Texas A&M University at Qatar

Electrical and Computer Engineering Program

ECEN 403

Senior Design Lab

Semester: Fall 2017

Costumer Needs Survey

Emergency Drone

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Submission Date: **01/10/2017**

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

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1.0 Introduction

This report is about the customer needs survey. The Ministry of transport and communication in innovation lab is as a stakeholder lending the drone. However, Hamad Medical Corporation is as a customer for the use case. As you will go through our report you will found that we did an interview and survey. We did both of the methods to gain all the required information to build our emergency drone in a desired way. This emergency drone will be going through different stages as the MOTC is working on this project for their future pilot updates.

2.0 Methods

Here we will be discussing the two kinds of methods we did them to know more about our customer needs. The emergency drone project is not a very well-known project among normal people. So, we did a survey to let other people know more about our project.

2.1 Interview

For the interview, we conduct five interviews to make sure that we get the best needed information. So, we did two of them with the ministry of transport and communication, another two with two of our distinct professor in electrical and computer engineering department. The last one was with Hamad Medical Corporation. All of those interviews was conducted face to face so that we gain more information and we can understand more. This was a challenge for us as we are only two students and we need to conduct all of this interviews. Also, it was not very easy to reach the companies as we need to arrange a timing which is suitable for all of us.

2.2 Survey

For the survey, we used survey monkey to build our questions on and then send the link to different kind of peoples to know what they think about our project. Those people are our family members, friends, and workers. We try to reach to different certain of ages so that we can see all the perspective.

3.0 Design summary

By the help of the ministry of transport and communication, we will take their delivery drone and add several features to it that would meet our needs to have a successful emergency drone. We will be adding voice communication; which will let the person to speak if he/she is in an emergency situation and have instructions if needed. A mechanical arm to pick and release items will also be added.

Moreover, we will add a pro-camera to figure out where the person location and have an overview of the situation. Then deliver the information to Hamad medical center. A delivery box will be designed with certain requirements that we identified from the customer needs. This box will have a payload of 5Kg.

4.0 Project status

The project is on progress, the drone arrived on the 28th of September, 2017. We will start taking the measurement of the drone to design the box and the mechanical arm. In addition, we are discussing the programming language that we will be using in the project. We are thinking of using either python or machine planner. But we may use the python as it is easier to learn in the meantime. The camera type is being discussed with the TA to find the best suitable one for the project. We still did not finalize which one to use but we may go with the pro-camera.

Also, we are conducting a meeting each Wednesday from 12pm to 1pm to finalize the tasks between the Electrical and mechanical major students. We started an outline of our ethnographic study report and how we want the video to look like. We divided the tasks between us for the next assignment as shown below.

5.0 Customer needs analysis

For the interview, the interviewer express that they are with the idea of having an emergency drone in this region. Hamad medical center really feel enthusiastic about this idea and we even have talked to one of the emergency doctor. As you can find in the **appendix** below the interview questions and answers you will see that all of them have a common aspect about the privacy of the drone. You know that with technology is it very hard to have a secure place but we are trying to have the drone with Hamad medical center. So, by this it will be used for medical us only.

For the survey, the statistics below shows that most of the people are welcoming the idea of having an emergency drone. They believe that it would be helpful but not the extent that it would replace ambulances. This comes from the fact that they are not familiar to the technology yet. In addition, they are interesting in the idea of communicating through a video where more than 50% believe that it helpful to communicate with patients during emergencies. The participants in the survey mentioned many difficulties that we may face like, hackers, unpredictable weather, and how hard it is for the community to adapt the technology. We were also pleased with the fact that only a small percentage of 10% would rather not to use the emergency drone.

6.0 Evaluation of assignment

The interview we conduct was really useful and we learn a lot of ideas within their answers. Those ideas we have in mind and papers would not stop only here, we are even thinking to explore our project and make it to help the patient in real life.

The survey was really helpful were it grab our attention to some aspects like hackers and how the community will accept the technology. Also it gave us an idea of how people would react to the project and this will keep all their responses on our mind while working on the drone.

7.0 Division of tasks of the next assignment

For the ethnographic study video:

Names	Tasks
Hamda	Report
Lolwa	Report
Mizan	Logo
Monib	Video

For the ethnographic study video, we decided to use explee animation website for creating our video. Also, we are working on the logo to have a unique logo for our drone and we will update every certain task in our drone wix website.

