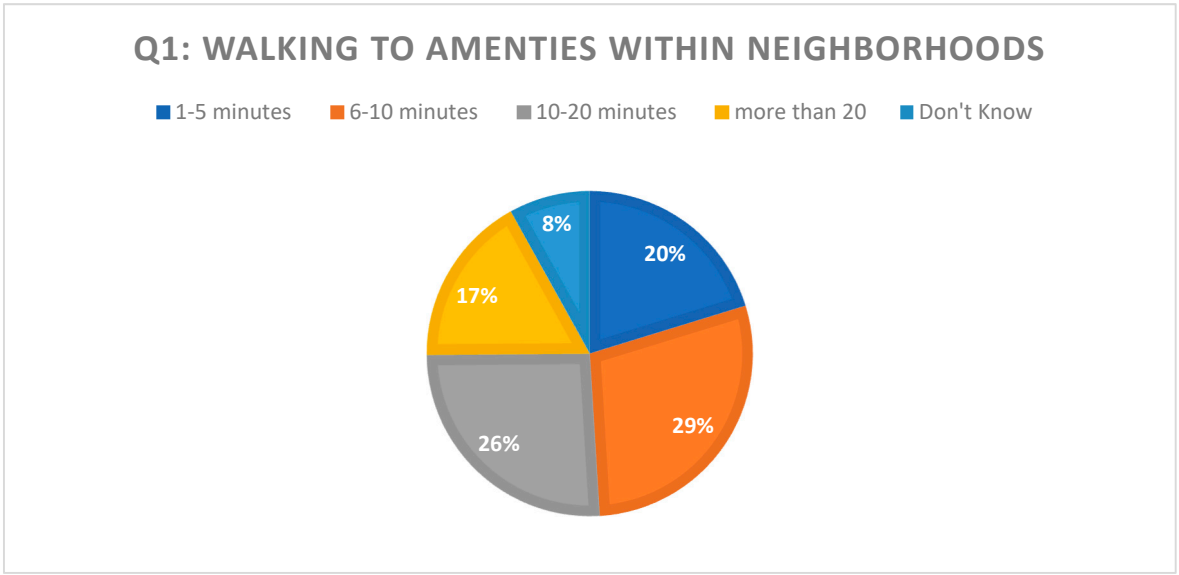
2. *Total- Attitude towards walkability::*

majority within	*1-5 minutes*	*6-10 minutes*	*10-20 minutes*	*more than 20*	*Don't Know*
Q1: About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Please put only one check mark (√) for each business or facility.	*83*	*118*	*106*	*70*	*33*

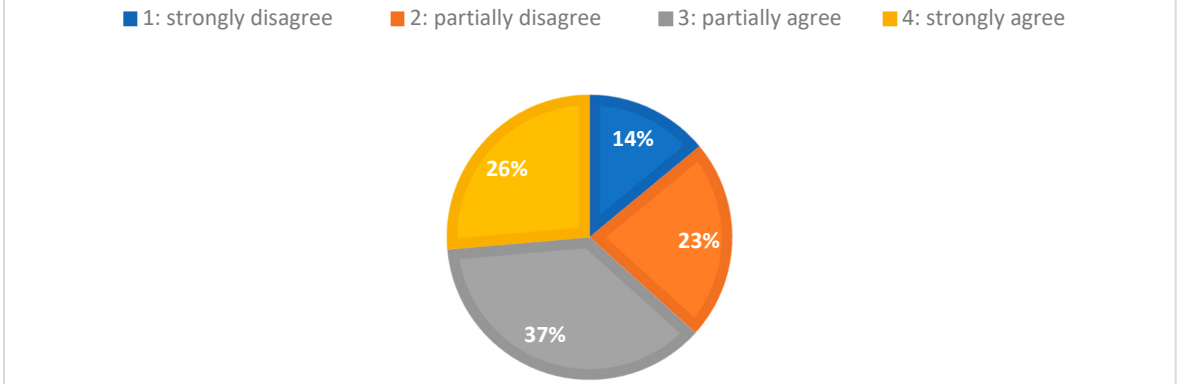
	1: strongly disagree	*2: partially disagree*	*3: partially agree*	*4: strongly agree*	
a. Access to services:					
2. Neighborhood Stores are within easy walking distance of my home	*61*	*99*	*161*	*115*	
3. There are many places worth walking to from my home.	*61*	*91*	*146*	*110*	
b. Walking and cycling lanes					
4. My neighborhood sidewalks are well maintained (paved, even, and not a lot of cracks).	*153*	*100*	*85*	*72*	
5.There are bicycle or pedestrian lanes within my neighborhood that are easy to get to.	*154*	*126*	*86*	*41*	
6. It is safe to ride a bike within my neighborhood.	*134*	*108*	*119*	*46*	
c. Neighborhood surroundings					
7. There are shady trees along the streets in my neighborhood.	*97*	*109*	*147*	*58*	
8. There are many interesting things to look at while walking.	*56*	*86*	*151*	*119*	

d. Traffic Hazards					
9. There is too much traffic to make walking easy and pleasant in my neighborhood.	*53*	*85*	*185*	*89*	
10. Most drivers exceed the posted speed limits while driving in my neighborhood.	*140*	*110*	*113*	*44*	
e. Neighborhood safety					
11. The crime rate in my neighborhood makes it unsafe to walk day and night.	*110*	*76*	*122*	*103*	
f. Lack of Parking:					
12. Parking is difficult in local shopping areas	*78*	*91*	*151*	*94*	
g. Physical Barriers:					
13. There are major barriers to walking in my neighborhood that make it hard to get from one place to another	*120*	*126*	*125*	*54*	
h. Social Interaction While Walking					
14. My neighborhood recreation places (parks and sports facilities) make it easy for residents to meet one another.	*128*	*76*	*129*	*81*	

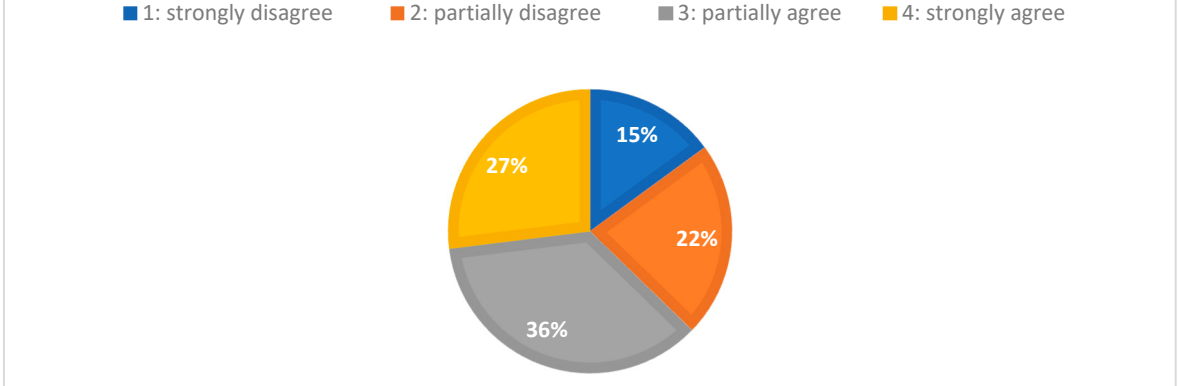
Q1: WALKING TO AMENTIES WITHIN NEIGHBORHOODS



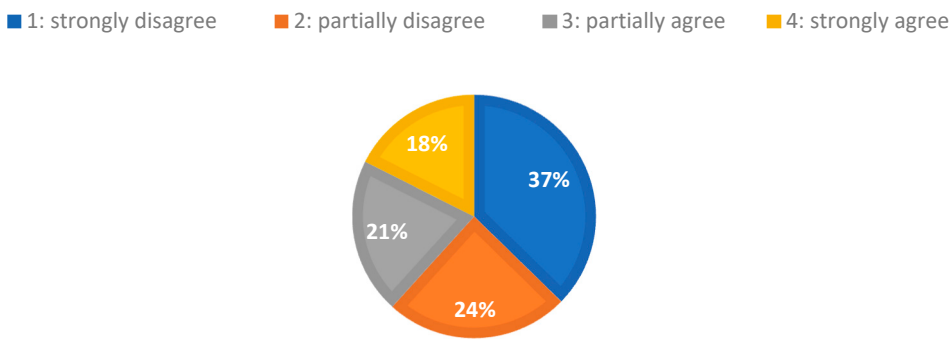
Q2 NEIGHBORHOOD STORES ARE WITHIN EASY WALKING DISTANCE OF MY HOME



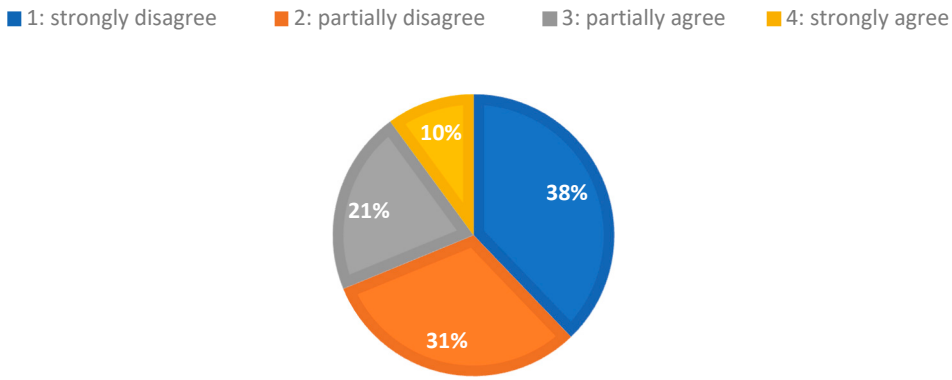
Q3 THERE ARE MANY PLACES WORTH WALKING TO FROM MY HOME

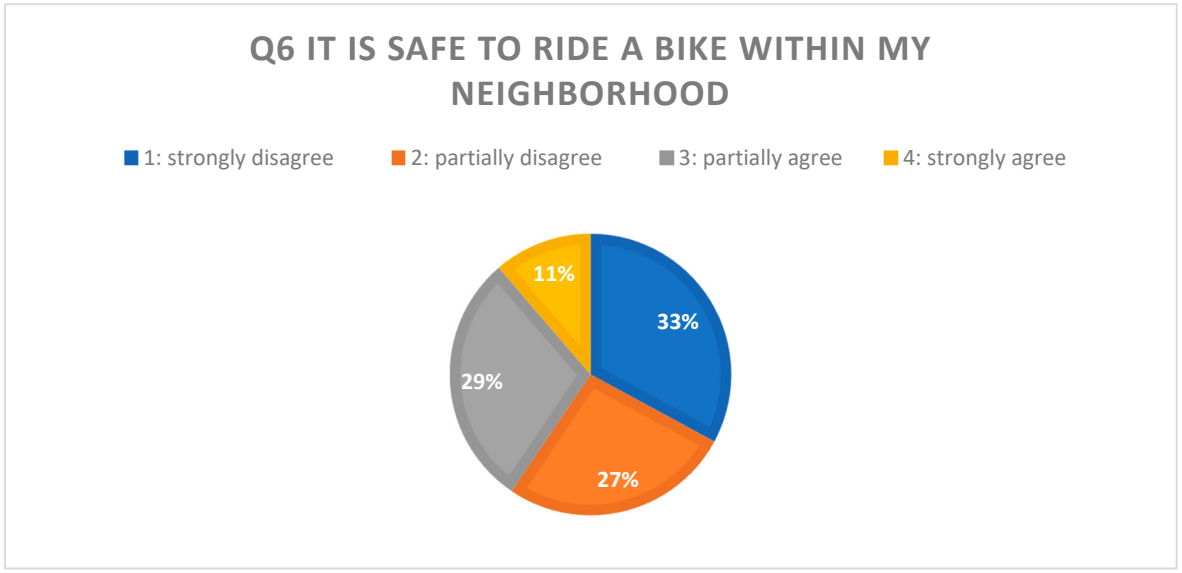


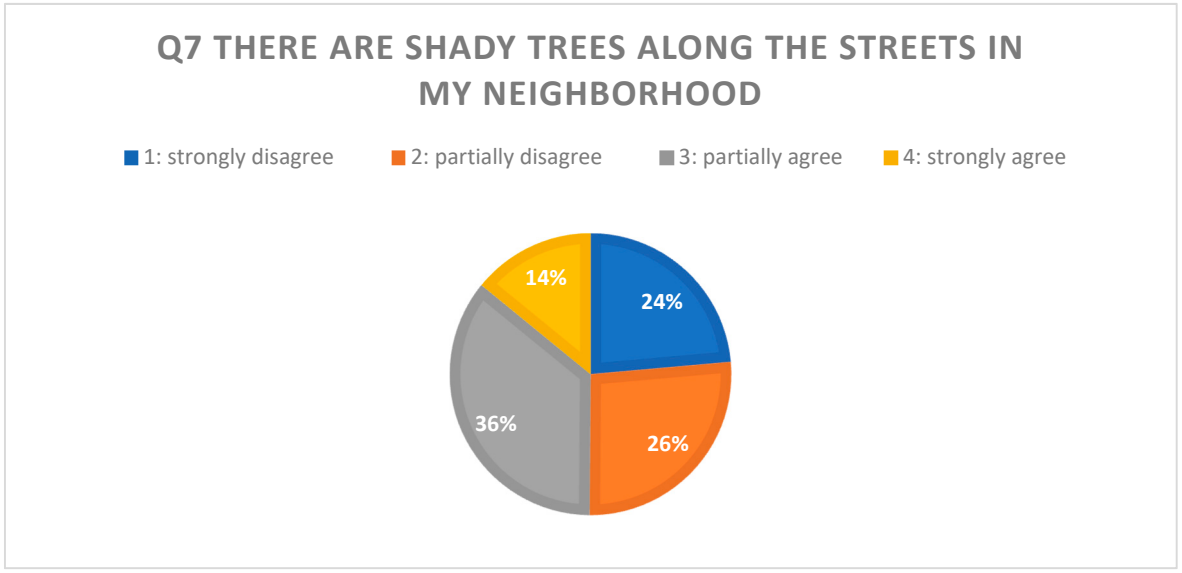
Q4 MY NEIGHBORHOOD SIDEWALKS ARE WELL MAINTAINED (PAVED, EVEN, AND NOT A LOT OF CRACKS)



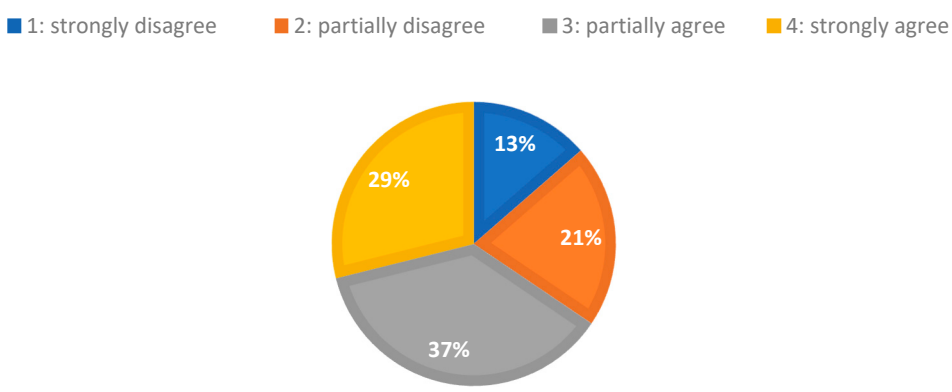
Q5 THERE ARE BICYCLE OR PEDESTRIAN LANES WITHIN MY NEIGHBORHOOD THAT ARE EASY TO GET TO.



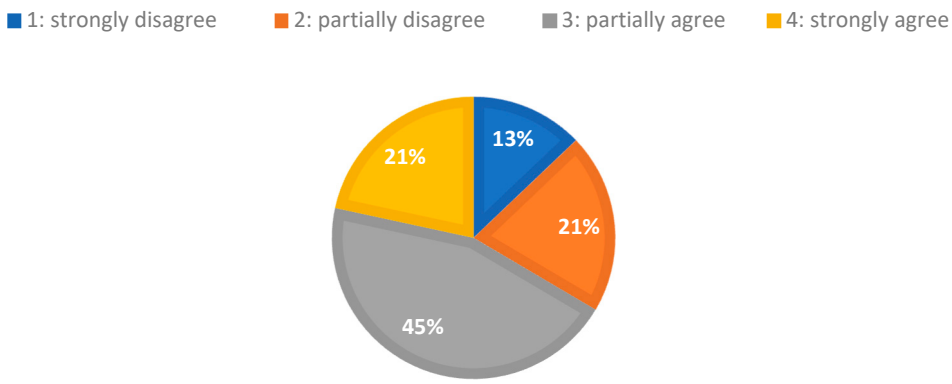