8.0 Appendix

- **Interviews:**

ICT interview questions:

This interview is for our senior design project. The project is about an emergency drone that will deliver medicines and equipment. There will be a camera and a voice communication to give an overview of the emergency situation.

1. Can you introduce yourself and your position?

Eman Al Kuwari, part of the Tasmu Smart Qatar team, responsible for the transportation and logistics verticals in the program. Previously was working in the innovation lab developing the drone delivery pilot.

2. How do you think the drone will benefit the country vision 2030?

Drones can be useful across different sectors in solving some of the challenges faced today. In certain fields such as the oil and gas it has proven to help lower the cost and monitor areas that are considered hazardous for humans to enter. Different sectors are coming up with different use case scenarios to help overcome challenges or optimize services, in that sense it can align we almost all pillars presented in the 2030 vision whether directly or indirectly. Also the great interest arising for the adoption of drones in Qatar can help achieve the diversification of the economy with all the unique researches being developed and the startups being established to create services for the country.

3. What current or future drone innovation really excites you the most?

Currently I'm fascinated at the recent developments in engineering of drones capable of transporting humans and the utilization of AI. Such concepts are being tested immensely and can cause disruption in the car industry if proven successful.

4. What challenges do you believe that emergency drone may face?

At the current stage the lack of maturity in the regulatory environment is the major obstacle that needs to address. As for technical challenge their several issues; the limited battery capabilities that limits the drones operations for longer distances, time and adding features such as keeping the item being

transported temperature. Another challenge is the harsh weather of Qatar that requires especially designed components that would be able to withstand the heat, strong winds, dust and humidity.

5. **What do you see as the most interesting problems in drone automation and control?**

I have two perspectives on this matter, one being the lack of skilled talent able to operate and program with enough knowledge and skill in that field. Second thing is the ability to manage and monitor several drones operating with several task on different routes and once.

6. **How can drones be successfully integrated into governmental or commercial uses without threatening privacy rights?**

This can be achieved if a regulatory system is put in place where operational drones can be registered. Also there are few known practices and concepts that can be adopted such as creating a group-fence to limit the drone from flying over certain areas.

This interview is for our senior design project. The project is about an emergency drone that will deliver medicines and equipment. There will be a camera and a voice communication to give an overview of the emergency situation.

1. **Can you introduce yourself and your position?**

Nabeeha Fatima, Innovation Lab Analyst, responsible for analyzing various emerging technologies and local challenges in key sectors (Transport, Education etc.) and developing pilots around them with a user-centered approach.

2. **How do you think the drone will benefit the country vision 2030?**

In the recent years, there have been dramatic developments in the field of drones. They no longer are viewed simply as toys or military aircraft; their use has been investigated in various applications such as wildlife & atmospheric research, disaster relief, delivery, Oil & Gas industry and agriculture. With all these applications, drones have numerous benefits to offer- (i) Increasing work efficiency and productivity, (ii) Decreasing workload and production costs, (iii) Improving accuracy (iv) Saving the environment and many more. All these directly contribute to economic, human and environmental development as mentioned in QNV 2030.

3. What current or future drone innovation really excites you the most?

While working on the pilot, the team and I realized the battery poses a major challenge. The existing batteries are heavy and have a lower capacity, which in turn affects the payload, and fight time. There have been research and development surrounding the batteries for e.g., using hydrogen cells instead of Lithium Polymer (standard drone batteries) and reducing the weight of the fuel cells as well. This could not only increase flight time but also allow the drone to carry way heavier payload including people (like a drone taxi) which I find to be very exciting.

4. What challenges do you believe that emergency drone may face?

3 key challenges:-

(i) Battery

As mentioned in the previous answer, battery poses quite a challenge since the existing batteries are heavy and have a lower capacity, which in turn affects the payload, and fight time.

(ii) Regulations

As of now, the regulations for flying drones in Qatar is still at its infant stage; which will be a major obstacle.

(iii) Weather

Qatar has high winds which quite unique in the region, at often times, the weather may not be permissible to fly drone especially with a payload

5. What do you see as the most interesting problems in drone automation and control?

Creating a secure drone network, especially when you are flying multiple drones with no interferences, so that the emergency drones complete their mission successfully.

6. How can drones be successfully integrated into governmental or commercial uses without threatening privacy rights?

Regulation is key in this situation. The government needs to define areas, policies and legislations for themselves and the public that would not only streamline processes for drones (in both public & private sector) but also protect privacy rights.