Q6 IT IS SAFE TO RIDE A BIKE WITHIN MY NEIGHBORHOOD
1: strongly disagree
2: partially disagree
3: partially agree
4: strongly agree
11%
33%
29%
27%


Q7 THERE ARE SHADY TREES ALONG THE STREETS IN MY NEIGHBORHOOD
1: strongly disagree
2: partially disagree
3: partially agree
4: strongly agree
14%
24%
36%
26%

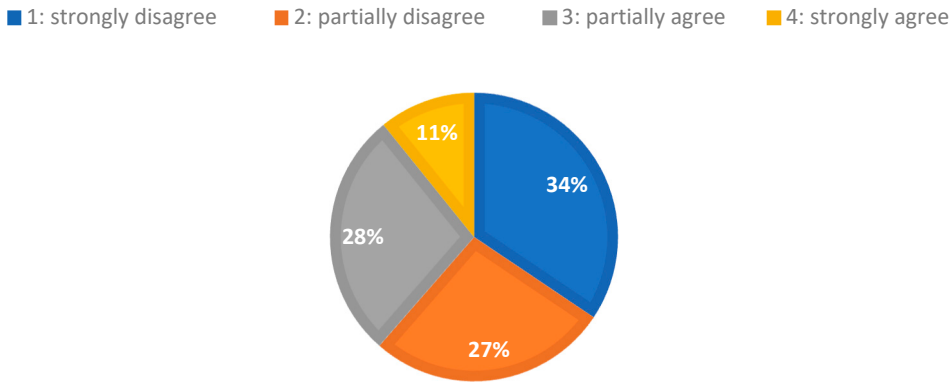
Q8 THERE ARE MANY INTERESTING THINGS TO LOOK AT WHILE WALKING



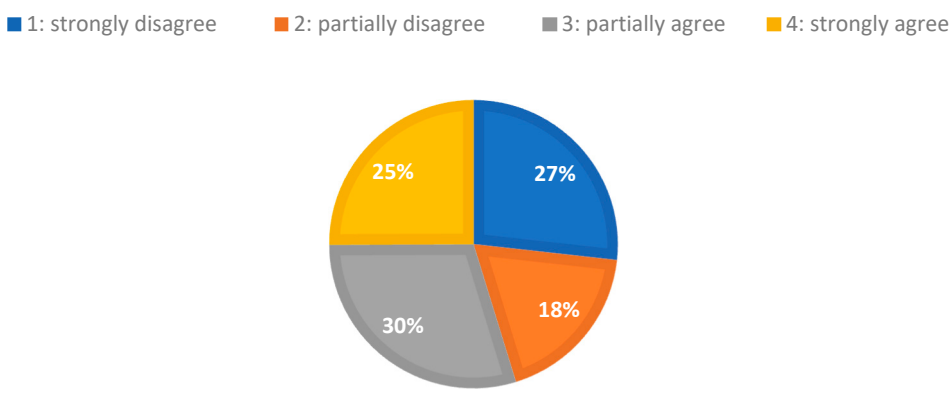
Q9 THERE IS TOO MUCH TRAFFIC TO MAKE WALKING EASY AND PLEASANT IN MY NEIGHBORHOOD



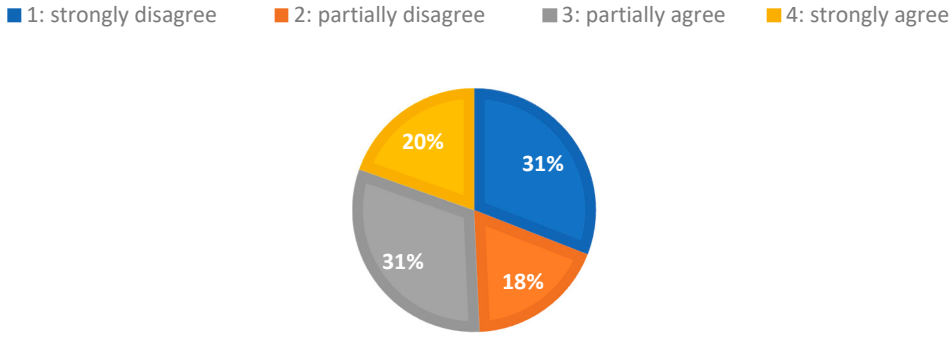
10. MOST DRIVERS EXCEED THE POSTED SPEED LIMITS WHILE DRIVING IN MY NEIGHBORHOOD

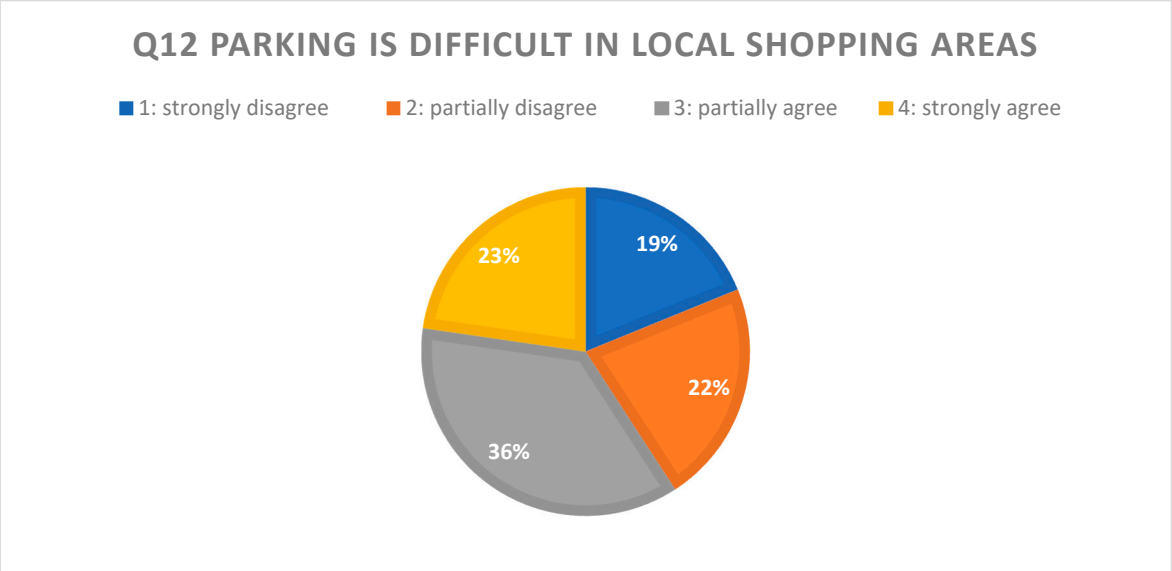


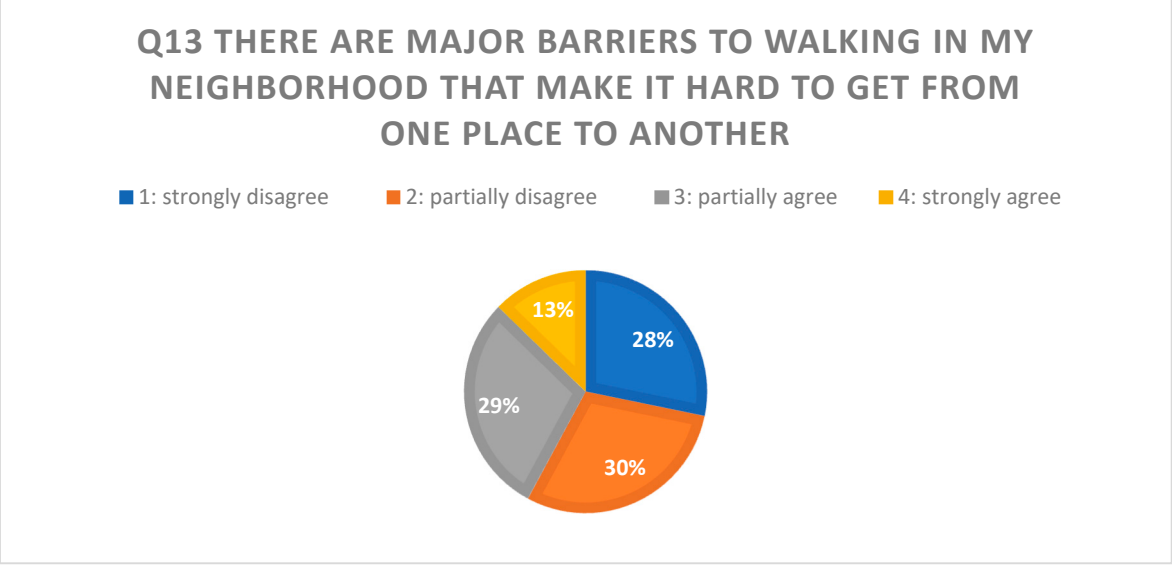
11. THE CRIME RATE IN MY NEIGHBORHOOD MAKES IT UNSAFE TO WALK DAY AND NIGHT



Q14 MY NEIGHBORHOOD RECREATION PLACES (PARKS AND SPORTS FACILITIES) MAKE IT EASY FOR RESIDENTS TO MEET ONE ANOTHER.