ECEN professors interview questions:

This interview is for our senior design project. The project is about an emergency drone that will deliver medicines and equipment. There will be a camera and a voice communication to give an overview of the emergency situation.

1- Can you introduce yourself and your position?

Shehab Ahmed, Associate Professor, Texas A&M University at Qatar

2- What kind of features would you want to add to the drone?

Features, in my opinion, are application specific. So, for delivery of medication, you need a very different set of features than for crop sampling.

3- How do you think the drone will benefit the country vision 2030?

Very difficult to answer this question.

4- What current or future drone innovation really excites you the most?

Energy storage and power management.

5- What challenges do you believe that emergency drone may face?

Distance, and payload size.

6- What do you see as the most interesting problems in drone automation and control?

I am not an expert on this.

7- How can drones be successfully integrated into governmental or commercial uses without threatening privacy rights?

Border patrol and agrictural applications seem interesting to me.

ECEN professors interview questions:

This interview is for our senior design project. The project is about an emergency drone that will deliver medicines and equipment. There will be a camera and a voice communication to give an overview of the emergency situation.

1- Can you introduce yourself and your position?

Joseph Boutros, Professor.

2- What kind of features would you want to add to the drone?

Besides voice communication, camera, it is not easy to guess other options. Try to monitor the drone good.

3- How do you think the drone will benefit the country vision 2030?

Improve the reliability of the delivery.

4- What current or future drone innovation really excites you the most?

Drone equipped with long-life battery. This is also a challenge for many cases.

5- What challenges do you believe that emergency drone may face?

Bad weather conditions.

6- What do you see as the most interesting problems in drone automation and control?

Avoid collisions under high traffic.

7- How can drones be successfully integrated into governmental or commercial uses without threatening privacy rights?

Technology is improving at the price of a reduced privacy.

HMC interview questions:

This interview is for our senior design project. The project is about an emergency drone that will deliver medicines and equipment. There will be a camera and a voice communication to give an overview of the emergency situation.

1- Can you introduce yourself and your position?

Dr.Eyad AlMadhoun, Head of the clinical pharmacy specialist.

2- What is the temperature that suit medicine?

Room temperature, maximum of 20 C for the medicines

3- What kind of medicine would you want to deliver for emergencies?
Calcium gluconate

Sodium bicarbonate
Dopamine
Dobutamine
Isoproterenol
Aspirin

4- What kind of emergencies would you want to use the emergency drone for?

Collapsed patients and cardiac arrest

5- What application you want to add it for the emergency drone?

A defibrillator to be in the drone

6- Is it healthy to put the medicine and deliver it on the drone?

Yes, as long as it temperature controlled

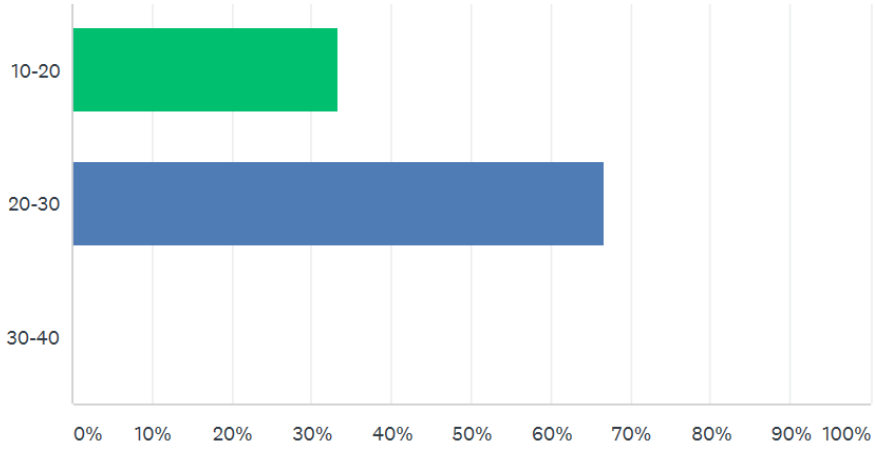
7- Do you think this drone will grab people attention?