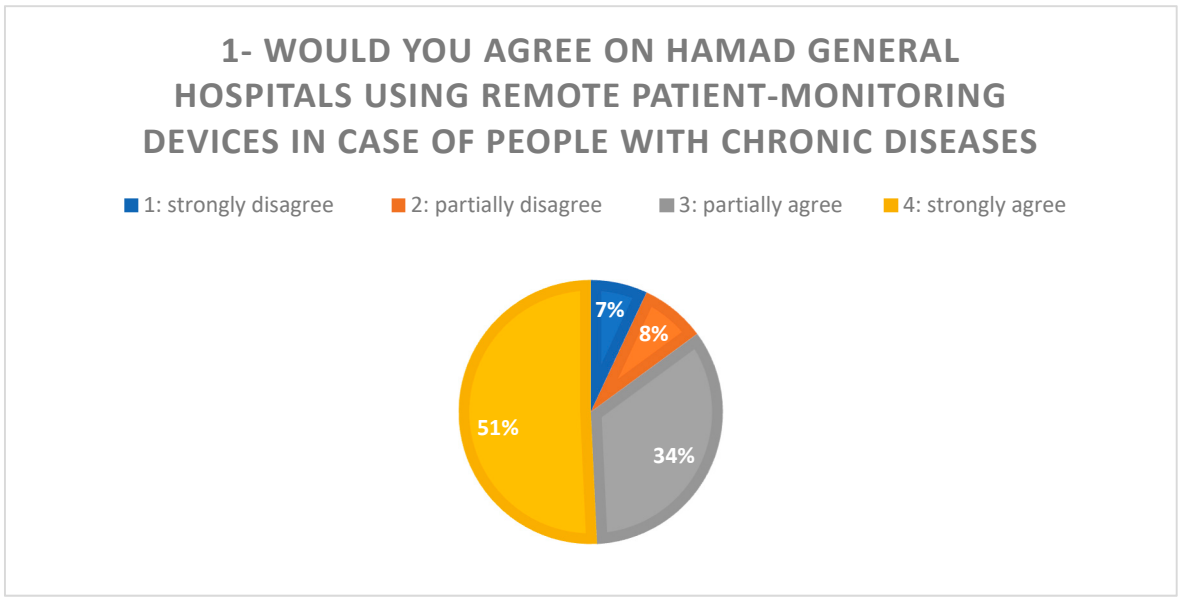


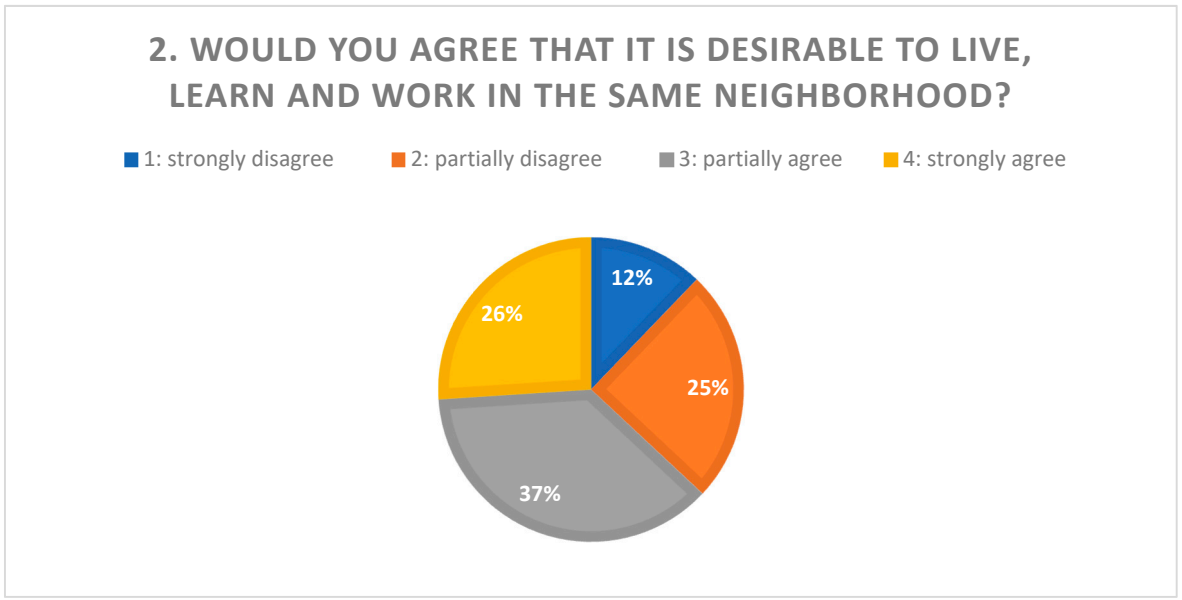


3. *Total- Attitude towards Smart:*

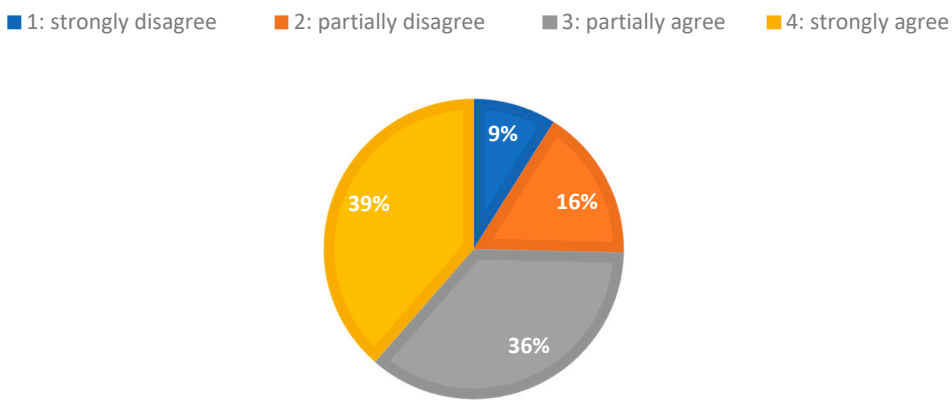
	1: strongly disagree	*2: partially disagree*	*3: partially agree*	*4: strongly agree*
E-health				

1- Would you agree on Hamad General Hospitals using remote patient-monitoring devices in case of people with chronic diseases?	*28*	*32*	*138*	*204*
2- Would You agree on receiving advice from doctors via telecommunications services?	*26*	*72*	*184*	*118*
E-learning & E-working				
1- Would you agree that the quality of education through E-learning methods is trusted?	*36*	*88*	*205*	*80*
2- Would you agree that It is desirable to live, learn and work in the same neighborhood?	*50*	*102*	*152*	*107*
3- Would you agree that E-learning and E-working will isolate community members?	*48*	*93*	*171*	*96*
4- Would you agree that E-working is more favorable than E-learning?	*32*	*109*	*211*	*59*
c. Safety and Security				
1- Data collection on traffic and road users is not breaching privacy	*36*	*66*	*145*	*155*
3. So long as surveillance cameras are installed in public places with the feature of distinguishing private information from public one is not a reason for concern.	*17*	*47*	*172*	*167*
e. Self-driving cars and car-sharing schemes				
Do you agree that you would feel comfortable using an automated vehicle?	*65*	*99*	*149*	*95*
Do you agree that you do not need a private car if a car-sharing scheme becomes successful because it can save money and time?	*76*	*111*	*146*	*77*

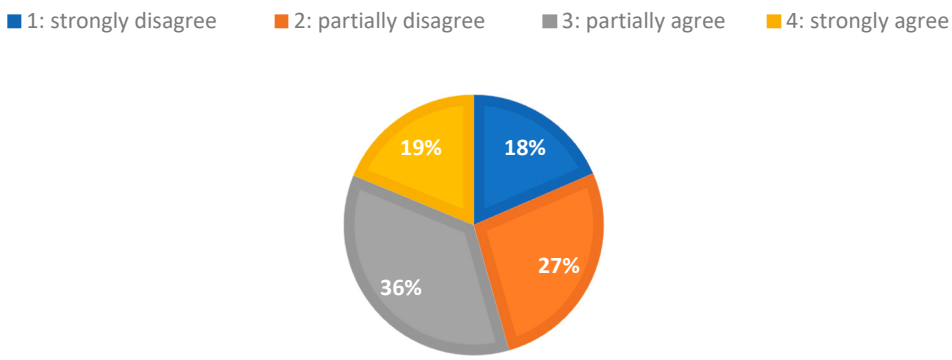

1- WOULD YOU AGREE ON HAMAD GENERAL HOSPITALS USING REMOTE PATIENT-MONITORING DEVICES IN CASE OF PEOPLE WITH CHRONIC DISEASES
1: strongly disagree
2: partially disagree
3: partially agree
4: strongly agree
7%
8%
34%
51%


2. WOULD YOU AGREE THAT IT IS DESIRABLE TO LIVE, LEARN AND WORK IN THE SAME NEIGHBORHOOD?
1: strongly disagree
2: partially disagree
3: partially agree
4: strongly agree
12%
25%
37%
26%

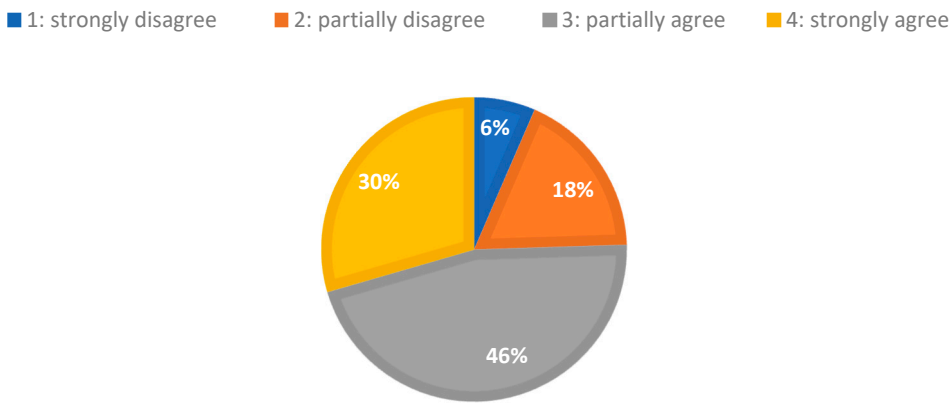
3. DATA COLLECTION ON TRAFFIC AND ROAD USERS IS NOT BREACHING PRIVACY



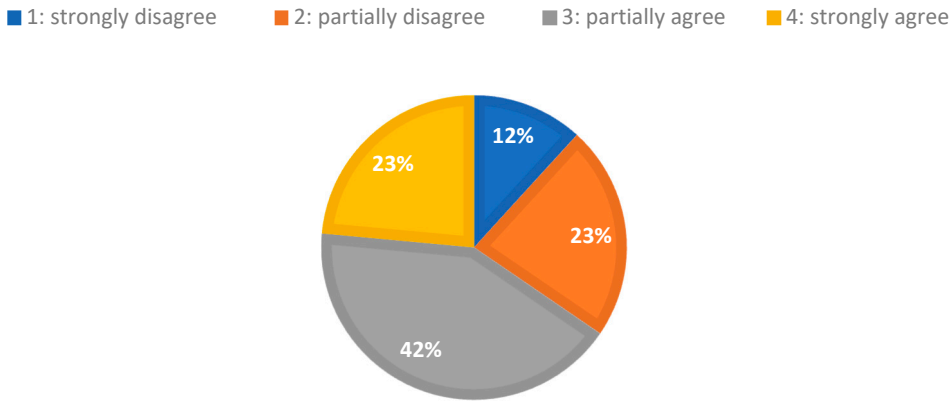
4. DO YOU AGREE THAT YOU DO NOT NEED A PRIVATE CAR IF A CAR-SHARING SCHEME BECOMES SUCCESSFUL BECAUSE IT CAN SAVE MONEY AND TIME?



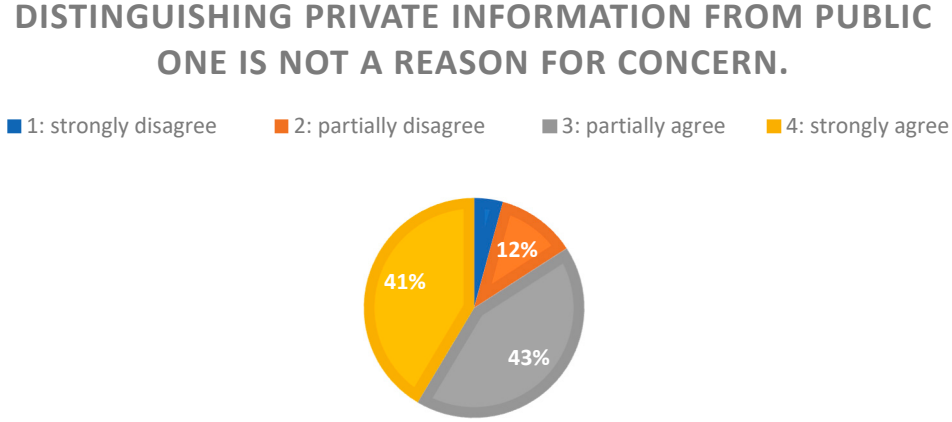
5. WOULD YOU AGREE ON RECEIVING ADVICE FROM DOCTORS VIA TELECOMMUNICATIONS SERVICES?