Yes

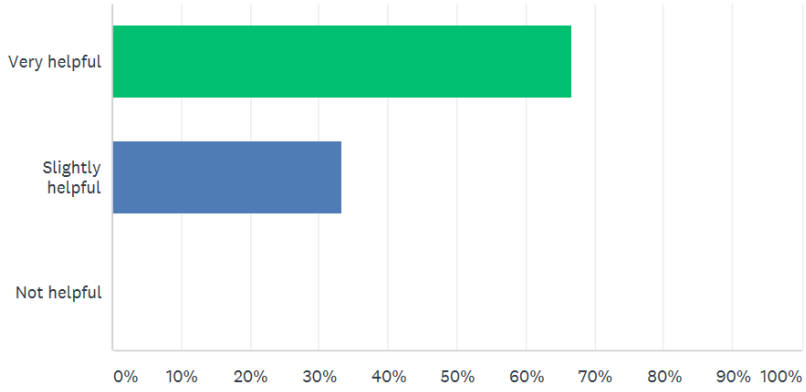
- **Survey:**

Nowadays everything is working with electronics devices. Having a drone to deliver items for people is very needed in this certain region. Therefore, we decided to communicate with the ministry of transport and communication to work together and enhance a drone that can benefit the country. It will be an emergency drone with the help of many well-known companies like ooredoo, ministry of transport and communication, ministry of interior, and Hamad medical center.

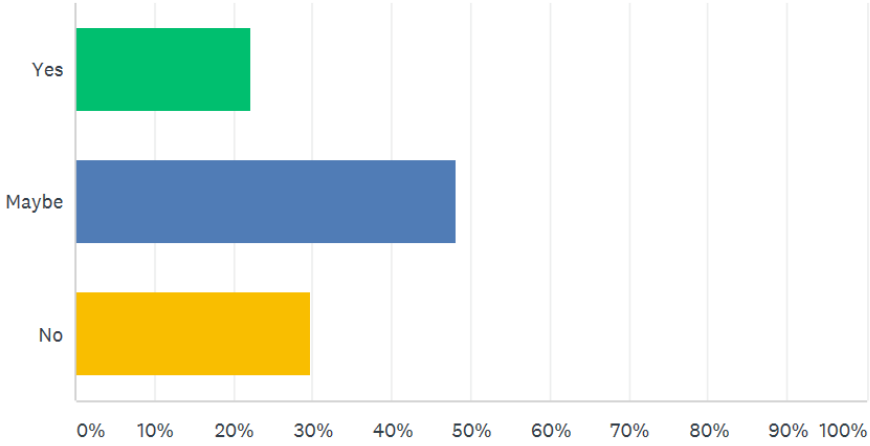
Q1: How old are you?



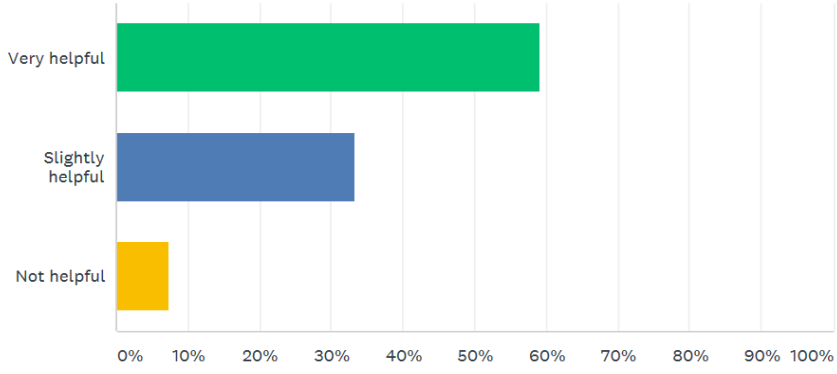
Q2: How helpful do you think an emergency drone will be in car accidents?



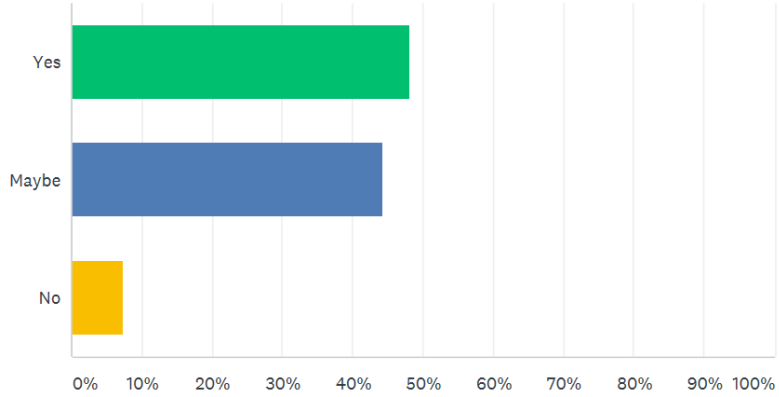
Q3: Do you believe that emergency drone can replace ambulances?