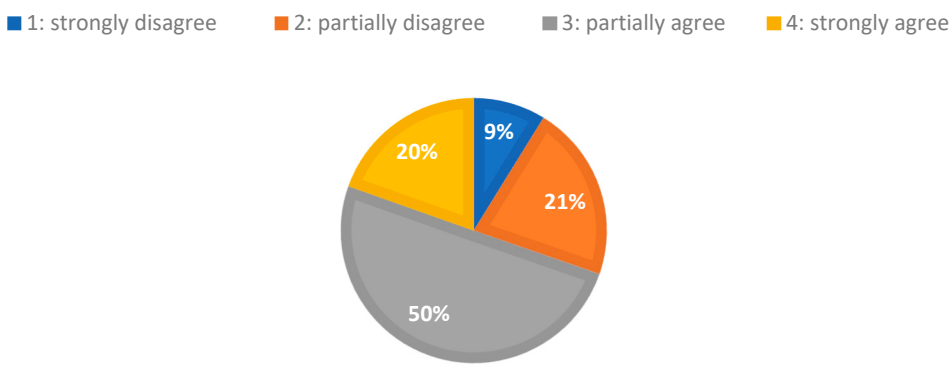
6. WOULD YOU AGREE THAT E-LEARNING AND E-WORKING WILL ISOLATE COMMUNITY MEMBERS?



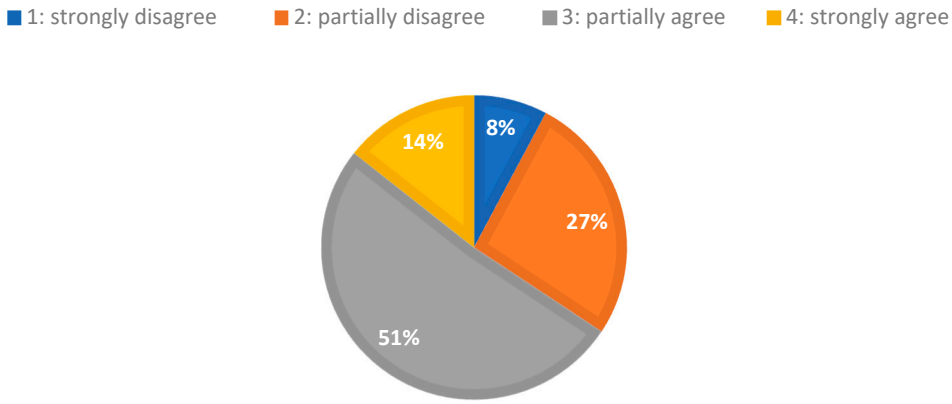
7. SO LONG AS SURVEILLANCE CAMERAS ARE INSTALLED IN PUBLIC PLACES WITH THE FEATURE OF DISTINGUISHING PRIVATE INFORMATION FROM PUBLIC ONE IS NOT A REASON FOR CONCERN.



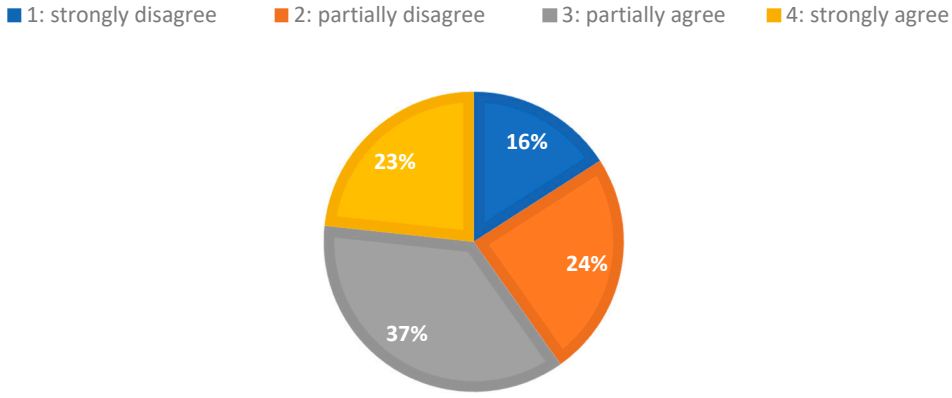
8. WOULD YOU AGREE THAT THE QUALITY OF EDUCATION THROUGH E-LEARNING METHODS IS TRUSTED?



9. WOULD YOU AGREE THAT E-WORKING IS MORE FAVORABLE THAN E-LEARNING?



10. DO YOU AGREE THAT YOU WOULD FEEL COMFORTABLE USING AN AUTOMATED VEHICLE?



4. *Quaetionnire sample:*

Neighborhood Design and Sustainability Survey

I would like to thank you for your participation and assure you that the questionnaire data is confidential and private.

This questionnaire is intended to be filled by parents of primary school students in Qatar

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General Summary:
The aim of this questionnaire is to gather the opinion of Qatari neighborhood residents on two topics: first, walking in the neighborhood and its obstacles. Second, the extent to which Qatari society accepts the idea of using smart technology to facilitate and save time and effort.

This questionnaire is divided into two parts:
Part 1: Measuring the population's acceptance of walkability.
Part 2: Measuring the population's acceptance of smart technology.

1.1. Research topic:

If you would like to know more about the "Research Topic", please read the following paragraph:

The questionnaire is linked to a research topic entitled "The impact of Smart transportation systems on the development of low density residential neighborhoods in Doha". A large number of researchers believe that the low population density in cities and neighborhoods is a challenge to their sustainability due to the lack of efficiency in the mobility and transportation systems.

This research challenges this view and offers an alternative one. Low-density neighborhoods have many characteristics that encourage people to live in them, such as being safer places for raising children and have better quality of life.

Transportation and mobility can be addressed by looking at three axes: The first one is the distribution scheme for the uses and services in the residential neighborhood, the second is the rehabilitation of the outdoors environment in the neighborhood for walking and other activities, the provision of public places such as parks and finally the use of smart technology in providing many services such as Civic, Education and work; and contributing to raising the neighborhood’s level of security and comfort.

1.2. Personal Data:

Please put (√) on the answer that represents you:

Age group:

☐ 20 – 30 ☐ 31 – 40 ☐ 41 – 55 ☐ 56 and higher

Gender:

☐ Male ☐ Female

Educational level:

☐ High School ☐ Bachelor ☐ Higher Education

Job:

☐ Private ☐ Governmental – office job ☐ Governmental - Technical or outdoors

☐ Doctor or Engineer

1.3. Part I: Neighborhood's Walkability:

Introductory paragraph:

Definition of Residential Neighborhood:

Residential neighborhoods have a number of basic characteristics, and they are as follows:

1. Social cohesion and a sense of belonging.
2. Clear geographical boundaries, distinguish it from neighboring areas.
3. Provide places for accommodation, work and entertainment.
4. Provide basic services such as shopping, dining, and worship.
5. Public places such as park and Sports clubs.

Social cohesion and a sense of belonging are the most important characteristics of the neighborhood. A residential area may lose some of its characteristics, except for social cohesion and the sense of community. Without this characteristic residential area is not identified as a neighborhood. Walking and public places contribute positively to cultivating a spirit of social cohesion among members of the neighborhood.

Neighborhood walkability questionnaire:

Q1: About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Please put only one check mark (√) for each business or facility.

	1-5 min	6-10 min	11-20 min	20+ min	don't know
1.grocery store					
2. supermarket					
3. laundry/dry cleaners					
4. elementary school					
5. other schools					
6. fast food restaurant					
7. coffee place					
8. ATM					
9. salon/barber shop					
10 your job or school					
11. public transport					
12. park					
13. gym or fitness facility					

If there are other facilities not mentioned please specify:

Please circle the answer that best applies to you and your neighborhood:

a. **Access to services:**

1. **Neighborhood Stores are within easy walking distance of my home.**

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

2. There are many places worth walking to from my home.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

b. Walking and cycling lanes

3. My neighborhood sidewalks are well maintained (paved, even, and not a lot of cracks).

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

4. There are bicycle or pedestrian lanes within my neighborhood that are easy to get to.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

5. It is safe to ride a bike within my neighborhood.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

c. Beautiful and comfortable streets:

6. There are shady trees along the streets in my neighborhood.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

7. There are many interesting things to look at while walking.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

d. Traffic Hazards

8. There is too much traffic to make walking easy and pleasant in my neighborhood.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

9. Most drivers exceed the posted speed limits while driving in my neighborhood.

1: strongly disagree 2: partially disagree 3: partially agree 4: strongly agree

e. Neighborhood safety

10. The crime rate in my neighborhood makes it unsafe to walk at day time.

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

11. The crime rate in my neighborhood makes it unsafe to walk at night time.

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

f. Lack of Parking:

12. Parking is difficult in local shopping areas

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

g. Walkability Barriers:

13. There are major barriers to walking in my neighborhood that make it hard to get from one place to another

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

h. Social Interaction While Walking

14. My neighborhood recreation places (parks and sports facilities) make it easy for residents to meet one another.

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

Do you think residential neighborhoods are important? Do you like the neighborhood you live in?
Please explain your answer in the box below:

1.4. Part 2: Smart Technology:

In this section people shall be made familiar with the concept of smart technology, so each part of the questionnaire starts with a short description paragraph.

a. **E-health:** might tackle many aspects of the health profession such as; **Remote patient monitoring** (RPM) is a technology to enable monitoring of patients outside of conventional clinical settings. In addition to long distance patient/clinician contact and care, advice, reminders, education, intervention, monitoring and remote admissions.

1- Would you agree on Hamad General Hospitals using remote patient-monitoring devices in case of people with chronic diseases?

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

2- Would You agree on receiving advice from doctors via telecommunications services?

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

b. E-working and E-learning:

E-working or E-learning is to work or learn at home or a remote location from work and learning places through telecommunications services. For example a neighborhood can provide an E-center for work, learning and Civic services where people can access within a walking distance.

1- Would you agree that the quality of education through E-learning methods is trusted?

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

2- Would you agree that It is desirable to live, learn and work in the same neighborhood?

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

3- Would you agree that E-learning and E-working will isolate community members?

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

4- Would you agree that E-working is more favorable than E-learning?

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

c. Safety and Security

Road surveillance cameras are so advanced that they can recognize people faces and identities. It is easy to recognize some people's activities like usage of cell phones while driving.

1. **Data collection on traffic and road users is not breaching privacy**

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

2. **So long as surveillance cameras are installed in public places with the feature of distinguishing private information from public one is not a reason for concern.**

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

d. Self-driving cars and car-sharing schemes:

Dubai has recently tested automated buses in Dubai Downtown. These automated buses will be providing public services in the upcoming years for 2020 Expo visitors. Dubai has also introduced a car-sharing scheme, which means that payment of charges is easily done.

1. **Do you agree that you would feel comfortable using an automated vehicle?**

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

2. **Do you agree that you do not need a private car if a car-sharing scheme becomes successful because it can save money and time?**

1: strongly disagree 2: somewhat disagree 3: somewhat agree 4: strongly agree

Thank you for your patience and cooperation in answering the questionnaire. If you have any comment on the above subject, please do not hesitate to include it in the box below:

QBRI
معهد قطر لبحوث الطب الحيوي
Qatar Biomedical Research Institute
جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY

Qatar Biomedical Research Institute
Institutional Review Board

September 17, 2018

Shk Soud Al-Thani
PhD Student
College of Science Engineering
Hamad Bin Khalifa University
Doha, Qatar

Ref.: Approval for QBRI-IRB
Review Type: Exempt Review
IRB Approval Date: September 17, 2018
IRB Expiration Date: September 17, 2019
IRB Project Number: 2018-027
Project Title: The impact of "smart" transportation systems on the refurbishment of Doha's existing low-density neighborhoods.

Dear Shk Al-Thani,

The QBRI Institutional Review Board (IRB) has reviewed your research proposal that was submitted for the above referenced protocol (2018-027). **It has been determined that your research proposal is eligible for exempt status and requires no further review.** This falls under the category two in MOPH guidelines, regulations and policies for research involving de-identified human subjects stating *that research the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.*

Although your research proposal falls under the exempt status, the research must be conducted according to the submitted research protocol outlined in the approved proposal. Please note that any changes/modifications to the original submitted protocol should be reported to the IRB committee for guidance and review. **Please consider that any modifications to the referenced research proposal may subject the proposal from qualifying for exempt review and require submission of a new IRB application.**

Request for a renewal, if required, should be submitted to IRB at least one month prior to the expiry date to allow the IRB sufficient time to review and approve the request. It is the sole responsibility of the investigator to ensure the timely renewal of the IRB.

Wishing you all the success in conducting your research.

QATAR BIOMEDICAL RESEARCH INSTITUTE
APPROVAL DATE 17 SEP 2018
APPROVAL Expires 17 SEP 2019
IRB APPROVED

Sincerely,

Dr. Khalid Al-Ali
Chairperson

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