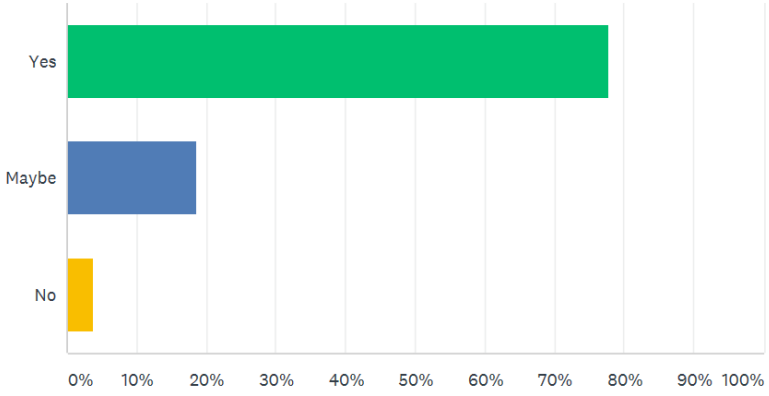
Q4: How helpful do you think communicating through a video in case of emergencies would be?



Q5: Do you think that the emergency drone will contribute significantly in saving people lives?



Q6: Do you believe that the emergency drone will play an important role in the country's 2030 vision?



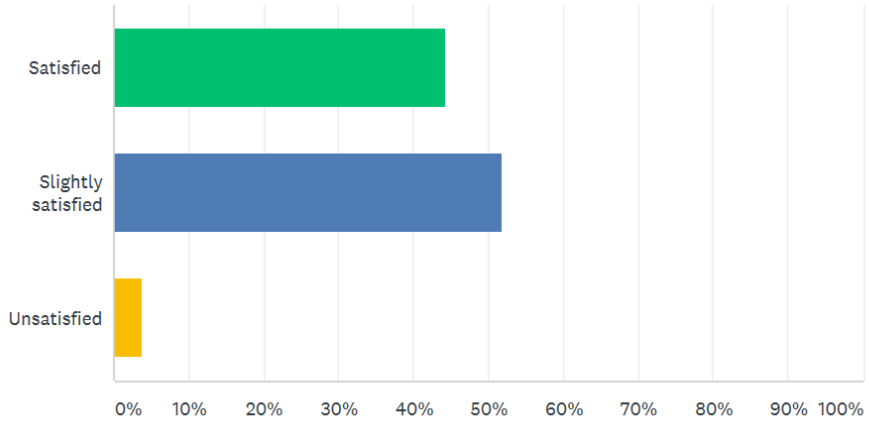
Q7: What kind of difficulties do you think the emergency drone can face from the community?

- How to deal with it?
- It may arrive late or doesn't have the enough equipment needed \
- Getting to far places not provide full medical help for people in need. If used for deliveries (like amazon drone delivery system) shipment might be lost trust issues - People through panic situations cannot act properly
- I think that would be communication since that would be the first time to use such a thing here in Qatar, it would be better to do stimulation sessions before actually integrating them With the health care system In addition to that, emergency drone won't replace an

ambulance because the weight that the drone can actually carry is small > that may not be an issue but it might be helpful to develop a drone that carries larger weights

- People would appreciate a fast response to their emergencies but might take a while to accept the idea of it.
- The car traffic
- There is generally nothing negative except if a drone malfunctions, falls and hits someone.
- Hard to control the drone, the battery (it will need huge energy), how it will know the location? How will it reaches far place? Wi-Fi? 4G. I'm trying to help you, because we face these problems with our drone. GOOD LUCK
- Hackers
- Unpredictable weather
- People won't know how to use it or they will be scared because their privacy is affected
- Spaces
- Help the person control themselves
- Yes
- That some injuries require transporting the patient to the hospital, which the drone cannot do.
- People may not relate to these kind of technology, too hard for the community to adapt with the drone.
- Understanding the role of the drone or how exactly it will help like what type of an emergency.
- None

Q8: How satisfied do you think patients would be with the emergency drone?



Q9: How likely would you use the emergency drone in case of emergencies?